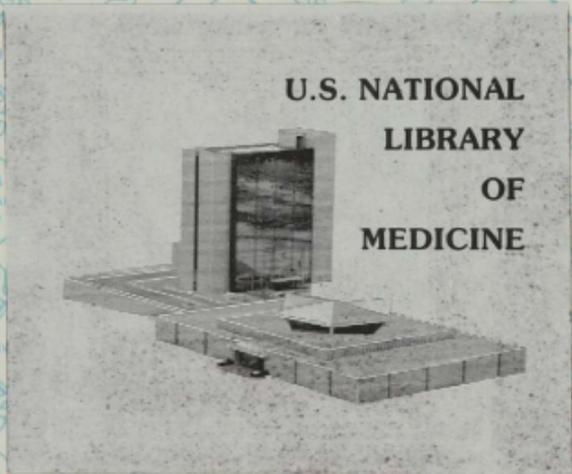


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The
MEDICAL DEPARTMENT
OF THE UNITED STATES ARMY
IN THE WORLD WAR

VOLUME VI

SANITATION

IN THE UNITED STATES

By

COL. WESTON P. CHAMBERLAIN, M. C.

IN THE AMERICAN EXPEDITIONARY FORCES

By

LIEUT. COL. FRANK W. WEED, M. C.

PREPARED UNDER THE DIRECTION OF
MAJ. GEN. M. W. IRELAND
The Surgeon General



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LETTER OF TRANSMISSION

I have the honor to submit herewith Volume VI of the history of the MEDICAL DEPARTMENT OF THE UNITED STATES ARMY IN THE WORLD WAR. The volume submitted is entitled, "SANITATION."

M. W. IRELAND,

Major General, the Surgeon General.

THE SECRETARY OF WAR.

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PREFACE

In the compilation of this volume it was inevitable that the record of the work of many medical officers who took a prominent part in the application of the various branches of "sanitation" to our Army, both at home and abroad during the World War, could not separately be displayed. This is unfortunate since, in many instances, specific chapters had been written by such officers with the thought in mind that these chapters would be incorporated in the present volume. To obviate repetition, and to follow the dictates of an expositional evolution, such manuscripts had to be utilized to the best advantage. In many instances, bibliographic references, in indicating the sources from which our material was derived, necessarily must serve as an acknowledgement of credit. On the other hand, since the volume comprises selected matter, no reference could be made to the work of innumerable officers, without doubt equally worthy of mention. Occasion is taken now to acknowledge credit to such officers, without whose work this volume would not have been possible.

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INTRODUCTION

Military sanitation may be defined, in general, as the prevention of disease in armies. More specifically, it consists in the practical application, under the diverse conditions met in field, camp, or permanent garrison, of a system of principles relating to the preservation of health, commonly denominated as the science of hygiene. Military sanitation as a conserving agency is to be contrasted with the practice of military surgery and medicine, which aim to salvage individuals who have suffered wounds or who have become ill as a result of the failure of sanitary methods to give perfect protection to the soldier.

Ordinarily little distinction has been made between the terms "military hygiene" and "military sanitation." The study of hygiene has been directed usually along two distinct but converging lines, individual and public. Under individual or personal hygiene are grouped such matters as cleanliness of the body, exercise, habits, association; while public hygiene considers those larger measures which, under the designation of "sanitary engineering," are instituted for the welfare and protection of civil and military communities as units. Military sanitation, as practiced in the United States Army, includes in its sphere both personal and public hygiene and in addition makes use of all the well-established procedures which more recently have been grouped under the heading of "preventive medicine." The term "care of troops" is sometimes used as synonymous with military sanitation. In recent years the adjective "sanitary" has been applied to troops and organizations of the Medical Department. An example of this usage is the "Sanitary Train," which comprised the four field hospitals and four ambulance companies designed for the collection and care of the wounded and sick of a division in the field. In this sense the word "sanitary" has nothing to do with "sanitation" in its generally accepted meaning.

In its scope military sanitation embraces all details which relate to the public health of a civil community, and in addition it takes cognizance of other factors which either do not enter into or can not be controlled in civilian life. On the one hand, civil and military hygienists tread on common ground as regards the consideration of site, soil, drainage, air, climate, altitude, habitations, ventilation, heating, lighting, care of the person, food, water, clothing, exercise, occupation, habits, morality, parasites, disease-bearing insects, communicable diseases, disinfection, disinfestation, disposal of excreta, garbage, manure, and other refuse, disposition of the dead, sanitary ordinances, inspections, and vital statistics. On the other hand, conditions incident to the march, the camp, the trench, the crowded transport, and the battle field bring in other problems difficult of solution and practically unknown in civil life. Furthermore, sanitary considerations of undoubted importance may have to be neglected because of military necessity, since war is waged in order to attain a decision of arms and not with high ideals of sanitation as its primary object.

While the civilian public-health official has to take his municipal population as he finds it, the military sanitarian can choose the bulk of his human material in the form of recruits, the proper selection of the soldier constituting one of the most important requirements for attaining satisfactory health conditions and the greatest degree of military effectiveness. The fundamental reason for military sanitation is not humanitarianism but increased military efficiency, and the application of sanitary procedures to armies is of primary value only in so far as these procedures are adapted to the requirements of the military machine and assist in the struggle for victory. Failure to grasp this essential fact not infrequently has led to disappointment and disillusionment on the part of sanitarians unfamiliar with the requirements of armies in time of war.

As to the general manner in which the Medical Department discharged its duties in respect to sanitation, it is considered best, for purposes of a complete understanding, to discuss this question at this time, since the text of this volume is so arranged as to deal with subjects separately.

In our Army, no executive powers are conferred on the Medical Department save in strictly Medical Department commands. In general terms the Medical Department is charged with investigating the sanitary condition of the Army and making recommendations in reference thereto; of advising with reference to the location of permanent camps and posts; the adoption of systems of water supply and purification, and the disposal of wastes; caring for the sick and wounded; making physical examinations of officers and enlisted men; the management and control of military hospitals; the recruitment, instruction, and control of the enlisted force of the Medical Department and of the Nurse Corps; and furnishing all medical and hospital supplies. The commanding officer universally is held responsible for the sanitation of his particular command, just as he is for all other matters pertaining thereto. However, of recent years, the practice has become common for a commanding officer to delegate his powers in respect to sanitation to his principal medical officer, and sometimes to his sanitary inspector, by the issue of an order to the effect that directions given by these officers on matters of sanitation shall be regarded as the orders of the commanding officer.

The duties of a medical officer acting in an advisory capacity are, in general, as follows:

(1) To keep himself informed of existing conditions and, especially in the case of a moving command, of conditions that may be anticipated, which have a bearing upon the health and physical efficiency of the command.

(2) To communicate to his commander such of this information as has a bearing upon military administration and to recommend such measures as the surgeon deems advisable to meet the existing or anticipated conditions. The scope of the information required, and of the field which recommendations must cover, varies greatly. It includes the training of the command in matters of personal hygiene and military sanitation; the provision of facilities for maintaining good sanitary conditions; and, in so far as they have a bearing upon the physical condition of the troops, the equipment of individuals and organizations, the condition of buildings or other shelter occupied by troops, the char-

acter and preparation of food, the suitability of clothing, the disposal of waste, and the disposition of the sick and wounded, including action on requests for leave or furlough on account of sickness.

(3) To make prescribed reports and returns and to take such action on the reports and returns of his subordinates as may be required by existing regulations.

(4) To perform such other duties as may be required of him by superior authority.

While medical officers acting as technical advisers of their commanders are responsible for pointing out insanitary conditions and making proper recommendations for their correction, the direct responsibility rests with the commanders. If, however, the commander authorizes the medical officer to give orders in his name for the correction of defects, then the duties and responsibilities of the latter are correspondingly increased. Each senior medical officer is the sanitary adviser of his commanding officer. This extends from the smallest independent command to the War Department, of which the Surgeon General is the adviser. Advice of this character may be oral or written. A special form is provided for the latter; it bears the name "sanitary report," and is regularly made monthly from every command. The surgeon forwards it to the commanding officer, who returns it to the surgeon with his comments. The surgeon then forwards it through military channels to The Adjutant General, who then sends it to the Surgeon General for comment. When necessary the local commander concerned is called on for explanation of defects, and ultimately directed to correct them if this lies within his power. Like action is taken in expeditionary forces, the reports not then being forwarded to the War Department. Special sanitary reports are resorted to in more immediate emergency and when it is deemed desirable that action be taken on some special insanitary condition. The channels through which they pass are those already specified.

The professional training of the military services, in matters pertaining to sanitation, was carried out, prior to the World War, chiefly by the regular courses of instruction given medical officers at the Army Medical School in Washington, D. C., and at the Army service schools, Fort Leavenworth, by the courses given the members of the Medical Department in field hospitals, ambulance companies, and detachments, and by the teaching of hygiene to other branches of the Army.

Hygiene is taught to cadets at West Point, conformably to the regulations for the United States Military Academy, and to commissioned officers of the Army at garrison and service schools, as prescribed by general orders issued from time to time for the regulation of military education in the Army.

A principal duty of the surgeon of a line organization is to instruct, at suitable times designated by the commanding officer, the entire personnel of the organization in personal hygiene, and to train his subordinates in all departments of field sanitary work.

One of the chief objects to be obtained by the Medical Department at camps of mobilization is described in the Manual for the Medical Department (1916, par. 594) as follows:

To instruct all individuals and organizations so far as practicable in personal and camp hygiene, and in addition to instruct Medical Department personnel, commissioned and enlisted, in the routine work of the Medical Department in the field. An important factor in the instruction will be the object lesson afforded by the administration of the camp and the measures inaugurated for the maintenance of sanitary conditions therein. This instruction will be carried out under the immediate supervision of the camp surgeon acting under the direction of the department surgeon. It will be systematically arranged and will follow a definite program furnished by the department surgeon.

Throughout the war the education of the Army was sustained, as required in the above-quoted paragraph, not only by medical officers attached to organizations, but also, and in an intensified manner, particularly as regards social hygiene, by the War Department. The activities of the Surgeon General's Office in connection with combatting venereal disease in the Army through educating the men were augmented by various civilian public-health agencies which on July 1, 1918, were placed under the direction of the United States Public Health Service. The educational facilities thus provided comprised syllabuses for lectures, lantern slides, and dramatic motion pictures whose themes were the dangers of acquiring venereal disease.

As with other military regulations, any infraction of a sanitary regulation is liable to punishment. Such punishment is specially extended to failure to take the venereal prophylactic or, as interpreted in the American Expeditionary Forces, the appearance of venereal disease was regarded as *prima facie* evidence of failure to take prophylactic.

Military practice enforces communication only through military channels; therefore, so far as the Army as a whole is concerned, advice or instruction on sanitary subjects can be published only in military orders. This is done on the advice and recommendation of the Medical Department. Technical advice is, however, transmitted directly by higher to lower medical authority.

All research investigations of sanitary subjects are carried on solely by the Medical Department.

The rôle of the Medical Department is purely advisory in so far as construction, sewage, water supply, etc., are concerned. It supplied no sanitary apparatus during the World War, though it did supply all of its own scientific apparatus.

Contrary to the case in some other armies, prophylaxis by means of vaccination, typhoid inoculation, etc., had the full support of the War Department, so that no difficulties were placed in the way of the Medical Department in this respect. In fact, if discovery of other similar methods had been made during the war there is little doubt but that they would have been adopted in the main. Scientific measures having to do with protecting the health of troops centered in the medical officers of the Army. These officers were notably assisted, however, by scientists in correlated fields. Entomologists and many sanitary engineers were commissioned in the Sanitary Corps and performed most valuable services in their specialties. Not only was there a Medical Department enlisted force, but this was also true for the Sanitary Corps. Members of the latter were very largely used for antimalarial work.

SECTION I

IN THE UNITED STATES

CHAPTER I

SANITARY INSPECTION

The principle of having sanitary inspections made by medical officers was established in our Army by a general order of April 21, 1818. As actually carried out the practice eventuated in two classes of inspectors, viz, local and general.

LOCAL SANITARY INSPECTIONS

In our Army, both in peace and in war, the senior medical officer, either in person or by deputy, is the sanitary inspector of the command to which he belongs. The following regulations on this subject were in effect when we entered the war in 1917, and were not materially changed during the war:¹

1387. The surgeon of every post or command, under the direction of the commanding officer, will supervise its hygiene and recommend such measures as he may deem necessary to prevent or diminish disease. He will examine, at least once a month, the sanitary condition of the public buildings and grounds, the drainage, the sewerage, the condition of all sanitary appliances, including incinerators, sterilizers, filters, and odorless excavators, the amount and potability of the water supply, the character and cooking of the food, including the quality of the milk and the condition of the dairies from which it is obtained, and the character and causes of prevailing diseases and measures taken to prevent them. Immediately after such examination he will report thereon in writing to the commanding officer, noting also in the report the dates on which the prescribed physical inspections of the various organizations of the command were made, the number of new cases of venereal disease which appeared in the command, the ratio of the same per 1,000 of strength, and the number of venereal prophylactic treatments given, with such recommendations as he may deem proper. The commanding officer will forward the report, through military channels, to The Adjutant General of the Army, noting thereon his views and the action taken by him; and should he have deemed the action recommended by the surgeon impracticable or undesirable, he will state fully his objections. The commanding officer will furnish the surgeon with a copy of his indorsement forwarding the report. Special sanitary reports will take the same course as the regular monthly sanitary reports. As far as practicable intermediate commanders will correct sanitary defects, noting their action by indorsement.

Sanitary inspections of a general hospital or other establishment or organization of the Medical Department will be made under the direction of the medical officer in command, by a junior medical officer assigned to that duty, who will report in writing to the commanding officer. The latter will forward the reports through military channels to the Surgeon General, indicating his action by indorsement thereon. The commanding officer will keep an appropriate record of the reports and his indorsements. (C. A. R., No. 25.)

414. The sanitary reports called for by Army Regulations constitute a record of the sanitary conditions of a post or command month by month and should be complete either in themselves or by reference. A duplicate of each report will be retained with the medical records of the post or command. At a permanent post the duplicates will be filed in and form a part of its medical history.

415. Important changes in sanitary conditions occurring during the month will be fully described in the monthly report, Form 50. When, however, there has been no important change and there are no readily preventable sanitary defects remaining uncorrected, it will not be necessary to report in full under each heading of the form. Under these circumstances a general statement under each heading should be made, referring by date to the previous reports which contain more extended information on the subject.

416. While the monthly sanitary reports are commonly used as the form of communication for suggestions requiring administrative action, the medical officer may, if he desires, make important recommendations the subject of a special sanitary report. The fact that such a special report has been rendered will be referred to on the next monthly sanitary report, with a brief note as to its contents.

417. When a regularly authorized sanitary inspector is present for duty with troops in the field the monthly sanitary report (Form 50) is not made by the surgeons of regimental and other similar organizations.

The form used for the regular monthly sanitary inspections was as follows:²

SANITARY REPORT

For the month of _____, 191__, at _____
(Designation of post or command.)

From: The surgeon.

To: The commanding officer.

I submit the following report on the sanitary condition of this command during the month designated:

1. Public buildings and grounds or camps and their surroundings: -----

2. Drainage, sewerage, and disposal of wastes -----

3. Sanitary appliances (filters, sterilizers, incinerators, odorless excavators, etc.) -----

4. Water supply -----

5. Food supply and its preparation -----

 - (a) Quality of the milk -----
 - (b) Condition of dairies -----
6. Clothing of the men -----

7. Character and causes of prevailing diseases and measures taken to prevent them -----

8. Dates of semimonthly physical inspections of the command (by organizations) -----

 - (a) Number of new cases of venereal diseases, -----; rate per thousand of strength -----
 - (b) Number of venereal prophylactic treatments given -----
9. Recommendations -----

Date, _____, 191__, _____, U. S. Army.

Sanitary inspections in commands were made throughout the war, and on the facts established by them mainly were based prompt action for the local correction of sanitary defects.

While these local inspections began with regiments and other smaller independent units, they did not cease there; divisions, camps, and depart-

ments also had their sanitary inspectors who reported direct to their respective commanders, who in turn were held responsible for the sanitation as well as all other matters having to do with their commands.^a

GENERAL SANITARY INSPECTION

DEVELOPMENT OF GENERAL SANITARY INSPECTION SERVICE, SURGEON GENERAL'S OFFICE, DURING THE WORLD WAR

Like many other of the Medical Department activities at the outbreak of the war, the sanitary inspection service grew up without formal order or organization.^b That the necessity for such inspections was at once tacitly accepted by the higher military authorities, is indicated by the issuance of the necessary travel orders by The Adjutant General. In anticipation of the future growth of the inspection service of the Surgeon General's Office, one of the Surgeon General's assistants, on November 13, 1917, recommended the centralized control and coordination of such service.³ The principles of the recommendation referred to were approved by the Surgeon General,³ and on January 1, 1918, the inspection service was definitely organized as a section of the division of sanitation.

The tendency for each professional division or section of the Surgeon General's Office to have inspectors for investigating exclusively the handling of its particular line of professional work in camp or in hospital had gradually developed in 1917 and persisted in an increasing degree. These inspectors, almost without exception, were temporary officers with relatively little knowledge of military matters, though experts in their respective technical subjects. The practice of independent inspection for every specialty was bound to result in duplication of travel, effort, and expense, and also in a lack of centralized knowledge regarding conditions, with consequent confusion due to diverse recommendations by different inspectors who frequently, due to inexperience in military affairs, viewed the administration of a camp or hospital chiefly from the standpoint of their own specialties. Therefore, to centralize and control such inspections, the following office order was issued:

Office Order No. 7.

SURGEON GENERAL'S OFFICE, WAR DEPARTMENT,
February 20, 1918.

1. Hereafter all inspections for the various divisions of the Surgeon General's Office will be authorized and ordered only through the inspection section of the sanitary division.

W. C. GORGAS,
Surgeon General, U. S. Army.

This centralization of professional and technical inspections, as distinguished from general sanitary inspections, continued in force for a time, but the desire for very frequent independent inspection by each professional division or section of the Surgeon General's Office remained and ultimately resulted in the appointment of "consultants," who visited the camps and hospitals ostensibly to consult regarding the cases pertaining to their specialties.⁴ In

^a For details concerning sanitary inspectors in the theater of operations, see the second section of this volume, "Sanitation in the American Expeditionary Forces," Chap. I.

^b For details concerning the organization of the division of sanitation of the Surgeon General's Office, see Vol. I, Chap. VIII.

reality these officers acted as inspectors of their special services and submitted extensive and detailed reports to their respective divisions or sections in the Surgeon General's Office. The consultants were not under the control of the inspection section nor of the division of sanitation. The inspectors of the inspection section, however, continued to inspect the professional services at all camps and hospitals, but this inspection was usually less detailed and technical than that made by the consultant.

PERSONNEL AND OPERATION OF SANITARY INSPECTION SECTION

The personnel of the inspection section, during the period from January 1, 1918, to the end of the war, consisted of an officer in charge, one and sometimes two assistants (medical officers), a force of civilian clerks, and a body of sanitary inspectors which varied in number from 4 to 8.⁵ The majority of the inspectors were medical officers of the Regular Army, but during most of the period there were also two or more inspectors from the Sanitary Corps, representing the section of sanitary engineering and the section of food and nutrition. These Sanitary Corps officers made technical inspections, as needed, to investigate matters pertaining to their specialties. There was also in the section one officer from the United States Public Health Service who investigated matters relating to mosquito control.⁵

As finally organized, the officer in charge of the section, under the chief of the division of sanitation, was charged with preparing itineraries for inspectors, obtaining orders for the travel entailed, determining the scope of the inspections, devising and altering questionnaires, handling the reports and recommendations of inspectors, and answering all kinds of complaints which required a special inspection or which could be definitely replied to on the basis of information already available in the filed inspection reports. The officer in charge also made many inspections himself in order to be thoroughly familiar with conditions in the various stations.

The matter of preparing itineraries was a difficult one because there were never sufficient inspectors. Consequently, in deciding on a course for any given inspector it was necessary to weigh carefully the respective needs of many stations in the area to be covered and to select for a visit only those points where sanitary problems appeared most urgent. Usually on an inspection trip the officer visited from 6 to 10 stations, the intention being that the trip should require about two weeks, rarely three. A card index was kept of all inspections made, but for convenience of the officer in charge of the section a charting scheme was devised to enable him to readily keep track of the work and to visualize the future needs.⁶ Charts prepared like the following were kept mounted on cardboard and hung in a row on the wall of his office, new sheets being superimposed as old ones became filled; more than a dozen separate charts were required to contain the names of all stations which were being inspected at the height of the military activities.⁶

CHART I.—Scheme to show what camps had been inspected, when, and by whom

National Army cantonments	Last insp. 1918	1918 Sept.	1918 Oct.	1918 Nov.	1918 Dec.	1919 Jan.	1919 Feb.	1919 Mar.	1919 Apr.	1919 May	1919 June	1919 July	1919 Aug.
Custer.....	8/15 AET			15 WFT				10 WPC				22-23 PCH	
Devens.....	3/9 PMA	22 WHW	12-13 WFT			7 WFT				6 JBC			
Dix.....	6/21 FWW	28 WPC	18-19 WFT						3-4 WPC		23 JBC		23 ERS
Dodge.....	8/12 AET			6 WPC			6 WPC				17 JBC ERS		
Funston.....	6/7 WPC		8-9 LAC	3-5 WPC		22 WPC			17 WPC				24-27 PCH
Gordon.....	7/17 FWW		12 JLM			13 HBMcl			17-18 JBC		12-13 JBC		
Grant.....	8/15 AET		12 LAC	7-8 WPC				9 WPC			16 JBC		
Jackson.....	7/20 FWW		16 AET	JHW		9-10 HBMcl				11 ERS	11 JBC		
Knox.....			16 FHM			28 WPC				29 JBC			
Lee.....	8/11 FWW		4 AET			6-7 HBMcl					5-7 RBM		
Lewis.....	7/23-5 WPC							17 JBC					9-10 WPC
Meade.....	3/4 AET		30 JBG 8 AET				7 AET				9 WPC		
Merritt.....	6/25 AET					30 JBC							
Mills.....	6/26 AET						3 JBC		4 WPC				
Pike.....	7/16 AET		11-12 LAC	1 WPC	21-22 HBMcl				15 WPC				30-31 PCH
Sherman.....	8/9 AET		8 JLM 15 LAC	5 WFT					21-22 WPC		19 JBC		
Taylor.....	7/19 AET		13-14 LAC	10 WFT		28-29 WPC				30-31 JBC			
Travis.....	9/20 WFL	21 WFL		16 WFL				5 WFL					31 JBC
Upton.....	6/25 FWW		15-16 WFT			10 WFT					5-7 WPC		

As soon as an inspection was directed by formal War Department order, the initials of the inspector were placed in the appropriate space for the month, opposite the camps to be inspected. The day of the month was added when the inspection had been completed. By glancing at these charts the officer in charge of the section could visualize the inspection situation and at once determine when stations had last been inspected and what ones were due for a visit. One chart was kept for National Army cantonments, one for National Guard camps, several for aviation stations, others for general hospitals, and a number for miscellaneous camps and other stations. An alphabetical list of stations was hung on the wall beside these charts, a reference to the chart number being made after the name of each station.

Having decided upon the most suitable itinerary for an inspector, the officer in charge of the section prepared a memorandum, addressed to the per-

sonnel division of the Surgeon General's Office, which was charged with the duty of obtaining orders for Medical Department personnel from The Adjutant General. In emergency the order could be obtained the same day the memorandum was written.

Reports of inspectors were prepared in quadruplicate and turned over by the inspector to the officer in charge of the section or to his assistant. One copy was filed in the central files of the Surgeon General's Office and one was kept in a small special file in the division of sanitation. This last-mentioned file was found indispensable for quick reference. In the case of hospitals, one copy was sent to the hospital division of the Surgeon General's Office, which was responsible for carrying out the corrective measures necessary in hospitals. A copy of reports on aviation stations was sent to the chief surgeon of the Air Service. A copy was circulated among the different officers in the Surgeon General's Office for their information. Matters pertaining to divisions of the Surgeon General's Office, other than the hospital division, were extracted and sent to the appropriate divisions for necessary administrative action. Questions outside the jurisdiction of the Surgeon General's Office were taken up verbally or by letter with the proper sections of the War Department. As far as possible the records of the corrective action taken were gathered together by the inspection section and filed with the reports to which they pertained.

SCOPE OF SANITARY INSPECTION SERVICE

Geographically the sanitary inspection service covered all stations, within the continental limits of the United States, which were under the direct control of the War Department. This included the National Guard camps and National Army cantonments (32 in number), the many special camps (such as Quartermaster, Engineer, Medical Department, Tank Corps, etc.), embarkation camps, the aviation fields, balloon schools, the technical schools, the recruit depots, the ordnance depots and arsenals, the ordnance proving grounds, the chemical plants, the remount stations, the quartermaster depots, aviation depots, the Army supply bases, the prison camps, the disciplinary barracks, the Students' Army Training Corps units, and the general hospitals. At all of the camps and other stations the inspections included the base or other station hospital. A detailed list of stations visited, together with dates of inspection and names of inspectors, is on file in the Surgeon General's Office.⁷ Commands under control of commanders of the geographical departments were not, as a rule, inspected by the officers of the inspection section, since the sanitary supervision of these stations was a function of the department surgeon.⁸ A few exceptions were made to this general rule, at times particularly as regards the large base hospitals at Fort Sam Houston and Fort Bliss, Tex.

In character of the stations visited, and in the detailed nature of the inspection, the scope of the work varied materially from time to time. At the outset of the war, in the summer and early fall of 1917, the inspections were chiefly confined to National Army and National Guard camps, then in the process of construction.⁵ The investigations were almost exclusively "sanitary" in the civil sense of the word. Questions of barrack and hospital construction, water supply, sewage disposal, and protection of the health of the civilian laborers

were the ones chiefly demanding attention. In the late autumn, when raw troops in large numbers began to arrive at camps, the inspection problems increased. The great base hospitals were being completed and had commenced to function in a half-finished state. Many very critical situations were presented by these hospitals, notably those having to do with the professional care of the sick, insufficient bed capacity, absence of hot water, and, in the tent camps, lack of sewer systems.⁹ In the camps generally shortage of clothing, lack of heating facilities, and epidemics of measles were paramount issues.⁹ During the winter of 1917-18 more commands directly under the administration of the War Department were established de novo, and others already existing were enormously increased. Such were the aviation fields (about 27 in number), the balloon schools (10 in number), the arsenals, the immense ordnance proving grounds, the numerous special camps, the new chemical plants, the very active recruit depots, the crowded disciplinary barracks, and the war prison camps. During this winter overcrowding and epidemics of measles, meningitis, and pneumonia called for special investigation.⁹ Gradually more and more general hospitals were opened and demanded careful inspection in view of the very limited amount of experienced personnel available for their administration. In the summer of 1918 all military activities were at their height and, in addition to other inspection features, the question of mosquito and fly control required much detailed attention; this was particularly true at certain southern camps located in dangerously malarious regions.⁹ At the same time development battalions, and a little later convalescent centers, were demanding investigation. Also the question of lousiness in camps was looked into at this period. In the fall of 1918, not only were nearly all camps being enlarged, but there was also inaugurated a novel policy regarding students in colleges and other educational institutions. The Students' Army Training Corps was organized¹⁰ and to inspect the nearly 600 separate military stations thus created the inspection section had to establish a new branch and gather together additional inspectors.⁵ All of the larger Students' Army Training Corps units had been visited once at the date when the signing of the armistice put a stop to further activities along this line. In September and October, 1918, the pandemic of influenza threw a great strain on the inspection service; many special inspections were made by the regular force of inspectors and by officers loaned from other divisions of the Surgeon General's Office.⁹ The signing of the armistice on November 11, 1918, put an end to progressive enlargement of the Military Establishment except in the direction of general hospitals necessary to receive and hold for definitive treatment the returning sick and wounded from overseas. The number and scope of inspections in these institutions increased during the winter of 1918-19 and the spring of 1919, continuing from then on, in decreasing degree, for many months. Throughout the whole period of the war, up to the beginning of the armistice, it had been necessary to supervise carefully the methods and accuracy of the physical examination required before recruits and drafted men were finally accepted for the Army.⁹ Shortly after the signing of the armistice extensive demobilization began and continued through the spring and summer of 1919, necessitating frequent inspection by the medical boards carrying out the physical examinations which were made prior to the discharge

of officers and enlisted men from the military service. The return from overseas of large numbers of soldiers during this period called for investigation as to the efficacy of the delousing measures in use at the receiving camps in this country.⁹ At all periods during the war specific complaints from sources outside of the Army frequently were made the subject of special investigations; usually such complaints had little, if any, well-founded basis.¹¹

As regards frequency of inspection, the service was never up to the desired standard. Originally it was contemplated that all commands directly under the War Department would be covered at least every two months and that special inspections would be made whenever epidemics, complaints, or other unusual events rendered it desirable. Owing to the impossibility of obtaining sufficient experienced and otherwise qualified officers for the inspection section, it was impossible to maintain such a schedule. It became necessary to visit the more important points to the partial neglect of other stations. Usually three and sometimes five or six months intervened between inspections.⁶

As regards their character, the inspections carried out by a sanitary inspector differed materially from those made by the Inspector General's Department. Less stress was laid upon matters of a purely military nature and much more emphasis was placed upon matters largely professional or technical in nature, such as details of camp sanitation; general administration of hospitals; hospital trains and hospital ships; nursing and professional care of the sick; competency of medical officers, including qualifications of specialists; handling of infectious diseases; prevention of venereal disease; management of quarantine and detention camps; examination of food handlers; extra-cantonment health activities; quality and use of medical supplies; character and adequacy of hospital construction; management of bacteriological laboratories and X-ray laboratories; special diets; instruction of sanitary trains; mosquito and fly eradication; delousing procedures; water purification and sewage disposal; physical examination for entry into the service and prior to demobilization; development battalions and convalescent centers; physical reconstruction; vocational education.

QUESTIONNAIRES AND REPORTS

In the early development of the inspection section an important feature was the devising of standardized questionnaires for the purpose of enabling the inspector to gain the necessary information regarding the stations visited, and to record this information in a systematic manner for the use of the Surgeon General's Office. The questionnaires were altered from time to time to meet varying conditions, but in general grew more complicated until the time of the armistice. The original form was simple and covered relatively few points, these pertaining mainly to pure sanitation. As used in the first inspections, before the camps were completed and the hospital opened, the report was made under the following heads:¹²

1. Situation and general surroundings of camp.
2. Personnel (line).
3. Progress of construction.
4. Relations between camp sanitary officer and (a) constructing quartermaster, (b) local health authorities, (c) Public Health Service.

5. Water supply.
6. Food supply and messing facilities.
7. Disposal of waste: (a) Garbage, (b) excreta, (c) manure, (d) rubbish.
8. General police.
9. Drainage of site.
10. Flies and mosquitoes.
11. Sanitary conditions of surrounding communities.
12. Activity of local boards of health.
13. Activity of United States Public Health Service.
14. Prostitution.
15. Venereal prophylaxis.
16. Vaccination (smallpox).
17. Typhoid prophylaxis.
18. Health of civilian employees.
19. Health of surrounding civil population.
20. Laundry facilities.
21. Bathing and bath houses.
22. Medical Department personnel and efficiency.
23. Medical supplies.
24. General estimate of the situation.

With the opening of the base hospitals, the questionnaire was supplemented by paragraphs pertaining to hospital administration. Early in 1918 separate questionnaires were prepared for the camp proper and for the base hospital, and the latter questionnaire gradually increased in scope as the various divisions of the Surgeon General's Office called for more and more detailed information regarding the operation of the services under their immediate supervision. At the height of our military activities there were four questionnaire forms in use, one for camps and cantonments, one for base and general hospitals, one for development battalions, and one for the Students' Army Training Corps units.¹² For small stations the questionnaire was appropriately modified by the inspector. In the fall of 1919, when the camps were diminishing in size and the great base hospitals had been transformed into comparatively small camp hospitals, a new questionnaire was devised which was suited to the needs of these reduced commands and was also equally applicable to recruit depots and other permanent military posts in peace times.¹² The various questionnaires in use during the war were the result of much thought and experience and, therefore, of real value to future students of this subject. Consequently approximate copies of questionnaire and report forms are shown below in detail. The first two do not correspond absolutely with the questionnaire form in use at any given date, but are composites, indicating the maximum field covered during the entire war period, regardless of the fact that some of the matters touched on were not actually contemporaneous; therefore, they afford a very complete list of headings to be drawn upon in devising future forms of a similar nature. The questionnaire was, of course, not slavishly followed, but it served as a guide and helped the inspector to make his inspection complete; any sanitary features which required more particular investigation were fully studied and reported upon, whether or not the matter was covered by a paragraph of the questionnaire.

COMPOSITE QUESTIONNAIRE COVERING ALL FEATURES REPORTED ON AT A CAMP OR CANTONMENT AT ANY PERIOD DURING THE WAR. NOT ALL THESE FEATURES WERE CONTEMPORANEOUS

Report of Sanitary Inspection of Camp -----
on -----, 1918

By Col. ----- M. C.

1. Purpose, strength, and organization of camp; names of commanding generals of camp, division and depot brigade.
2. Organization, efficiency, and equipment of sanitary units:
 - (a) Names of inefficient medical officers and steps taken to eliminate them.
 - (b) Camp surgeon's office; names, duties, and efficiency of commissioned personnel in office.
 - (c) Division surgeon's office; names, duties, and efficiency of commissioned personnel in office.
 - (d) Name and efficiency of C. O. of sanitary train.
 - (e) Name and efficiency of director of field hospitals. Amount of drill and other instruction. Amount of field work and night work. Efficiency of organization.
 - (f) Name and efficiency of director of ambulance companies. Amount of drill and other instruction. Amount of field and night work. Efficiency of organization.
 - (g) Names and efficiency of surgeon of depot brigade and his commissioned office assistants.
 - (h) Camp ambulance service. Adequacy and efficiency of same.
 - (i) Regimental or other unit sanitary detachments, and management of infirmaries. Character and amount of drill and instruction. Are sick and wounded cards made out promptly on completion of case?
 - (j) Are narcotics and alcoholics conserved as required by Pars. 240 and 244 M. M. D?
 - (k) Are common drinking cups used for administering medicine at infirmaries?
 - (l) Are thermometers properly disinfected between cases in infirmaries?
 - (m) Character and efficiency of instruction of regimental or other organization sanitary units.
 - (n) Have the two sanitary squads been organized?
 - (o) Size, organization and efficiency of camp Sanitary Corps detachment, if any. What work is being done?
 - (p) Character and efficiency of physical examination of drafted men.
 - (q) Character and efficiency of physical examination for enlistment.
 - (r) Character and efficiency of physical examination for demobilization.
 - (s) Organization and efficiency of convalescent center.
 - (t) Organization and efficiency of development battalions.
 - (u) Number of C. D. D. boards in camp, including base hospital.
 - (v) How many discharged on C. D. D. in last month?
 - (w) Average length of time required for discharge.
 - (x) Causes of delay, if any.
3. Are defects reported by sanitary inspector promptly corrected?
4. Is the camp utilities organized and efficient?
5. Opinion of commanding general upon medical department conditions.
6. Do medical officers of commands make daily the inspections required by paragraph 16, special regulations 28, 1917?
7. Statistics of sickness:
 - (a) Strength of command and the noneffective rate.
 - (b) Number of "quarters" and "hospital" cases.

8. Communicable diseases:

- (a) Numbers of each class at end of each week during preceding month (including venereal).
- (b) Causes of death during past three months.
- (c) Character and efficiency of quarantine.
- (d) Character and efficiency of quarantine and detention camps, if any.
- (e) Are sick men promptly removed from barracks? What steps other than sick call taken to eliminate sick?
- (f) Length of time measles and influenza cases are kept on sick report.
- (g) Are camp spot maps kept?

9. Venereal disease:

- (a) Are physical inspections held twice monthly? How does camp surgeon know that they are?
- (b) Numbers of new cases and of prophylactic treatments in past month. How many cases originated near camp?
- (c) Is there a G. U. specialist on duty in the camp? Does he supervise the adequacy of venereal prophylaxis and physical inspections?
- (d) Are there any prophylactic stations in adjacent towns?
- (e) Do all men know about the prophylaxis?
- (f) Are lectures on venereal disease given to all men by medical officers? How frequently?
- (g) Do organization surgeons report to organization commanders names of men who develop venereal disease after failure to take venereal prophylaxis?
- (h) How many men were tried in the preceding month for acquiring venereal disease after failing to use venereal prophylaxis?
- (i) Are all new cases of venereal disease put on sick report or carded for record?
- (j) Is treatment of syphilis and chronic cases of gonorrhoea followed up by G. U. specialist?
- (k) Are venereal cases in the infectious stage restricted to camp? By what means?
- (l) What has been the result of attempts made to learn where men acquire venereal disease?
- (m) Character and efficiency of procedures to promote morale in the camp.

10. Vaccination; typhoid and paratyphoid prophylaxis:

- (a) Is the command completely protected against smallpox and typhoid? What record has camp or division surgeon to show this?

11. Water supply; source:

- (a) Quantity.
- (b) Quality.
- (c) Dates of examinations in past month.
- (d) Are common drinking cups used?
- (e) Source and quality of ice used.

12. Barracks or tents:

- (a) Sufficiency of air space and floor space? Report instances of overcrowding, if any, and degree of same.
- (b) Is capacity of dormitories marked thereon?
- (c) Ventilation. How supervised?
- (d) Do men sleep with head of one man opposite feet of two adjacent men?
- (e) Adequacy of heating system.
- (f) Condition of guard house.

13. Drainage.

14. Condition of roads:

- (a) Is there dust or mud?

15. Baths; adequacy:

- (a) Disposal of waste water.
- (b) Is there sufficient hot water?

16. General police of camp site.

17. Disposal of wastes:
 - (a) Garbage; how is garbage removal contract working?
 - (b) Excreta; sufficiency of seating capacity; adequacy and efficiency of sewage disposal.
 - (c) Manure; how disposed of?
 - (d) Rubbish.
18. Adequacy and condition of kitchens and messing facilities:
 - (a) System of dishwashing. Is it adequate to insure sterilization and to avoid soiling of soldiers' hands with possibly infected water?
19. Food supplies, including milk products.
20. Bakeries:
 - (a) Are bakers' hands clean? Are they inspected? By whom?
 - (b) Method of handling of bread between bakery and company. Is it satisfactory?
21. Examination of food handlers for "carriers" (Changes No. 4, S. R. No. 28):
 - (a) How many have been examined? Is it up to date?
 - (b) What record has camp surgeon of the examinations?
22. Exchanges:
 - (a) Cleanliness.
 - (b) Are foods and drinks, especially milk products, sanitary?
 - (c) Have attendants been examined for "carriers"?
23. Clothing:
 - (a) Sufficiency.
 - (b) Is there an ample supply of shoes of proper sizes?
 - (c) Is there adequate supervision of the fitting of shoes?
24. Orthopedics:
 - (a) Activities of orthopedic assistants.
25. Mosquitoes:
 - (a) What antimosquito work is in progress?
26. Flies:
 - (a) Are fly traps, fly swatters, and fly paper provided by Q. M. D. in sufficient quantities?
 - (b) Are these appliances properly baited and maintained in the locations prescribed by memo. from S. G. O.?
27. Extra-cantonment areas:
 - (a) Activity of United States Public Health officials. Name and efficiency of officer in charge.
 - (b) Activity of local boards of health.
 - (c) Contagious diseases in vicinity of camp.
 - (d) Supervision of shops and booths for sale of foods and drinks in adjacent communities.
 - (e) Supervision of mosquito and fly-breeding in adjacent territory.
28. Medical supplies:
 - (a) Sufficiency.
 - (b) Are requisitions promptly filled?
 - (c) Efficiency of camp supply officer.
29. Character and efficiency of gas defense instruction:
 - (a) Is disinfection of masks adequate? Who supervises it?
30. Remount station:
 - (a) Strength (men and animals).
 - (b) General sanitary condition.
 - (c) Veterinary service.
31. Remarks:
32. Résumé:

* This instruction was at first handled by the Medical Department. Later it was taken over by the Chemical Warfare Service. The same mask was used by many men during instruction.

33. Recommendations made to commanding general:

(Here was entered usually an exact copy of the letter from inspector to commanding general, in which he reported defects and made recommendations for their correction.)

34. Recommendations made to Surgeon General:

(Here were recorded such recommendations, sometimes confidential, as the inspector made to the Surgeon General by telegraph, or verbally or in writing on his return to Washington.)

COMPOSITE QUESTIONNAIRE AND REPORT FORM COVERING ALL FEATURES REPORTED AT A
BASE OR GENERAL HOSPITAL AT ANY PERIOD DURING THE WAR

Report of Sanitary Inspection of _____ Hospital at _____
on _____ 191__
By Col. _____ M. C.

1. Situation:

- (a) Condition of roads.
- (b) Improvement of grounds.

2. Construction:

- (a) Progress on authorized projects.
- (b) Additional required or recommended.

3. Organization and administration:

- (a) Name and efficiency of C. O.
- (b) Number of officers in each grade.
- (c) Adjutant's office, including personnel adjutant.
- (d) Training of understudies for administrative positions.
- (e) Hospital regulations, adequacy of same.
- (f) Officer of the day; duties. Are they properly prescribed?
- (g) What action to eliminate unfit officers. Names of those considered unfit.
- (h) What course of instruction given to officers? How many hours?
- (i) Adequacy of officers' quarters.
- (j) Amount and sufficiency of transportation, including ambulances. Is ambulance service satisfactory?

4. Nurses:

- (a) Number, sufficiency, efficiency.
- (b) Name and efficiency of chief nurse.
- (c) Adequacy and suitability of quarters.
- (d) Administration of nurses' mess.

5. Detachment of enlisted men of the Medical Department:

- (a) Efficiency of C. O. and organization of office.
- (b) Condition of records.
- (c) Number of company punishments in last three months. Number of trials and convictions by summary court in last three months. How many in confinement now?
- (d) Number and efficiency of N. C. O.?
- (e) Strength, sufficiency, and efficiency of detachment other than N. C. O.
- (f) Sufficiency of clothing and equipment? Are there white suits for all entitled to wear them? (M. M. D. Par. 47-a.)
- (g) Character and amount of instruction and drills.
- (h) Character and efficiency of guard.
- (i) Operation of venereal prophylactic station. Who supervises it?
- (j) How often are physical inspections held? Are they without notice?

6. Barracks and squad rooms:
 - (a) Adequacy.
 - (b) Ventilation and heating.
 - (c) Equipment. Is it adequate?
 - (d) Operation of mess and kitchen.
 - (e) Character and condition of guard house.
7. Registrar's office:
 - (a) Organization and administration.
 - (b) Status of records and returns.
 - (c) Average length of stay of patients in hospital during past month.
 - (d) Mean daily number of cases in hospital each month since hospital opened (not to cover more than 1 year).
8. Dispensary service:
 - (a) Compliance with pars. 240-244, M. M. D.
 - (b) Are common drinking cups used to administer medicine?
9. Dental service: Is it satisfactory?
 - (a) Do patients on admission receive a dental survey?
10. Medical service: Is it satisfactory?
 - (a) Adequacy of staff as to number and efficiency. How many officers? Name and efficiency of chief.
 - (b) Bacteriological types of pneumonia in as far as worked out during last three months.
 - (c) Per cent of cases in which empyema followed pneumonia in last three months.
11. Surgical service: Is it satisfactory?
 - (a) Name and efficiency of chief.
 - (b) Adequacy of staff as to number and efficiency. How many officers?
 - (c) Are assistants being trained? Is instruction in surgery being given?
 - (d) Have there been any deaths due to accident or incompetency?
 - (e) Do clean wounds become infected?
 - (f) Is surgical equipment adequate?
 - (g) Are any types of elective operations on patients being performed which are not followed by early and full return to duty?
 - (h) Results of empyema cases. How many now in hospital?
 - (i) Results in osteomyelitis cases. Approximate number in hospital? Estimated duration of treatment before discharge.
 - (j) Have all fracture cases been reported? Are measurements taken to determine shortening?
 - (k) How many cases now in hospital in which there is any peripheral nerve injury?
 - (l) Are any amputation cases in hospital? If so, how many? Have they been reported to S. G. O.?
 - (m) Are there any maxillo-facial cases in hospital? If so, how many? Have they been reported to S. G. O.?
 - (n) Is X-ray work satisfactory?
 - (o) Does it cooperate well with other services?
 - (p) Do the chiefs of services make daily visits to the laboratory to discuss the X-ray findings in their cases, with the roentgenologist, in the light of other clinical findings?
 - (q) Are the other officers invited to participate in these conferences?
 - (r) Character and efficiency of reconstruction and educational work.
 - (s) Number of officers engaged in reconstruction work.
 - (t) Number of reconstruction aides, each class separately.
 - (u) Adequacy of space and equipment for reconstruction work.
 - (v) Number of patients undergoing reconstruction work.

12. Eye, ear, nose, and throat department: Is it satisfactory?
- (a) Number, efficiency and adequacy of officers on duty.
 - (b) Adequacy of equipment.
13. Laboratory, including ward laboratories: Is it satisfactory?
- (a) Name and efficiency of chief.
 - (b) Brief summary of work done in last month.
14. Genitourinary service: Is it satisfactory?
- (a) Name and efficiency of chief.
15. Psychopathic service: Is it satisfactory?
- (a) How many insane have been in this hospital over four months?
16. Communicable diseases:
- (a) Administration of isolation and other wards. Is memo. S. G. O., January 1, 1918, complied with?
 - (b) Are attendants isolated?
 - (c) Is the professional and nursing care satisfactory?
17. Wards, and care of patients:
- (a) Bed capacity of hospital.
 - (b) Number of patients present, overseas and domestic separately.
 - (c) Numerical classification of patients by services; i. e., surgical; medical; dental; G. U.; psychopathic; eye, ear, nose, and throat (total of six classes to equal total in hospital).
 - (d) How admitted? Operation of receiving ward.
 - (e) Care of valuables and other effects (pars. 293 and 303-304, M. M. D.): Are money and valuables handled by enlisted men? Who has combination of safe?
 - (f) Is patients' clothing laundered as often as necessary at Government expense? (Cir. letter No. 71, S. G. O., and amendment to pars. 222 and 267, M. M. D.)
 - (g) Efficiency of ward service; including nursing, bathing of patients, cleanliness of linen and clothing, and food service to bed patients.
 - (h) Do chiefs of service report daily names of men dangerously ill? To whom?
 - (i) Are nearest relatives notified direct from hospital regarding seriously ill? Prior to major surgical operations? By whom?
 - (j) Are letters from relatives promptly answered? By whom?
 - (k) Are post cards sent to relatives on arrival, departure, and discharge?
 - (l) Care of dead (pars. 87, 162½, 167, 824, A. R.). Describe system of inspecting and caring for the dead. Are reports of inspection filed?
 - (m) Percentage of dead which are autopsied.
18. Kitchen and mess management: Is it satisfactory?
- (a) Organization and efficiency personnel.
 - (b) Source and quality of supplies.
 - (c) System of storage and issue. Is it adequate?
 - (d) Diets and bill of fare.
 - (e) System of feeding in mess hall.
 - (f) Handling of hospital fund. Amount (par. 248-262 M. M. D.). Is duty officers' mess account separate from hospital fund?
 - (g) Can any of the fund be spared?
 - (h) Have cooks and other food handlers been examined for carriers? How recently?
 - (i) Adequacy of mess halls, kitchens, and equipment.
 - (j) Condition of food served to wards.
 - (k) Does nurse supervise serving in wards?
 - (l) Number and efficiency of food carts.
 - (m) Efficiency of dish washing in central mess and in ward kitchens? Does it insure sterilization?
 - (n) Condition of bakery, cleanliness of bakers and character of bread. Who inspects bakers?
 - (o) Adequacy of fly prevention. (Cir. 133, W. D., 1919, and Cir. letter No. 148, S. G. O., 1919.)

19. Exchange:

- (a) Organization and administration.
- (b) Sanitary condition of food supplies.
- (c) Operating under W. D. exchange regulations?
- (d) Records and dividends.

20. Laundry:

- (a) Organization and administration.
- (b) Number and duties of enlisted and civilian employees.
- (c) Quality of work.
- (d) Adequacy of equipment and supplies.
- (e) Disinfection department.
- (f) Clean linen and issue department.
- (g) Arrangements for outside work; prices.

21. Medical supply department: Is it satisfactory?

- (a) Organization of supply department.
- (b) Are consolidated memo. receipts made and checked (par. 294 M. M. D.)?
- (c) Care of unserviceable property.
- (d) Adequacy of storerooms.
- (e) Sufficiency of medical supplies.
- (f) Are requisitions filled promptly?
- (g) Is Circular No. 131, W. D., 1918, fully complied with? If not, what alterations have been made and by what authority? ⁴
- (h) How many property loan records are in use for the medical property in the hospital?
- (i) If all medical property in hospital is carried on one property loan record, describe method property officer uses to keep track of property in different departments. How often checked?
- (j) Have additional stock cards been sent up within the hospital?
- (k) How does the responsible medical officer account for narcotics and alcohol that he draws from the local supply officer?
- (l) Is the reserve of medical supplies on hand in the possession of the local supply officer ample?
- (m) Sufficiency of medical supplies in the hospital.
- (n) Are hospital requisitions promptly filled by camp or station supply officer?
- (o) Does camp or station supply officer experience delay or difficulty in the filling of requisitions he makes for hospital? If so, state specific instances with date and number of requisitions, details of items required for, and apparent reason for delay or difficulty.
- (p) Are emergency purchases for hospital promptly handled by the local supply officer? If not, give specific instances and attending circumstances.

22. Quartermaster supply and utilities departments:

- (a) Number of enlisted men in quartermaster; supply, and utilities detachments. Number of civilians. Are numbers adequate?
- (b) Status of records and property returns?
- (c) Sufficiency of supplies.
- (d) Operation of power plant, heating system, and hot water system.
- (e) Water supply.
- (f) Sewerage system and plumbing.
- (g) Electric lights; other electrical appliances.

23. Fire protection:

- (a) Description of system; adequacy.
- (b) How often are drills held?

24. Disposal of wastes.

25. General police of buildings and grounds.

⁴ Subparagraphs (a) to (f) were in use when the medical supply department was under the control of the Medical Department. Subparagraphs (g) to (p) were used after this function was taken over by the Purchase, Storage, and Traffic Division, General Staff.

26. Remarks:

- (a) State of morale among medical officers, Medical Department detachment and patients. Name of morale officer and steps being taken to improve morale.
- (b) How many patients A. W. O. L.? How many tried by court martial in last month, domestic and overseas cases separately.
- (c) Efficiency of morale organization.
- (d) Apparent causes of poor morale if noted.

27. Are the provisions of Circular No. 226, W. D., 1919, fully complied with in each case? What steps are taken to insure compliance?

28. Number discharged on C. D. D. in last month:

- (a) Length of time required to secure discharge of patient on C. D. D. after papers leave hospital.

29. Résumé.

30. Recommendations made to commanding general:

(Here is entered complete copy of letter from inspector to commanding officer in which the inspector enumerates defects found and makes recommendations for their correction.)

31. Recommendations made to Surgeon General:

(Here are entered recommendations made to the Surgeon General by telegraph at the time of inspection, or verbally or in writing after his return to Washington.)

QUESTIONNAIRE FOR USE IN INSPECTING AND REPORTING UPON DEVELOPMENT BATTALIONS

Report of Sanitary Inspection of Development Battalion at Camp.....
on.....1918

By Col.....M. C.

1. Situation—Describe the location and surroundings of the development battalions, each separately:
 - (a) Are the venereal battalions adjacent to the other battalions?
 - (b) Are venereal cases segregated in separate companies exclusively?
 - (c) What steps are taken to restrict venereal cases to their company areas?
2. Housing of battalion; give details (separately for each).
3. Have local authorities made the most of their opportunities to improve the environment?
4. Construction, if any, authorized for development battalion purposes:
 - (a) Progress.
 - (b) Suitability.
 - (c) What additional construction is needed?
 - (d) Has a suitable building been provided for the treatment of venereal cases?
 - (e) Has a suitable building been provided for the treatment of orthopedic cases?
5. Number, sufficiency, and efficiency of medical department personnel.
6. Total number of men in development battalions classified as follows:
 - Venereal.
 - Orthopedic.
 - Cardiovascular.
 - Neuropsychopathic.
 - Eye, ear, nose and throat.
 - Pulmonary.
 - Postoperative.
 - Convalescent.
 - Non-English speakers.
 - Others.
 - (a) Number of battalions and strength of each.
 - (b) Percentage of each class (A, B, C, and D) in entire battalion strength at date of last monthly report.

7. Have all the men been classified? If not, why not?
8. Describe fully the system for reception, preliminary physical classification, and assignment of newly received men, submit samples of the blank forms in use.
 - (a) What percentage of the men can be finally classified at the first examination?
9. General Efficiency of classification:
 - (a) Do surgeons understand the meaning of classes A, B, C, and D?
 - (b) Do the surgeons classify according to the possible occupations of the man?
10. Method for keeping the history of each case subsequent to physical classification and assignment.
11. Method of recording results of periodical physical examinations.
12. Physical training:
 - (a) Full account, giving separately the part played by the line and medical staff.
 - (b) Separate report on general methods employed for cardiovascular, foot joint, and back cases, etc., as the case may be.
 - (c) Are the medical officers supervising the physical training and development of the men in classes "B" and "C"?
 - (d) In what manner and how often?
 - (e) Does the battalion surgeon or the specialist do this?
 - (f) Are the physical changes in the men checked up, and if so, by whom?
 - (g) Are men from the battalion used for work which interferes with the fundamental purpose of fitting these men for military service in the shortest possible time?
13. How many men have been kept in the battalions over three months?
 - (a) Give causes and classification of these cases.
 - (b) Should there be a time limit placed on the length of stay in development battalions? If so, what limit?
14. Are all class "D" men promptly discharged?
 - (a) Average time required to discharge a soldier on certificate of disability from time of classification in class "D."
15. Methods in use to promote morale:
 - (a) Present state of morale:
16. Results being obtained:
17. Report and recommendations made to commanding general:
18. Recommendations already made to Surgeon General:

(Here were included telegrams sent at time of inspection.)
19. Recommendations now made to Surgeon General:

(Here were included recommendations made on return of inspector to Washington.)

QUESTIONNAIRE FOR INSPECTION OF AND REPORT ON STUDENTS ARMY TRAINING CORPS UNITS

Report of Sanitary Inspection of S. A. T. C. Unit at _____ on _____, 1918

1. Date: By _____ Medical Corps
2. Name of school:
3. Location:
4. Number of inducted men in this school at date of report. (If more are to be inducted in near future state numbers of these separately):
5. Names of medical officers or contract surgeons on duty at school:
6. Number and grades of enlisted men, Medical Department, on duty at school, if any:
7. Data regarding physical examination prior to induction:
 - (a) Date of beginning and of completion of examination.
 - (b) Total number examined.
 - (c) Number accepted for general military service.
 - (d) Number accepted for special and limited military service.
 - (e) Number rejected.
 - (f) Have identification records been made for each inducted man?
 - (g) Have all inducted men received smallpox vaccination?
 - (h) Has the administration of triple typhoid vaccine been carried out in all cases?
 - (i) Has report of physical examination been made to Surgeon General as required by letter S. G. O., September 21, 1918?

8. Data relating to housing facilities:

- (a) Number of inducted men quartered in each of the following: College dormitories, private houses, buildings rented for quarters, buildings specially constructed as barracks, and other types.
- (b) General character of each class of buildings referred to in preceding sub-head (a).
- (c) In case of college dormitories, number of men per room and sizes of different types of rooms.
- (d) Amount of floor area per bed allowed throughout all buildings used as sleeping quarters (halls, lavatories, closets, recreation rooms and mess halls should not be included in floor area).
- (e) Character and adequacy of ventilation.
- (f) Character and adequacy of heating.
- (g) Adequacy of fire escapes.
- (h) Character and adequacy of toilet and bathing facilities. (Tubs or showers?)
Is sewage disposal adequate?
- (i) Sufficiency of hot water.
- (j) Relation of toilets to kitchens, dining rooms and sleeping quarters. Can flies pass back and forth?
- (k) Adequacy of screening against mosquitoes.
- (l) Character and adequacy of beds, mattresses, and bedding.

9. Data regarding water supply:

- (a) Source, quality, and adequacy.
- (b) When was it last examined chemically or bacteriologically?
- (c) How often is it examined?
- (d) Results of last examination.
- (e) Are common drinking cups used?

10. Data regarding food and messing arrangements:

- (a) Character, size, and adequacy of each of the mess rooms and kitchens.
- (b) Are mess rooms and kitchens screened against flies?
- (c) Are dishes washed in a manner to secure cleanliness and to sterilize them?
- (d) Cleanliness of food, kitchens and mess rooms.
- (e) Efficiency and cleanliness of steward, cooks, and attendants.
- (f) Are food handlers examined at intervals to eliminate the ill? Have they received triple typhoid inoculations?
- (g) Source, character, and sufficiency of food supplies (including milk).
- (h) Is food inspected by a medical officer and if so how often?
- (i) System and adequacy of garbage disposal.

11. Data regarding care of the sick:

- (a) Number of sick in hospital and in quarters on date of report. How many of these have venereal disease? How many have pneumonia? Number of deaths since college opened?
- (b) Method of caring for seriously ill. If in a civil hospital, give brief description of same, adequacy of care, cost of care, and location of hospital with reference to school.
- (c) Adequacy of ambulance service.
- (d) Describe the infirmary of dispensary building, if any (location, adequacy, character of construction, number of wards, number of beds, type of bed, floor space per bed, toilet, bathing and heating facilities, method of feeding patients, etc.).
- (e) Are there rooms for isolating infectious cases? If so, number and capacity of same? Is the bedding in such rooms sterilized after each case is disposed of?
- (f) Are cases of acute respiratory diseases screened from one another and from those with other diseases?
- (g) Number of attendants for the sick (male and female); efficiency and sufficiency of same?

11. Data regarding care of the sick—Continued.

- (h) Character and adequacy of operating room, if any.
 - (i) Provisions for emergency surgical operations.
 - (j) Are there sufficient medical supplies of all kinds?
 - (k) Is there undue delay in receiving supplies?
 - (l) Are there sufficient official manuals and blank forms on hand? Is a copy of the Manual for the Medical Department, 1917, on hand?
 - (m) Is monthly report of sick and wounded being rendered?
 - (n) Is sick call held daily?
 - (o) Steps taken to detect and remove from barracks early cases of communicable disease.
 - (p) Are physical inspections, particularly with a view to detecting venereal disease, held twice monthly?
12. Character, sufficiency, and adequacy of clothing, including woolen uniforms, shoes, woolen underwear, hats, leggings, and raincoats.
13. Character and adequacy of laundry facilities. Prices for work.
14. Is the town in which the school is located free from saloons and houses of prostitution?
15. Is the local police department acting efficiently in preventing prostitution?
16. Is instruction given to all inducted men regarding the danger of venereal disease and the methods of preventing it?
17. Is there a station for administering venereal prophylactic treatment and are records kept of all such treatments?
18. Miscellaneous information.
19. Recommendations to Surgeon General.

QUESTIONNAIRE ADOPTED IN OCTOBER, 1919, FOR USE IN THE INSPECTION OF THE REDUCED CAMPS AND CAMP HOSPITALS AND FOR OTHER STATIONS OF SIMILAR SIZE

Report of Sanitary Inspection Made at on, 1919
By Col., M. C.

I. GENERAL SECTION

1. Purpose and organization of station, name of commanding officer, principal units and strength of each.
2. Organization, efficiency, and equipment of Medical Department.
 - (a) Name of surgeon, efficiency and administration of surgeon's office; name of division surgeon, if any, with personnel and organization of his office.
 - (b) Names, duties, and efficiency of all other commissioned Medical Department personnel at station.
 - (c) Ambulance service; adequacy and efficiency of same.
 - (d) Sanitary train, if any; composition, size, equipment, drill, instruction, records, and efficiency; condition of barracks.
 - (e) Number of regimental or other organization infirmaries in camp; adequacy, management, and condition of same.
 - (f) Size and efficiency of regimental or other Medical Department detachments, including officers (not to include hospital); character of records, drill, instruction, equipment, and discipline.
 - (g) Hours for holding sick call.
 - (h) Is professional service at sick call satisfactory?
 - (i) Are narcotics in the infirmaries conserved as required by paragraphs 240 and 244, M. M. D.?
 - (j) Are common drinking cups used for administering medicines at infirmaries?
 - (k) Are thermometers properly disinfected between cases in infirmaries?
 - (l) Character and efficiency of physical examination for enlistment. Is it carried out by a board?

2. Organization, efficiency, and equipment of Medical Department—Continued.
 - (m) Average length of time required to obtain final action on C. D. D. cases after soldier is reported unfit for duty by company commander or regimental surgeon.
 - (n) Causes of delay, if any.
 - (o) Number of discharges for disability during preceding three months.
 - (p) Size, organization, and efficiency of force for carrying out antimalarial work, if any.
 - (q) Are civilian physicians practicing on the reservation? If so, do they comply with regulations?
3. Are sanitary defects reported by surgeon or sanitary inspector promptly corrected?
4. Opinion of commanding officer upon Medical Department conditions and efficiency of his medical officers.
5. Do medical officers of commands make daily inspections required by paragraph 16, Sanitary Regulations. (Spec. Regs. 28, 1917.)
6. Statistics of sickness:
 - (a) Strength of command and the noneffective rate on date of inspection.
 - (b) Number of "quarters" and "hospital" cases.
 - (c) Number of cases of communicable disease at present date, classified by diseases.
 - (d) Causes of death during past six months, classified by diseases and by months.
 - (e) Character and efficiency of quarantine measures in use.
 - (f) Are sick men promptly removed from barracks? What steps other than sick call taken to eliminate sick from barracks?
 - (g) Are spot maps of disease kept?
 - (h) Number of new cases of venereal disease and of prophylactic treatments in past month. How many contracted in vicinity of posts?
 - (i) Is the venereal prophylaxis station properly located, equipped, and maintained? How many such stations in camp? Are there any stations in adjacent towns?
 - (j) What steps have been taken to inform all men about venereal prophylaxis?
 - (k) Are lectures on venereal disease given to all men by medical officers? How frequently?
 - (l) Does the surgeon report to organization commanders men who neglect to take venereal prophylaxis?
 - (m) How many men were tried for acquiring venereal disease after failing to use venereal prophylaxis in preceding three months?
 - (n) Is there a marked difference in venereal rates for various companies of the command?
 - (o) Is treatment of chronic cases of gonorrhoea and of syphilis properly followed up?
 - (p) Are venereal cases in the infectious stage restricted to the station? By what means?
 - (q) Are physical inspections made as required by existing orders? By whom made? Are they held without notice? Is a company officer present?
 - (r) Character and efficiency of procedure to promote morale in camp.
7. Vaccination—Typhoid and paratyphoid prophylaxis:
 - (a) Is the command completely protected against smallpox and typhoid?
 - (b) What record has surgeon to show this?
8. Water supply:
 - (a) Source and quantity.
 - (b) Quality.
 - (c) Dates of examinations in past six months.
 - (d) Are common drinking cups used?
 - (e) Source and quality of ice used.

9. Barracks or tents; character and suitability of same:
 - (a) Sufficiency of air space and floor space.
 - (b) Is capacity of dormitories marked?
 - (c) Character and adequacy of ventilation. Who inspects it at night?
 - (d) Do men sleep with heads and feet alternating?
 - (e) Character and adequacy of heating system.
 - (f) Condition of floors, particularly with reference to dust.
10. Baths in barracks or tents:
 - (a) Character and number per authorized capacity. Are they adequate?
 - (b) Disposal of waste water.
 - (c) Is there sufficient hot water?
11. Guard house; adequacy and suitability of same:
 - (a) Is there overcrowding?
 - (b) Are the bathing facilities adequate? Is there hot water?
 - (c) Are the beds and bedding clean and free from vermin?
12. Drainage of reservation and condition of roads:
 - (a) Are grounds and roads unduly dusty?
13. General police of grounds:
14. Character and sanitary condition of stables:
15. Disposal of wastes:
 - (a) Garbage: How disposed of? Is it satisfactory?
 - (b) Excreta: Percentage and sufficiency of toilet seats:
Are they kept clean?
 - (c) Adequacy and suitability of sewer system.
 - (d) Method of disposal of sewage. Is it satisfactory?
 - (e) Manure: How disposed of? Is it satisfactory?
 - (f) Rubbish: Condition of dump.
 - (g) Character of efficiency of incinerator, if any.
16. Adequacy and condition of messes, kitchens, and messing facilities:
 - (a) Is food adequate and well prepared?
 - (b) System of dish washing. Is it adequate and satisfactory?
17. Sources and character of general food supplies:
 - (a) Source and character of milk supply.
 - (b) Source and character of ice cream.
18. Bakeries; adequacy and condition:
 - (a) Character of bread.
 - (b) Are bakers' hands clean? Who supervises this matter?
 - (c) Method of handling of bread between bakery and company:
Is it satisfactory?
19. Examination of food handlers for "carriers" (Changes No. 4, S. R. No. 28):
 - (a) Have all been examined?
 - (b) What method has the surgeon for checking those examined?
20. Post exchange:
 - (a) Is building suitable?
 - (b) Cleanliness.
 - (c) Are foods and drinks, especially milk products, sanitary?
 - (d) Have attendants been examined for "carriers"?
21. Clothing:
 - (a) Sufficiency and suitability.
 - (b) Is there adequate supervision of the fitting of shoes?
22. Mosquitoes; prevalence and varieties of same:
 - (a) Methods of prevention in use.
 - (b) Condition of screening.

23. Flies; prevalence of same:
- (a) Are fly traps, fly swatters, and flypaper provided by Q. M. D. in sufficient quantities?
 - (b) Are these appliances properly used?
 - (c) Methods in use to prevent breeding of flies.
24. Adjacent community; sanitary condition of same:
- (a) Activity of local or State boards of health.
 - (b) Supervision of eating places.
 - (c) Are infectious diseases and deaths on the reservation reported to local health authorities?
25. Remount station:
- (a) Number of men and animals.
 - (b) Location with reference to camp.
 - (c) General sanitary condition.

II. HOSPITAL SECTION

1. Situation of hospital; is it satisfactory?
- (a) Appearance and improvements of grounds.
2. Construction; character of same:
- (a) Adequacy and suitability of present buildings.
 - (b) Is lighting, ventilation, heating, water service and plumbing satisfactory?
 - (c) Progress on authorized construction projects.
 - (d) Additional construction or repairs required or recommended.
3. Organization and administration; is it satisfactory?
- (a) Name of officer in charge.
 - (b) Adequacy of hospital orders.
 - (c) Is there an officer of the day? Are his duties properly prescribed and carried out?
 - (d) Hour for sick call? Who attends it? Is the service satisfactory?
 - (e) Are company sick books properly prepared before being sent to hospital?
 - (f) Is there any instruction for officers? If so, character of same.
4. Nurses:
- (a) Number, sufficiency, efficiency.
 - (b) Name and efficiency of chief nurse.
 - (c) Adequacy and suitability of quarters.
 - (d) Administration and suitability of nurses' mess.
5. Detachment enlisted men, medical department:
- (a) Number, sufficiency, and efficiency of N. C. O.
 - (b) Strength, sufficiency, and efficiency of detachment other than N. C. O.
 - (c) Sufficiency of clothing. Are there white suits for all entitled to wear them, and are they worn?
 - (d) Adequacy and condition of equipment.
 - (e) Instruction and drills. Is it satisfactory? Amount?
 - (f) How often are physical inspections held? Are they without previous notice?
6. Barracks and squad rooms; character of same:
- (a) Adequacy.
 - (b) Ventilation and heating.
 - (c) Equipment.
 - (d) Operation of mess and kitchen.
7. Record office; adequacy of same:
- (a) Status of records and returns.
 - (b) Average number of days in hospital per patient during past month.
 - (c) Mean daily number of cases in hospital for each month during last year.
8. Dispensary service; character and efficiency:
- (a) Compliance with paragraphs 240-244, M. M. D. Are poisons kept under lock and key?
 - (b) Are common drinking cups used to administer medicine?

9. Dental service.
10. Medical service.
11. Surgical service:
 - (a) Is there a competent operator?
 - (b) Is the operating room kept equipped and ready for surgical work?
 - (c) Is X-ray apparatus satisfactory and well operated?
12. Eye, ear, nose, and throat service:
 - (a) Is there a competent specialist?
 - (b) Is there adequate equipment?
13. Laboratory service.
14. Genitourinary service:
 - (a) Are syphilitic registers kept up to date?
 - (b) Are venereal cases intelligently and carefully treated until cured?
15. Psychopathic service:
 - (a) Adequacy of wards for the insane and for prisoners.
 - (b) Are the insane promptly disposed of?
16. Communicable diseases:
 - (a) Administration of isolation wards (memo. S. G. O., January 1, 1918). Are the precautions to prevent cross infections adequate?
 - (b) Are malarial registers kept up to date?
17. Wards and care of patients; are they satisfactory?
 - (a) Ward capacity, with floor area per patient on which this capacity is based.
 - (b) Number of patients present.
 - (c) Who admits patients coming at times other than sick call?
 - (d) Care of valuables and other effects (pars. 293 and 303-304, M. M. D.).
 - (e) Efficiency of ward service, including nursing, bathing of patients, cleanliness of linen and clothing, and food service to bed patients.
 - (f) Are thermometers properly disinfected? How?
 - (g) Are flies and mosquitoes present in wards?
 - (h) Are nearest relatives notified regarding seriously ill? By whom?
 - (i) Care of dead (pars. 87, 162½, 167, 824, A. R.). Who inspects bodies prior to shipment and what record of this inspection is made and filed?
18. Kitchen and mess management; is it satisfactory?
 - (a) Number, cleanliness, and efficiency of cooks. Are gratuities paid? If so, what amounts?
 - (b) Source and quality of supplies.
 - (c) System of storage and issue.
 - (d) Diets and bill of fare. Are diets satisfactory and actually served as shown on bill?
 - (e) Character of feeding in mess hall.
 - (f) Is handling of hospital fund satisfactory and in accordance with regulations? Amount?
 - (g) Have cooks and other food handlers been examined for carriers?
 - (h) Adequacy of mess hall, kitchens, and equipment.
 - (i) Condition of food served to wards.
 - (j) Does female nurse supervise serving in wards?
 - (k) Efficiency of dish washing in general mess and in wards.
 - (l) Adequacy of fly protection and eradication (Cir. 133, W. D., 1919, and Cir. letter 148, S. G. O., 1919).
19. Laundry:
 - (a) Quality of work.
 - (b) Clean linen and issue department.
 - (c) Are prices reasonable?
 - (d) Are patients' washable garments laundered at Government expense?
 - (e) Character and adequacy of disinfecting plant.

20. Medical supply department:
- (a) Are loan cards in use and checked?
 - (b) Is system of issuing supplies satisfactory?
 - (c) Is permanent hospital equipment adequate?
 - (d) Sufficiency and quality of expendable supplies.
 - (e) Are hospital requisitions promptly filled?
21. Fire protection:
- (a) Description of system adequacy.
 - (b) When were fire extinguishers recharged?
 - (c) Are fire escapes ample?
 - (d) Are helpless patients kept above the second floor?
22. General police of buildings and grounds.

III. SUMMARY AND RECOMMENDATIONS

1. Résumé.

(A brief summary in one or two paragraphs covering the essential sanitary features of the station, the condition of the hospital, and the efficiency of the personnel.)

2. Remarks.

3. Recommendations made to commanding officer.

(Here enter copy of letter showing defects and recommendations which was furnished commanding officer before departure of the inspector from the station.)

4. Recommendations made to Surgeon General.

PROCEDURE FOR INSPECTORS AND METHODS OF PREPARING REPORTS

The general method of procedure for inspections was as follows: As already stated, the officer in charge of the inspection section requested of the personnel division of the Surgeon General's Office that orders be issued for a given inspector to proceed to the places named for the purpose of making sanitary inspections, and on completion of that duty to return to his proper station. The inspector was informed when this order was asked for. On receipt of information that he was to visit certain stations, the inspector dispatched a mimeographed standard letter to the camp surgeon of the camp, or to the commanding officer of the hospital, which was to be inspected, requesting him to have prepared, in letter form, on the inspector's arrival, certain information indicated in the mimeographed letter. The form of these mimeographed letters varied from time to time, and also according to the personal views of the individual inspector. In general they called for statistical matter and for the opinion of the surgeon on various features. The information asked for covered many of the points which were to be reported on subsequently by the inspector, amplifying the subjects shown in the questionnaire. On arrival at the station, the inspector reported to the commanding officer, visited all parts of the camp or hospital, and investigated thoroughly all conditions therein, checked his observations against the statements made in the letter to him from the camp surgeon or the commanding officer of the hospital, and reached his own conclusions regarding the sanitary situation. Before leaving the camp the inspector reported in writing to the commanding general of the camp, or to the commanding officer of the general hospital, what sanitary defects and irregularities he had found, and made recommendations for the correction of any of these which it appeared that the local commander would be able to remedy without action of higher authorities. In the case of a general

hospital the inspector, in the name of the Surgeon General, directed the commanding officer of the hospital to report in writing to the Surgeon General, (for the attention of the division of sanitation) what action had been taken to correct the deficiencies or irregularities noted. In both instances the inspector embodied a copy of this letter in his formal report to the Surgeon General. In the case of stations other than general hospitals, the recommendations of the inspector, on submission of his report to the Surgeon General, were referred by the Surgeon General to The Adjutant General of the Army with request that the commanding general of the camp be instructed to report regarding the action he had taken for correcting the defects noted by the inspector.

On the basis of his own observations, supplemented by the replies of the camp surgeon, or the hospital commander, to the questions contained in the mimeographed letter referred to above, the inspector prepared his report on the sanitary conditions of the station, and on his return to Washington submitted this to the chief of the division of sanitation for action. As previously stated these recommendations which the inspector made were then referred to the different administrative divisions of the Surgeon General's Office, or to the proper administrative bureaus of the War Department, as circumstances indicated, with a view to accomplishing the prompt correction of the defects. In the case of all important defects the inspector usually saw personally to the expedition of the necessary corrective measures. This latter procedure often resulted in obtaining much more rapid corrective action than would have been possible by routine military correspondence.

The formal reports of the inspectors were made up usually in quadruplicate after the return of the officers to Washington. Some times they were prepared at the camps and mailed in, but the scarcity of good stenographers in camps, and the resulting delay to the inspectors, usually acted to prevent the preparation of reports in the field. Urgent recommendations intended for the Surgeon General were always telegraphed. Reports were prepared in two ways: In the first, and the one most frequently employed, numbered heads and lettered subheads were used, as indicated in the questionnaires given above; in the second, the report was in the form of a running narrative, paragraphed to correspond with the numbered heads in the questionnaires. Each plan had special merits; the latter furnished a much more readable paper; the former rendered reference to individual features of the report more convenient. Selected samples of reports illustrating the two systems and indicating the general scope of the inspection follow.*

SPECIAL SANITARY INSPECTION, CAMP FUNSTON, AND BASE HOSPITAL AT FORT RILEY,
KANS., NOVEMBER 14-17, 1917

By Colonel ———, Medical Corps

Site:

The location and the drainage of Camp Funston are poor. The site is an erosion valley between high bluffs. From the center of the camp it is about 4 miles to Fort Riley. The site is a few feet above the level of the Kansas River and is subject to inundation every few years. At the time the site was selected allotment was made for the funds necessary to build a levee to keep out the river. The need for such a levee should have been sufficient reason for rejecting the site as unsuitable. The ground, for the most part, is absolutely level and

* Names of inspectors are omitted.

is flooded for many hours after rains. It is extremely muddy in wet weather, and excessively dusty in dry weather, the dust being of a peculiarly penetrating and irritating character.

Meningitis has been endemic and at times epidemic for a number of years in the State of Kansas and in adjacent States.

The command consists of 29,600 men, of which one complete sanitary train and one Infantry regiment are colored. About 8,000 more negroes were expected shortly, but telegram dated November 17 indicated that these would be delayed.—The command is composed of the 89th Division under General —— (chief of staff, Colonel ——), and the 92d Division under General ——-. The 92d Division consisted of a complete and well-trained sanitary train, colored, and a headquarters troop containing two enlisted men. The 8,000 colored men expected were to be assigned to the 92d Division. The remainder of the 92d Division is at Grant, Dix, Meade, and Upton, and will not be brought together at Funston.

The division surgeon of the 92d Division is Colonel ——, who arrived at the camp one week ago. Sanitary inspector, Major ——, M. R. C.

The barracks of the sanitary train of the 92d Division were in excellent order, but greatly overcrowded. The negro personnel, including officers, was reported to be satisfactory. Commanding officers of field hospitals and the directors of field hospitals and ambulance companies are to be white. Lieutenant Colonel —— is senior to Lieutenant Colonel ——, but is under the control of Colonel ——, who acts as camp surgeon.

There has been no meningitis or pneumonia in the 89th Division.

All that follows in this report pertains to the 89th Division only, unless specifically stated to the contrary.

1. State of organization of sanitary units:

(a) Division surgeon's office: Thoroughly satisfactory. There is ample office room. The records are well kept. There are spot maps of infectious diseases. The organization is very superior.

The division surgeon has in his office one assistant, Captain ——; one training officer, Lieutenant ——; one statistician, Lieutenant ——; one chief dentist, Major ——; and also a major of the Veterinary Corps.

A very complete and comprehensive instruction order has been issued and is being vigorously carried out.

(b) Base hospital: Very good. See special report.

(c) Field hospitals: Four are organized and have complete personnel. Director, Major ——, M. R. C., is very efficient. Units are well organized and well drilled. Complete equipment for one and partial equipment for the remainder. Shortages have been reported to the supply division. There are no trucks.

(d) Ambulance companies: Four organized and have complete personnel. Director is Lieutenant ——, M. R. C. Information received that his commission as major is en route. These units are well organized and efficient. There are 14 ambulances and no trucks. More ambulances urgently needed to handle transportation situation in the camp, and were telegraphed for.

The barracks and camp area of the sanitary trains were in most excellent condition.

(e) Regimental sanitary detachments: Personnel in excess of maximum allowance for all regiments. Organization very good. Infirmaries were in good condition and personnel appeared well trained, in view of short length of service. In some cases, it appeared that sick men were being kept too long in barracks. Recommendation was made to the commanding general that this practice be stopped.

2. Commissioned personnel, character and efficiency:

Division surgeon highly efficient. Sanitary inspector highly efficient; has 11 assistants, who divide up camp area between them.

There is considerable poor medical material in the division. The inefficient men are being kept under observation, and boards will be held on them later. One regimental medical officer who allowed a man sick with pneumonia to remain in barracks is to be tried by court-martial. Red Cross ambulance company from ——, ——, has only one thoroughly efficient medical officer.

First Lieutenant ——, M. R. C., and First Lieutenant ——, D. R. C., have been tried for getting drunk on dispensary alcohol while on duty.

3. Are defects reported by division sanitary inspector properly corrected?

Yes. There is unusually good cooperation between the division surgeon's office and the commanding general and chief of staff.

4. Is officer of Sanitary Corps on duty?

No; but one is en route.

The supply officer is old and inactive, but thoroughly conversant with his work.

5. Are sanitary squads organized?

No; except in contractor's camp. All matters which would come under the control of sanitary squads are handled by the camp utilities under charge of a quartermaster. The work is being carried out satisfactorily. There is a sanitary squad for the contractor's camp.

6. Opinion of commanding general upon Medical Department conditions:

He is well satisfied and is heartily supporting his medical officers.

7. Do surgeons of commands make daily inspections as required by paragraph 16, S. R. No. 28?

Yes.

8. Sick rate:

(a) Sick rate of division: Noneffective rate per 1,000 November 15, 54.9 in the 89th Division. (Strength 28,700). Annual admission rate per 1,000 based on last week's figures, 261.

(b) Does division surgeon keep records by regiments? Yes.

(c) Do regimental surgeons keep records by companies? No; but will be instructed to do so.

(d) Proportion of quarters to hospital cases? Hospital, 1,250; quarters, 219. Of the 1,250 in hospital, about 300 were healthy meningitis carriers.

9. Communicable diseases:

On November 15: Measles, 220 cases; meningitis, 41; pneumonia, 75; mumps, 69; scarlet fever, 1; typhoid fever, 2 (1 is a carrier).

Since the establishment of the camp and up to November 15, the following cases of infectious diseases have occurred at Camp Funston: Cerebrospinal meningitis, 53 cases; pneumonia, 152; measles, 229; mumps, 113; scarlet fever, 6; diphtheria, 2; typhoid, 2 (1 is a carrier); smallpox, 1.

There have been 17 deaths from meningitis and 17 from pneumonia.

Careful inquiry indicates that only three new cases of venereal disease infected after arrival at camp have developed since the drafted men reached Camp Funston. Genitourinary specialist states he has not seen a single case which was undoubtedly a new infection.

Meningitis and pneumonia situation.—The situation as regards both these diseases was serious. The extremely damp and cold weather prevailing in October, the lack of heating facilities in the barracks, the shortage of warm clothing, the insufficient bedding, the extreme amount of irritating dust, the overcrowding existing at that time in the barracks, and the influence of smallpox and typhoid vaccination, were all factors tending to lower vital resistance and to lead to the development and spread of both these diseases among those who already harbored these organisms in their respiratory passages in a more or less attenuated form. In this connection, it should be remembered that a large portion of the command was drawn from an area (Kansas and adjacent States) in which meningitis has been endemic, and at times epidemic, for many years. Up to November 13, 1917, there had been 53 cases of meningitis. The distribution by companies and the dates of occurrence are shown in attached tabulations. (Since my visit and up to November 25, there have been 24 more cases). An analysis of the attached tables shows that the cases are quite generally distributed in a number of different regiments, but also suggests that contact infection may have been a factor of some importance in spreading the diseases in certain companies, namely: Company A, 354th Infantry, Company L, 354th Infantry, Companies 43d, 62d, and 78th of the 164th Depot Brigade.

The barracks at Camp Funston which were most crowded had no cases of meningitis. No cases had developed among the attendants at the base hospital or in regimental infirmaries, but one female nurse at the base hospital and two male attendants at infirmaries had become carriers in spite of the fact that they are stated to have been using sprays of dichloramine-T.

A study of the spot map on November 13 showed that certain areas of the camp had been entirely free from meningitis and certain other areas considerably affected. The spot map for measles on the same date showed that the areas where meningitis was most prevalent were the same as those where the measles cases were especially numerous.

The continuous arrival of new men, the constant transferring of men from one organization to another, and the frequent shifting of whole organizations from one barrack to another render the study of the development and spread of epidemic disease extremely difficult and unsatisfactory in this and other cantonments; consequently, conclusions drawn from spot maps may be very fallacious.

The latest reports received by me, under date of November 19, 1917, showed that 10,909 throat cultures had been taken from contacts and that 381 healthy carriers had been found. Thirty-seven companies had been completely cultured, several of them having been cultured more than once.

A number of healthy carriers subsequently became sick with mild or severe symptoms of meningitis. The average length of time the carriers were under observation before clearing up was 10 days. During this period, they were using sprays of dichloramine-T thrice daily.

As soon as a case of meningitis was detected, the patient was removed to the base hospital in a special ambulance, the company was quarantined under guard, and all men were cultured. If carriers were found, they were removed to the base hospital, isolated, and sprayed with dichloramine-T thrice daily. The rest of the company continued in isolation under guard for 10 days, being sprayed three times a day with dichloramine-T and drilled separately. The bedding and clothing of patients was sent to the base hospital for disinfection by steam.

Recommendation by the division surgeon that places of congregation, such as the Y. M. C. A., be closed was not approved by the commanding general. Travel in the street cars, however, was forbidden. Barracks were being aired, bedding put outdoors, and inspection to determine adequacy of ventilation made three times each night. Each man in the division was inspected by a medical officer daily.

At the time of my departure, work had begun on the segregation camp, which was to consist in part of tents and in part of temporary barracks formerly occupied by Cavalry.

The distribution of pneumonia as shown by spot map of November 13 was much more general than that of meningitis. Many sections of the camp which had had few cases of meningitis, or none at all, showed considerable numbers of pneumonias. The incidence by dates of pneumonia, as well as of measles, mumps, and meningitis, is shown in attached tabulations. Pneumonia cases were treated in special wards, separate from cases of other disease.

10. Venereal diseases:

(a) Are the regular venereal inspections held twice monthly? Yes.

(b) Is the venereal prophylaxis in regular use? Yes. Records at infirmaries well kept. An officer has already been detailed to follow up and supervise prophylaxis.

(c) Are there any stations in town? No.

(d) Do all men know about the prophylaxis? Are lectures on venereal disease given to all men? Yes. Orders have been issued and also verbal instructions have been given.

(e) Do regimental surgeons charge themselves with responsibility for conviction of men who neglect to take venereal prophylaxis? No; will be instructed to do so.

(f) Are any men actually tried for acquiring venereal disease after failing to use the venereal prophylaxis? No; only three new cases have developed since the troops arrived at camp.

(g) Are all new cases of venereal disease admitted to sick reports? No; there is not sufficient room, but all are carded for record. It is estimated 5 per cent of the command has venereal disease.

(h) Is treatment of chronic cases of gonorrhoea systematically followed up by regimental surgeons? Yes.

(i) Is the treatment of syphilitics after discharge from hospital followed up by the genitourinary specialists? No; but necessary instructions will be given. Hitherto all syphilitics have been discharged when discovered.

(j) Are such cases restricted to camp? Yes.

(k) What is the admission rate per thousand (annual) for the division at the last weekly report? 36.1 per 1,000.

(l) Social measures to diminish temptation: Usual activities of the Y. M. C. A. and Knights of Columbus. A very extensive amusement center, known as the zone of camp activities, to cost half a million dollars, is in process of construction in the center of camp. This will have an immense central exchange, four theaters, shooting galleries, poolrooms, restaurants, and library and other features. There will be about 30 busses running on regular routes from all points of the camp to the center. In Junction City and Manhattan, citizens are doing as much as is practicable at such small places to furnish amusement for the men.

(m) Education of soldiers, distribution of pamphlets, and other measures: Pamphlets received and distributed; lectures have not been given, but will be given shortly.

(n) Are any attempts made to learn where men acquire venereal disease, as in places near camp, etc.? No steps have been taken in this direction, but will be.

(o) Prostitution, control of: There are believed to be no prostitutes in Junction City and Manhattan, and few in the country about. The authorities are following up the subject very closely.

11. Are physical inspections made as required by paragraph 15, Special Regulations No. 28?

Yes.

12. Recruit examination:

Recruit examinations are being carried out in accordance with instructions. Division surgeon reviews all cases for rejection. Thirty-five thousand and twenty-seven whites have been examined; of these, 467 were rejected and 17 in process of rejection. Two thousand colored men have been examined and 19 rejected.

The policy here has been to hold to the service men who were not perfectly fit for all military service, provided they were useful for some service.

13. Vaccination; typhoid and paratyphoid prophylaxis:

Completed, except for a few stragglers and these are being vigorously followed up.

14. Water supply:

Source is a series of bored wells, five in number. These are 40 feet deep and do not pass through impermeable strata. All contained gas-forming bacilli at first examinations, but now only one is so infected. Water is chlorinated.

(a) Quantity: Scanty. A few parts of camp which are elevated above the flat do not get water all the time, and the supply for fire protection is insufficient.

(b) Quality: Satisfactory after chlorination.

(c) Examination: Once a week.

(d) Are common drinking cups used? Yes.

(e) Quality of ice used: Source unknown. Ice plant will shortly be in use.

15. Barracks or tents:

The barracks are about 96 per cent completed. Tents are to be used in part for segregation camp.

(a) Air space: The infirmaries and some barracks are overcrowded. This is particularly notable in the colored regiment, the colored sanitary train, and in the remount station. In some barracks the air space per man is as low as 328 cubic feet. It appears that when all the new construction is completed, there will be 500 cubic feet of air space per man for the entire division, except in regimental infirmaries, where additional construction is necessary to provide sufficient air space for the medical department enlisted personnel. (See subject of "Air space and ventilation" in résumé).

(b) Ventilation: As per standard plans. Special efforts are being made to insure adequate ventilation through windows at night, and an inspection of each barrack by commissioned officer is made three times nightly. One of these visits is after midnight.

(c) Heating: By steam. This is satisfactory, except for the fact that no return-flow pipes have been provided and the steam condenses into water under the middle of the floor of each building. This forms puddles beneath the buildings, and in many instances flows out from beneath the building, causing large muddy areas. It is estimated that 300,000 gallons of water per day are wasted as a result of this condensation.

16. Drainage:

Poor. Ground is flat and subject to inundations. Much drainage work needs to be done. (See remarks in first paragraph of this report.)

17. Condition of roads:

The roads are extremely dusty, as is also the soil of the camp site off the roads. In wet weather, all of the roads except the few macadamized ones are very muddy. All roads and certain parts of the area off the roads are to be oiled. Work on this has just started.

18. Baths:

Satisfactory. Plenty of hot water, except in regimental infirmaries, where supply is entirely inadequate. This applies to all cantonments visited, and recommendation covering this point has been made in the report on Camp Dodge.

19. General police of camp site:

Excellent.

20. Disposal of wastes:

(a) Garbage: The garbage disposal plant has not been completed, but, nevertheless, is in use. It is not thoroughly satisfactory. The concrete area beneath the platform is very rough and will be difficult to keep clean. A good road is being built to the plant. The plant is poorly located, access to one side of it being impossible on account of a gully; this will lead to congestion of trucks. The water for washing cans is heated by a coil in the incinerator. This does not work well. One of the washing tanks serves as a reservoir for the hot water, and after a few cans have been washed fragments of garbage sift into the coil and block it up. A separate heater is to be installed. The cans are well washed and well cared for. This work is done by conscientious objectors (Mennonites). The contract is working fairly well. The garbage is removed in iron-lined trucks. The contractor does not yet remove waste paper or tin cans, and these are being burned on the dump in a thoroughly satisfactory manner. The contractor pays 6 cents per man per month.

(b) Excreta: Satisfactory. No complaints of shortage of seating capacity. The untreated sewage flows into the Kansas River, the outflow being 300 yards from the nearest barracks; thence it flows for some distance past these and other barracks. At the present height of the river there is an eddy which keeps a seum of sewage circling about near the outflow. In summer, when the river is higher, the sewage will have to be pumped into it and a plant for this is already completed. It is believed that the amount of sewage discharging into the river so near to certain barracks will probably create a nuisance in warm weather, and that ultimately a septic tank will have to be installed. The State authorities are satisfied with the present arrangements. Pit latrines are still used by many contractors about the cantonment area and are well cared for.

(c) Manure: This is burned one-half mile from the buildings in windrows in a satisfactory manner. No one can be found who will take this away without expense to the Government. Panama incinerators are to be built shortly for handling it.

(d) Rubbish: Burned at the dump.

21. Kitchens and messing facilities:

These are satisfactory for the most part. The tables have the boards permanently nailed in place, and wide cracks provided for cleaning. Most of the kitchens are not screened, as screening could not be obtained in the market. There were some flies in all kitchens, and little attempt made to catch them. Refrigerators are generally blocked up 12 or more inches from the floor.

22. Food supplies:

Satisfactory. Milk is from dairies which are carefully inspected by the State, and which pasteurize their product. There was a small epidemic of food poisoning in one company of the colored regiment recently. Meat is delivered to the companies by the quartermaster in large sheet-steel motor vans in which the quarters of beef are hung up. There

are doors in the rear, closing tightly, keeping out flies and dust. These vans were recommended by ——— and were made by the Columbia Steel Tank Co., in Kansas City, Mo. The vans rest on standard 3-ton Government trucks.

23. Examination of cooks for carriers:

Both cooks and bakers are now being examined at the Fort Leavenworth laboratory.

24. Bakeries:

These were in excellent condition, except for the presence of flies. No effort was being made to catch them. Bread was of excellent quality.

25. Exchanges:

These were clean and the food was in a sanitary condition and derived from places which are carefully inspected. There were a few flies present.

26. Fitting of shoes:

Little has been done in this matter. Lectures are being given by the orthopedists. Shoes are scarce.

27. Mosquitoes:

None.

28. Flies:

Very few now, but were very bad in the fall.

(a) Are flytraps and paper provided by Q. M. D.? Yes.

29. Extra cantonment area:

(a) Activity of public health and other officials: Surgeon ———, of the Public Health Service, is stationed at Manhattan. He is active and cooperating with the sanitary authorities, and makes daily reports to the division surgeon.

(b) Activity of local boards of health: Local boards of health are working in conjunction with Surgeon ———, U. S. P. H. S.

(c) Contagious diseases: Meningitis is endemic in the surrounding country. Measles is prevalent; also some scarlet fever and diphtheria. There is much typhoid in the village of Ogden, 1½ miles from Camp Funston, 30 or 40 cases having occurred. The town is under embargo; it is a very unsanitary community.

A new town known as Army City is being built immediately adjacent to the reservation.

(d) Booths for sale of food and drinks: These are being inspected by the sanitary inspector, and any which are unsanitary are closed or an embargo placed on them. All of these will be closed as soon as regimental exchanges are generally in operation.

(e) General sanitary conditions: Satisfactory, except as noted above.

30. Medical supplies:

In general, sufficient. Some shortage of veterinary instruments.

(f) Economy in use of: Satisfactory.

31. Gas defense:

Gas defense officer has arrived; gas house nearly completed. Instruction has been started.

32. Remount station:

In general, satisfactory. Well policed. There were a large number of flies in the kitchen and no screens in the doors or windows. Fly paper was in use. Traps and poison are needed. The barracks were overcrowded, but more are to be built at once. There were 3,000 animals and considerable pneumonia (27 cases to date). The veterinary hospital was in good condition. All animals dying of disease were posted. There is a shortage of instruments, post-mortem case, ambulance, and operating table.

BASE HOSPITAL, FORT RILEY, KANS.

I. Situation:

The base hospital is located on the Fort Riley reservation, using the post hospital, artillery barracks, artillery guardhouse, artillery officers' quarters, and 19 standard base hospital wards for shelter. At date of my visit, there were 214 men in the post hospital buildings; 870 in the artillery barracks, and the remainder of the 1,284 cases being treated were in tents. The site is satisfactory, but the plan is extremely straggling and will be very difficult to administer. From one end of the hospital to the other is over 1,000 yards. The

administration building (the old artillery headquarters) is near one end of the group. It is impossible to connect up all the groups of buildings by corridors. A trolley line and a much-traveled road runs through the site, and numerous other less-traveled roads separate the groups of buildings. There are 13 separate messes, including the nurses' and the officers' messes, and 14 separate heating plants (not counting those in officers' quarters).

The construction is going on very slowly, owing to difficulty of getting laborers, and will not be completed before Christmas. Barracks are being repaired, repainted, and are having plumbing installed on the second floors. Little of this has been done, as yet, and several barracks not yet repaired have, from necessity, been filled with patients.

The hospital is located about 4 miles from Camp Funston. The connecting road is excellent.

2. Capacity:

When completed, capacity will be 1,719 beds, allowing 850 cubic feet of air space per bed.

(a) Adequacy: Uncertain. If Camp Funston is ultimately to have 55,000 troops, as has been suggested, and if Fort Riley continues to have about 6,000 troops, as it does at present, the hospital should be enlarged to at least 2,000 beds. At present the hospital is hard pushed to keep up with the demands of the camp and the post. The meningitis ward was greatly overcrowded. Measles wards were crowded. Many convalescent measles and meningitis cases were in tents, and there were 200 meningitis carriers in tents.

(b) Number of patients present: One thousand two hundred and eighty-four in hospital, including about 200 meningitis carriers in tents.

3. Medical personnel, character, and efficiency:

(a) Commissioned: There was insufficient competent medical and laboratory personnel for present emergency at the time of my visit. There were too many surgeons. Of the medical officers with medical training, practically all were men of middle age, recruited from small towns. They were not up-to-date practitioners, particularly as regards the modern treatment of meningitis. Two expert laboratory men and three well-trained clinicians were urgently needed and were telegraphed for; also 10 young, energetic, up-to-date men with medical training.

The chiefs of service are satisfactory. * * * The head of the laboratory section, Captain ———, is highly efficient. * * *

The following medical officers were reported to be incompetent and unsuited for the service: * * *

(b) Nurses: There were 34 nurses on duty, which number was entirely insufficient for the needs at the time. Telegram was sent requesting the immediate sending of 20 more. The nurses were satisfactory; the chief nurse was efficient.

(c) Enlisted: The enlisted men were fairly satisfactory, but inexperienced. There were no bad characters among them. There were 425 on duty, and 50 more were asked for by telegraph. The difficulties of handling this hospital with its widely separated buildings will make necessary the constant employment of an abnormally large detachment of enlisted men.

4. General police:

Excellent.

5. Fire protection:

As good as at any permanent military post. Commanding officer has asked for more fire appliances and for a professional fire department. A fire order is in force and drills are held, the last being two days ago. There is a fire marshal and assistants. Such fires as have occurred have been promptly put out.

6. Administration and organization of office:

Fairly satisfactory, except as regards the prompt elimination of unsuitable medical officers. * * *

The hospital has recently been attached to Camp Funston, and the commanding officer is under the orders of General ———. He is also post surgeon, and to that extent is under the control of the post commander. There is some conflict in orders, and results are not satisfactory.

7. Dental services:

Excellent. There was one regular and six dental reserve officers on duty. There was a base outfit in operation and another en route.

8. Operating rooms and surgical work:

The original operating suite of the post hospital is being supplemented by a new and very excellent operating room, which is nearly completed. The original X-ray outfit of the post hospital is to be continued in use and another and better X-ray equipment is to be installed shortly. The surgical work was satisfactory, and a large number of major operations had been performed.

9. Laboratory:

Laboratory is located on the lower floor of the administration building. Additional rooms were nearly ready for occupation, and space will probably be sufficient.

(a) Personnel: Personnel was insufficient for the enormous amount of work resulting from the meningitis and pneumonia epidemics.

(b) Character of work: An enormous amount of work in culturing meningitis contacts was being carried out, as many as 1,022 cases being cultured the last day of my visit. In all, up to November 19, 10,900 cases had been cultured. The work in pneumonia is unsatisfactory, partly because of lack of white mice and partly as a result of the inefficient work of Lieutenant ——. All kinds of work were being done except Wassermann's.

10. Eye, ear, nose, and throat departments:

The building is not yet completed. The service was satisfactory, except that there were no nurses in the wards.

11. Wards and care of patients:

The wards in the post hospital are excellent. The barracks which were used as wards were in much need of repairs and shabby in appearance; they lacked toilet facilities, except in the basements. These defects will soon be obviated. The wards were well run and the nursing and care for patients in general was very good, except in the meningitis ward. The meningitis cases were cared for in the permanent brick isolation ward of the post hospital. This was greatly overcrowded, and there were insufficient nurses. The patients were illy cared for. Records were not being kept; even the reports of temperatures and of the serum treatment were lacking. The physicians in charge were incompetent, though working diligently. I at once had the number of nurses increased and had an adjacent building vacated and converted into an overflow ward for meningitis.

(a) How admitted: Patients admitted by the medical officer of the day during the day, and by medical officer of the night at night. All cases are seen by medical officer before admission. The admitting ward was not completed.

(b) Average number of days per patient: For October, 9.12.

(c) Average number of days for venereal cases: For October, 10.32.

(d) Management of contagious diseases: In general satisfactory as regards isolation and segregation of attendants. The male attendants in the meningitis ward were segregated and, after a month of service were relieved from duty, their throats being cultured before they were allowed to return to their detachments. The female nurses were not segregated, and it was hardly practicable to do so. Directions were given that cultures be taken from them at frequent intervals.

12. Care of patients' valuables and other effects:

Satisfactory. Facilities for storing the patients' clothing not yet completed. All valuables are received by medical officer.

13. Kitchen and mess management:

Satisfactory. It will be very difficult to administer economically the 13 separate messes which it will be necessary to run in this hospital when it is completed.

(a) Diets: Satisfactory.

(b) Is food served to patients in satisfactory condition? Patients were well satisfied with the food served them.

(c) State of hospital fund: Hospital fund is rapidly increasing.

14. Laundry:

There is no laundry at the hospital. The division laundry will be used.

15. Exchange:

There is none for the hospital. Use will be made of the Fort Riley post exchange, in which the hospital detachment will be shareholders.

16. Supply Depot:

This is located in a gun shed. The space is ample, as all the supplies for the hospital can be stored in the hospital storerooms. Considerable work is necessary in the way of heating, installing windows and shelving and additional doors. The money for this work has been allotted.

(a) Efficiency of supply officer: Reasonably efficient, but old and not very active.

(b) Sufficiency of supplies: Generally sufficient. Shortage of veterinary instruments.

17. Care of property:

Satisfactory. Inventories and checks are made monthly.

18. Dispensary management:

Satisfactory. Alcoholics and narcotics properly checked.

19. Care of dead:

Not satisfactory at time of my visit. The morgue is much too small, but a new one has been authorized. The morgue is located in the basement, with windows at ground level and not provided with curtains. At the time of my visit to the meningitis ward at night, the lights were burning in the morgue, and passers-by could look in through the windows. There were five dead bodies in the morgue at the time, and these were covered with sheets more or less soiled with blood. The autopsy table was in filthy condition, smeared with blood and fragments of tissues.

Embalming is being done by an undertaker from Junction City, and is satisfactory.

RÉSUMÉ

The location and drainage of Camp Funston are poor. The site is a level alluvial deposit in an erosion valley, subject to inundations from the Kansas River every three or four years. A dike is to be built to guard against recurrence of inundations. The soil is very muddy when wet and extremely dusty when dry. The sanitary conditions in and about the camp are excellent except for some overcrowding in certain dormitories. The division surgeon and sanitary inspector are highly efficient. The division commander heartily cooperates in all sanitary matters. The sanitary units are well organized and well trained. There is practically no venereal disease developing in the command. The remount station is well cared for, except for some flies in the kitchen and some overcrowding in the barracks.

Air space and ventilation.—At present there is considerable overcrowding in the remount station, in the dormitories of the regimental infirmaries occupied by Medical Department enlisted men, and in certain barracks used by line organizations. In some of the dormitories there was an allowance of only 327 cubic feet per man. The crowding was most noticeable in barracks occupied by colored troops and in the dormitories of the regimental infirmaries. However, the majority of the dormitories were not excessively crowded.

Nearly all of the supplementary construction required by the reorganization of the army has been completed; and when this is finished and the new buildings occupied it appears that there will be an allowance of 500 cubic feet of air space per man. However, on account of the necessity for leaving space about the radiators and for passages, there is certain to be a very limited available floor space per man, which will lead to close proximity of the beds and will favor spread of disease by contact infection. This is equally true in all the cantonments I have visited. It will not be possible to maintain a distance of 5 feet between the heads of adjacent sleepers except by placing the men in such a way that the feet of one man are opposite the heads of the two adjacent men. Such an arrangement was recommended to the commanding general.

The ventilation through windows was being carefully supervised at Camp Funston and orders were in force that an inspection should be made twice each night by a commissioned officer, one such inspection being after midnight.

Sick rate.—The sick rate November 15, 1917, was 54.9 per thousand. There were 1,284 sick in the base hospital. From the establishment of the camp up to November 15, 1917, the following cases of infectious diseases have occurred at Camp Funston: Cerebrospinal meningitis, 53 cases; pneumonia, 152; measles, 229; mumps, 113; scarlet fever, 6; diphtheria, 2; smallpox, 1; typhoid, 2 (one is a carrier). There have been 17 deaths from meningitis and

17 from pneumonia. Careful inquiry indicates that only 3 new cases of venereal disease, infected after arrival at camp, have developed since the drafted men arrived at Camp Funston.

The meningitis and pneumonia situation is grave. For details, see section 9 ("Communicable diseases").

Base-hospital situation.—The base hospital is too far away from the camp (about 4 miles), and as planned will be very difficult to administer because of the scattering of the buildings and the impossibility of connecting all the groups by corridors; the hospital will be about 1,000 yards from end to end. There will be 13 separate messes and 14 separate heating plants. Construction has been proceeding very slowly and will probably not be completed before the end of December. The capacity is barely keeping up with the needs of the division. It will ultimately be about 1,719 beds. * * * Both the commanding officer and the chief of the medical service have been working under great difficulties due to the professional inefficiency of many of the medical men under them and the overcrowding resulting from the sudden development of the pneumonia and meningitis epidemic when the hospital was but partially completed. The surgical service was extremely well run and the patients well cared for. The care of the pneumonia patients was satisfactory. The care of the meningitis patients was poor, due to overcrowding, lack of nurses, and the fact that the physicians were not competent to do up-to-date work in meningitis. This condition on the date of my departure had been largely relieved and will be entirely remedied on the arrival of the additional doctors and nurses asked for. Laboratory work on meningitis was extremely satisfactory. Work on pneumonia unsatisfactory on account of lack of white mice.

REPORT AND RECOMMENDATIONS MADE TO THE COMMANDING GENERAL, CAMP FUNSTON, IN WRITING

Report that on sanitary inspection of Camp Funston, including the base hospital at Fort Riley, the sanitary conditions were found to be excellent with the exception of marked overcrowding in certain organizations. This was especially notable in sanitary trains, in regimental infirmaries, and in the quarters occupied by the colored regiment. In Company D of the colored regiment, the air space in one dormitory was 328 cubic feet per man and the barracks occupied by the two field hospitals (colored) of the 92d Division were even more crowded. This overcrowding, together with the prevailing arrangement of the bunks in groups of two, greatly facilitates the spread, through contact infection, of pneumonia and meningitis, both of which diseases are far more prevalent at this camp than at any other National Army cantonment. The epidemic of pneumonia and meningitis in this command is of the most serious import, and the following recommendations are made in the hope of checking the progress for the epidemic:

(a) That an isolation or detention camp, having a capacity of 2,000 beds, be constructed in the vicinity of Camp Funston, this to be used for the detention of new arrivals and for the isolation of contacts and of carriers. This detention camp should consist of two-story buildings similar in type to the standard cantonment barrack, being divided by transverse partitions 8 feet in height into compartments holding not to exceed eight men and providing a floor space of 50 square feet per man. Each compartment should be provided with a door opening on the ground in the case of the lower story and upon a balcony in the case of the upper story; the stairs being outside. There should be no doors between the individual compartments. Detached kitchens should be built and meals should be obtained by the occupants of the compartments from the kitchen and eaten in the compartments to which the men belong. The whole camp should be surrounded by a barbed-wire fence. A telegram has been sent to the Surgeon General recommending the construction of such a detention camp.

(b) That the construction necessary to provide a minimum of 500 cubic feet of air space per man in each barrack be pushed as rapidly as possible.

(c) That no more men be sent to this camp until the construction recommended in paragraph (b) has been completed. Recommendation to this effect has been made by telegram to the Surgeon General.

(d) That the beds in all barracks be so arranged that they are not in contact, and that the men be required to sleep so that the feet of one man are opposite the head of the ad-

acent man. This plan is suggested with the view of securing a space of at least 5 feet between the heads of individuals, thereby diminishing the danger of the men coughing in each other's faces.

(e) That arrangements be made to provide racks outside each barrack for the airing of bedding and that all bedding be aired daily when the weather is favorable, particular attention being given to the shifting about of the bedding so that the same articles are not exposed day after day to the sun while others are protected from the effects of the sun. At least once a week the beds should be removed from the barracks and sunned.

(f) That the present orders regarding ample ventilation at night be most vigorously enforced.

(g) That all new arrivals at the camp as far as possible be segregated in their barracks by companies and drilled separately until they can be cultured for meningitis.

(h) That the oiling of the roads be pushed as rapidly as possible.

(i) That greater attention be given to prompt removal of sick men from the barracks.

(j) That the flies in the mess at the remount station and in the bakery be destroyed. In the latter building there was no fly paper in use; the screen doors were warped and broken and propped open at the time of my visit.

(k) That the completion of the isolation wards at the base hospital be pushed as rapidly as possible.

(l) That the temporary barracks, adjacent to the Artillery barracks, which were formerly given to the hospital and then taken back (being now occupied by Cavalry), be turned over to the hospital. These are urgently needed for sheltering the personnel of the hospital.

RECOMMENDATIONS ALREADY MADE TO THE SURGEON GENERAL

These are shown in attached copies of telegrams. They were in brief to send additional physicians, laboratory workers, nurses, and enlisted men of the Medical Department; to provide white mice and additional supplies of laboratory apparatus and dichloramine-T; and to construct a segregation camp of 2,000 beds adjacent to Camp Funston; also to send 12 additional ambulances. (Inquiries made since my return to Washington indicate that attention has been given to all of these matters except the construction of the barracks for the detention camp.)

Recommendation was also made that no more drafted men be sent to Camp Funston until the construction necessary to provide a minimum of 500 cubic feet of air space per man in each dormitory had been completed.

RECOMMENDATIONS NOW MADE TO THE SURGEON GENERAL

(a) If it is contemplated to increase the command at Camp Funston to 50,000 or 55,000 men, it is recommended that the hospital be increased by at least 300 beds.

(b) That a sergeant, first class, Medical Department, be assigned to duty with the 92d Division for duty in the division surgeon's office. There is no noncommissioned officer in this office at present.

(c) That the division surgeon of the 92d Division be put on the mailing list for circulars, memoranda, etc., in the Surgeon General's Office. The division surgeon states that he received no official publications of any kind.

(d) That the shipment of veterinary supplies to Camp Funston and to other camps be expedited.

(e) That the sending of Mason's Handbook, and of books on sanitation which are necessary for carrying out instruction in divisions, be expedited. It is thought that a standard supply of these books should be sent to each division without requisition.

(f) That the furnishing of individual personal equipment for medical officers and enlisted men of the Medical Department, paragraphs 864 and 865, M.M.D., be expedited if possible.

(g) That instructions be issued to division surgeons calling attention to the importance of keeping the door closed between the kitchen and the bedroom occupied by the cooks. In nearly every barrack visited at cantonments these doors are kept open, and flies crawl over the dirty bedding of the cooks and then over the food.

Colonel, Medical Corps, Special Sanitary Inspector.

REPORT OF SANITARY INSPECTION OF GENERAL HOSPITAL No. 31, CARLISLE, PA., MADE
ON OCTOBER 8, 9, 10, 11, 1919,

By Col. ———, M. C.

1. Situation:

General Hospital No. 31 is situated at Carlisle, Pa., in the old military post formerly utilized by the Interior Department as an Indian school.

Condition of roads is excellent; \$7,000 has been expended on the roads recently.

The grounds are improved and beautified.

2. Construction:

There is no construction in progress or authorized.

Corridor from surgical pavilion to surgical ward is needed.

The water pressure ranges from 12 to 20 pounds, which pressure is inadequate to provide the proper supply of water to the third floors of the various buildings. (See report on water system by Capt. ———, S. C.)

3. Organization and administration:

Col. ———, M. C., is the commanding officer, and he is efficient.

There are 2 colonels, 1 lieutenant colonel, 5 majors, 9 captains, and 5 first lieutenants on duty.

Unfit medical officers have been reported to the Surgeon General, and discharge requested.

There is no course of instruction given to medical officers.

Officers' quarters are not quite adequate to care for all commissioned personnel on duty.

There are accommodations for 26 bachelor officers and 9 married officers. All others live outside.

Ambulance and other transportation is adequate.

Maj. ———, S. C., is the adjutant. Major ——— was on leave at the time of inspection, but he is reported by the commanding officer as being efficient.

The hospital is governed by a series of orders and memoranda.

The officer of the day is excused from routine duties and is on constant duty in the office of the officer of the day. He is responsible for the proper performance of duty by the guard and inspects all wards and kitchens at 7 a. m.; also he makes a general tour of inspection after 9 p. m., and is required to inspect dinner and supper of patients and enlisted attendants. He is present at reveille and retreat, roll calls, visits sentry posts, and holds roll call. He reports to the commanding officer daily and makes written report to him of all matters occurring during his tour of duty.

4. Nurses:

Sixty-nine nurses are on duty, six of whom are on leave of absence preparatory to discharge. This number is sufficient, and nurses appear to be somewhat above average.

Miss ——— is the chief nurse. She is efficient.

Nurses' quarters are adequate and comfortable.

The nurses' mess is very good. Twelve civilians are employed (1 cook, 2 second cooks, 8 maids and 2 male waiters). In addition to the nurses in this mess, a number of reconstruction aides are also present. The mess is now feeding 120 nurses and aides, and there is no crowding except in the kitchen. The range upon which the cooking is done is too small to properly cook for this number. The floor of the kitchen is dirty.

5. Detachment enlisted men M. D.:

Capt. ———, S. C., is in command of the Medical Department detachment.

The records are in satisfactory condition.

During the past three months, there have been 35 trials and convictions by summary court. One hundred and thirty have undergone company punishment; eight are now in confinement.

There are 61 noncommissioned officers on duty; 2 master hospital sergeants, 3 hospital sergeants, 13 sergeants, first class, 29 sergeants, and 14 corporals. This number is sufficient; efficiency is good.

There are 353 enlisted men exclusive of noncommissioned officers on duty. Of these, 157 are in the regular service, and 85 per cent are recruits of from two days to three months' service. Considering the short period of service, efficiency is satisfactory.

Clothing and equipment is adequate. White suits are available for all entitled to wear them.

Seven hours weekly are devoted to drill and instruction. Recruits receive two weeks of intensive training.

The venerable prophylactic station is satisfactory, and is under the supervision of the G. U. service.

Physical inspections are held twice monthly.

No civilian employees have replaced discharged enlisted men of the Medical Department. Thirty have been employed by the Quartermaster Corps to replace discharged soldiers from that corps.

6. Barracks and squad rooms:

The old gymnasium is utilized as a barrack. It is orderly, well kept, cleanly, and adequate.

Ventilation and heating are satisfactory.

The equipment is ample and includes trunk lockers, barrack bags, and wall lockers.

There is no detachment mess. The detachment eats in the general mess.

7. Registrar's office:

Capt. ———, S. C., is the registrar. He keeps all sick and wounded records and attends to all correspondence pertaining thereto. He makes out C. D. D's, pay rolls, keeps service records of patients, and also has charge of patients' valuables. Money is kept in safe in the office of the registrar. Banking system is not employed.

Organization and administration is satisfactory.

Records and returns are satisfactory, except the sick and wounded report is sometimes late.

Average number of days in hospital per patient during past month, 24 days.

Mean daily number of patients in hospital for each month since hospital opened.

September, 1918.....	18	April, 1919.....	486
October, 1918.....	56	May, 1919.....	509
November, 1918.....	34	June, 1919.....	611
December, 1918.....	63	July, 1919.....	717
January, 1919.....	85	August, 1919.....	640
February, 1919.....	156	September, 1919.....	462
March, 1919.....	412		

8. Dispensary service:

There has been no audit of the alcohols or narcotics in the dispensary since September 1. Common drinking cups are not used to administer medicine.

9. Dental service:

Captain ———, D. C., is the chief of service. He is efficient. Dental survey is made when patients are admitted. The service is satisfactory.

10. Medical service:

Col. ———, M. C., is the chief of service. He is efficient. Six medical officers are on this service, all of whom are reported as efficient. None except Colonel ——— pertain to the regular establishment.

Bacteriological types of pneumonia worked out during last three months: Type two, 1; type four, 1.

Percentage of cases in which empyema followed pneumonia in last three months, 50 per cent.

11. Surgical service:

Maj. ———, M. C., is the chief of service. He is efficient. Eleven medical officers are connected with this service, all of whom are reported as efficient.

No deaths have been due to accident or incompetency.

Four clean wounds have become infected since May, 1919. Surgical equipment is adequate.

Elective operations on patients are followed by early return to duty.

Results in empyema cases are satisfactory.

There are approximately 490 osteomyelitis cases under treatment. Babcock method is not employed. Major ——— obliterates the diseased bone area and converts same into a cup-shaped cavity, using a muscle transplantation, if indicated, or Dakin tubes and packing. (Chutro treatment.) A number of excellent results were observed. Several unsuccessful cases of bone grafting, seemingly performed too early, have recently been received at this hospital from Fox Hills and Colonia.

All fracture cases have been reported and measurements taken to determine shortening.

Two cases of peripheral nerve injury are now in hospital.

One amputation case is now under treatment. He arrived October 3, 1919, and has not been reported.

There are no maxillofacial cases in hospital.

X-ray service is satisfactory and cooperates well with other services.

Chiefs of service make daily visits to the laboratory to discuss X-ray findings with the roentgenologist.

Of the 592 patients in hospital, 324 are enrolled in the reconstruction service. Of the 324 enrolled, 227 are in regular attendance. Of the 592 patients now under treatment, 240 have just arrived. Prior to their arrival, there were only 388 patients in hospital, of whom 296 were enrolled. The hydrotherapy department is below the average standard employed in the reconstruction service, because the pressure in the mains is inadequate to provide proper water force. Five officers are engaged in reconstruction work. Reconstruction aides are assigned as follows:

Chief head aide.....	1	Head aides.....	2
Carpenter.....	1	Oxy-acetylene welding.....	1
Masonry.....	1	Blacksmithing.....	1
Sheet metal.....	1	Auto tire repair.....	1
Stenographers.....	2	Stenography and typewriting.....	1
Farm.....	1	Arithmetic.....	2
General crafts assistants.....	4	Algebra, geometry, trigonometry.....	1
Jewelry shop assistants.....	1	Wireless telegraphy.....	1
Ward workers assistants.....	5	French and Spanish.....	1
Up-grade.....	1	Mechanical drawing.....	1
English to foreigners.....	3	Music.....	1

The space assigned to the reconstruction service is adequate.

12. Eye, ear, nose, and throat department:

Capt. ———, M. C., is the chief of service. Captain ——— has been conducting this service, but in a manner not satisfactory to the commanding officer, and his discharge has been recommended. Another officer is under orders for this hospital, and will relieve Captain ———.

13. Laboratory, including ward laboratories:

Lieut. Col. ———, M. C., is in charge. Colonel ——— has just arrived, and his efficiency has not been observed.

Brief summary of work done in laboratory in past month:

Blood examinations, counts, etc.....	107	Complement fixations for syphilis.....	29
Routine chemical and microscopical urine examinations.....	181	Animal inoculations for T. B.....	2
Routine feces examinations.....	7	Smears for Vincent's angina.....	125
Sputums for T. B.....	47	Smears for tonsils and wounds for organism.....	65
Routine spinal fluids.....	3	Smears for bacterial counts.....	3
Smears for G. C.....	37	Gastric analysis.....	3
Dark fields for T. pallidum.....	2	Autogenous vaccines.....	1
Blood cultures.....	2	Vaccinations administered.....	27
Feces cultured for B. dysentery.....	1	Triple typhoid inoculations administered.....	102
Nasopharyngeal and wound cultures.....	218	Dakin's solution prepared, liters.....	600
Milk and water analyses.....	15		

Work greatly diminished during month, due to almost complete disruption of service by discharge of its personnel.

14. Genitourinary service:

Captain _____, M. C., is chief of service. Captain _____ is not a G. U. specialist and has not been well trained in this work. His discharge has been recommended and another officer is expected to arrive soon to take over this service.

15. Psychopathic service:

There is no psychopathic service.

16. Communicable diseases:

Infectious diseases are handled in accordance with memorandum, S. G. O., January 1, 1918.

17. Wards and care of patients:

Bed capacity of the hospital is 903. Five hundred and ninety-two patients are now under treatment, 560 of whom are overseas patients and 26 are domestics.

Numerical classification of patients by services is as follows:

Surgical.....	477	Genitourinary.....	17
Medical.....	96	Psychopathic.....	2
Dental.....	2	Eye, ear, nose, and throat.....	3

The officer of the day acts as receiving officer and admits all patients through the receiving office, where Forms 55a and clinical brief are prepared. Patient is assigned to ward and copy of clinical brief is sent to the registrar's office, while the original is sent to the ward with the patient. The register number is assigned at the receiving office.

Valuables and money are kept by the registrar, who gives receipt for property placed in his care. Both original and duplicate are signed by both the patient and registrar. Valuables are kept in the registrar's safe, and he alone has the combination. Enlisted men do not handle money or valuables of patients.

Ward service is efficient. Patients are well fed, well nursed, and bed linen and clothing are cleanly, but the floors of wards O, P, and Q are dirty and show lack of attention.

Patients' clothing is laundered as often as necessary at Government expense.

Chiefs of service report daily names of men dangerously ill.

Nearest relatives of dangerously ill are promptly notified by the commanding officer.

Letters from relatives are promptly answered by the registrar or commanding officer.

Post cards are sent to relatives on arrival, departure, and discharge.

The dead are cared for in compliance with Army Regulations. The body is carried to the morgue, where it is prepared and tagged and the undertaker at Carlisle is notified. When body is ready for shipment it is inspected by a medical officer designated by the commanding officer, who sees that instructions concerning dead are carried out, and makes written report to the commanding officer.

Only two have died during the past three months, and one was autopsied.

18. Kitchen and mess management:

The general mess is well organized and well operated. The soldier cooks are satisfactory, and food is well prepared. The kitchen police are nearly all recruits, but are rendering good service. The mess hall and kitchens are well policed and very cleanly. Flies are present.

Food is secured from approved sources.

System of storage and issue of food is satisfactory.

Diets are well varied and food is well cooked.

System of feeding is cafeteria.

Amount of hospital fund on hand at last statement, \$1,916.12. Fund is in the hands of the mess officer, Lieut. _____, S. C.

The hospital operates a farm and has under cultivation 245 acres of land. During the month of September, the mess used from this farm 650 bushels of potatoes, 1,679 dozen ears of sweet corn, 143 bushels of tomatoes, 12 bushels of beets, 33 bushels of carrots, 31 bushels of spinach, 400 squash, 2,061 gallons of milk, 2,145 pounds of pork. The farm receipts for September were \$3,019.68. Figuring the value of the farm products utilized by the general mess during September, the cost per man per diem was \$0.7848. The amount actually expended from the hospital fund per diem per man was \$0.6366. Including farm products, the cost for August was \$0.7209. Excluding farm products, it was \$0.6355.

None of the fund can be spared.

All the cooks and food handlers have not been examined for carriers. None of the kitchen police and waiters and only two of the cooks in the general mess have been so examined.

Mess halls, kitchens, and equipment are adequate.

Condition of food served to the wards is generally satisfactory, but food carts can not be placed in service on account of the absence of runways. However, hand-carried thermo-containers serve to get the food to the wards while still warm, and if necessary toast and other articles are reheated before serving.

Nurses supervise the serving in wards.

Dish-washing machine in general mess is efficient and serves to sterilize, but plates and cups are placed on the table wet and are not dry when used.

19. Exchange:

Organization and administration of post exchange is satisfactory, except the floor back of the counters is exceedingly dirty. One food handler has not been examined as a typhoid carrier, and ice-cream scoop is kept in dirty water.

Sanitary condition of food supplies is satisfactory.

Exchange operates under War Department regulations.

Dividend of \$700 was declared in September to hospital fund. An additional \$90 was devoted to the athletic fund, and \$10.25 was devoted to athletics for nurses. Forty dollars was expended on flower seeds.

The exchange is small, and stock carried is not extensive.

20. Laundry:

The operation of disinfection department is efficient. The sterilizer is a No. 2 Erie Sterilizer Co., capable of disinfecting one-quarter ton of material at one time, including mattresses, pillows, etc.

The post laundry is required to work two shifts with day and night crews in order to meet the demand. Twelve civilian employees, all female, are used as ironers, manglers, and seamstresses. These civilian employees and one noncommissioned officer and four privates constitute the day shift. One noncommissioned officer and four privates are also on duty at night.

Quality of the work is good. There are no complaints.

Equipment is adequate to meet the needs by working two shifts.

Issue department functions satisfactorily.

21. Medical supply department:

Loan cards are in use and checked. Circular 131, W. D., 1918, is complied with.

Thirty-six loan cards are in use throughout the hospital. They are signed first by the ward master and later by medical officers or other officers in charge of property. One set of additional loan cards have been set up in the hospital by the utilities officer by authority from the Purchase, Storage, and Traffic Division.

There is a sufficiency of supplies. Supplies in warehouse are not in charge of a medical officer. The supply officer belongs to the Sanitary Corps.

Hospital requisitions are promptly filled, and there are no delays. Emergency cases are handled promptly by the supply officer.

System of issuing supplies in the medical supply department is as follows: Requisition in duplicate is received from proper officer. Shipping ticket is made out by the supply officer and is signed by the receiving officer. Supplies are then dropped from stock card and are taken up by receiving officer on loan cards. Medical supplies on hand are in accordance with stock cards.

22. Q. M. department including ordnance:

Two enlisted men are on duty in this detachment. Thirty civilian employees have replaced enlisted men who have been discharged.

Status of records and property returns is satisfactory.

Supplies are ample.

There is no power plant. Heating system operates satisfactorily and hot-water system is efficient.

Water is hard, and water pressure is below needs during a part of the 24 hours when water consumption is greatest. The water main is tapped at numerous points before it reaches the hospital, and at times the pressure is so low from this cause that there is difficulty in getting water on the third floor of the various buildings. The hydrotherapy department is also slightly crippled by this reduction in water pressure. Capt. ————, S. C., recently visited this post and has just made an elaborate report concerning water supply and increased water pressure, a copy of which is hereto attached. Water pressure ranges from 12 to 20 pounds.

Sewage is carried by the city sewer.

Plumbing is in excellent condition.

Electricity is purchased from the United Electric Light Co., Lemoyne, Pa., and from the Carlisle Heat, Light & Power Co., Carlisle, Pa.

23. Fire protection:

A ground tank with 200,000 gallons capacity is used as a reserve water supply for fire protection. The pressure is increased by a 500 gallons per minute capacity electric pump. There is 1 Howe-Ford fire engine, capacity 400 gallons per minute, and 7 hand-drawn and 1 Dodge chemical machines. In addition, there are numerous Pyrenes and acid-soda extinguishers. Water pails, ladders, and axes are located at convenient points. Reliance may also be placed on the local fire department of Carlisle.

24. Disposal of wastes:

Edible garbage is fed to hogs at hospital farm. Nonedible garbage and refuse is burned at dump.

Paper is baled and sold.

25. General police of buildings and grounds:

The police of the grounds is excellent throughout. The police of wards is generally good, but the floors of wards O, P, and Q are dirty and show lack of attention. The general mess is particularly cleanly.

26. Remarks:

The morale is seemingly above normal. The welfare organizations cooperate heartily with the commanding officer and morale officer, and an attractive program of trips and amusements is worked out weekly. (See sample attached.) The commanding officer states that his morale is at times somewhat lowered by the incoming of patients from other hospitals where military restraint has not been practiced. In addition to the above there is a general desire to leave the service, but this seems less prominent than usual. Maj. ————, Engineers, is morale officer. The occupational and physiotherapy aides working among patients in the wards tends to the improvement of morale. Nine patients are now absent without leave. During the past month 25 overseas and 1 domestic patient have been tried by court-martial; at present 3 overseas cases are in confinement and 5 are restricted to the locked ward.

The provisions of Circular No. 226, W. D., 1919, are complied with. Upon the discharge of a patient all his service records are closed out. Form 333 BWRI and Form 39 QMC are checked against his service record and pay card. When allotment is in operation, request for discontinuance is made out and forwarded to the proper bureau at Washington. This is checked up by the registrar when the soldier's record is completed.

Forty were discharged on C. D. D. last month. Length of time required to secure discharge of patients on C. D. D. after papers leave hospital, one week.

Recruiting party goes out from one to three weeks, and since September 1 has enlisted about 140 men. These recruits are given two weeks' intensive training before assignment to duty.

The bakery is cleanly and well kept, but has many flies, and the finger nails of the bakers are not cleanly. The bread is of average quality.

27. Résumé:

This is a well-organized and well-conducted hospital. At present it is slightly handicapped by the water pressure ranging from 12 to 20 pounds, which is barely sufficient to get a supply of water to the third floors of various buildings and which restricts the hydro-

therapy department. The 245 acres of land under cultivation constitute a valuable asset in the matter of feeding patients with farm products, including not only vegetables but milk and pork.

28. Recommendations made to commanding officer:

CARLISLE, PA., October 10, 1919.

From: Col. ———, M. C., sanitary inspector.

To: Commanding officer, U. S. A. General Hospital No. 31, Carlisle, Pa.

Subject: Sanitary Inspection.

1. At the sanitary inspection of your hospital just completed, general conditions were found to be satisfactory, except:

Messes.—(1) There is only one range in the nurses' mess.

(a) The mess is now feeding 120 nurses and aides, and it is thought another range should be installed.

(b) The kitchen floor of the nurses' mess is very dirty.

(c) There are a good many flies in the general mess, and plates and cups are placed on the table wet and are not dry when used.

(d) None of the kitchen police and waiters and only two of the cooks in the general mess have been examined as typhoid carriers.

Dispensary.—There has been no audit of the alcohols and narcotics in the dispensary since September 1, 1919.

Ward service.—The floors of wards O, P, and Q are dirty and show lack of attention.

Exchange.—(a) The ice-cream scoop is kept in dirty water. (b) One food handler has not been examined as a typhoid carrier. (c) The floor of the exchange back of the counters is very dirty.

Water supply.—The water pressure varies from 12 to 20 pounds. This pressure is insufficient to provide an adequate flow of water to the third floors of the various buildings, and does not provide proper force for the hydrotherapy department.

It is recommended that the report recently rendered by Capt. ———, S. C., bearing upon this subject, be considered.

Bakery.—The bakery has many flies and the finger nails of the bakers are not cleanly.

2. It is requested that this communication be forwarded to the Surgeon General, attention Colonel Howard, with indorsement stating action taken to correct the defects mentioned above.

—————,
Colonel, Medical Corps.

29. Recommendations now made to Surgeon General:

1. That the question of increasing the water pressure of this hospital, as recommended by Capt. ———, S. C., be considered.

2. That a corridor from the surgical pavilion to the surgical ward be installed.

—————,
Colonel, Medical Corps.

INSPECTIONS DURING INFLUENZA EPIDEMIC

The influenza epidemic, which struck such a paralyzing blow to all our camps, was made the subject of many special investigations by the inspection section.⁷ This epidemic at once raised highly important sanitary questions, particularly regarding quarantine, hospitalization, professional care of the sick, and the disposal of the dead. Inspections were made at all the more important stations in the East and Middle West, partly by regular members of the inspection service and partly by officers borrowed for that purpose from the division of internal medicine of the Surgeon General's Office. In general, it was found that the difficult situation was being well handled at the camps. The inspectors offered recommendations for the improvement of such conditions as were susceptible of betterment, and their advice and presence served to steady morale and

to promulgate the impression that everything possible was being done. In Chapter XVI is quoted a report illustrative of the situation found at one large camp (Dix) and of the action taken by the inspector. The circumstances related in this report were considered to be representative of the situation and difficulties existing at other camps, and it was thought the recommendations would be of use at many stations, particularly those farther south and west, where the epidemic was just beginning. Consequently, copies of this report, with a prefacing memorandum, were sent to a large number of stations.¹³

GENERAL RESULTS OBTAINED BY THE INSPECTION SERVICE

The service of the inspection section enabled the Surgeon General to keep in close touch with conditions at all camps and hospitals, not only by written report, but also by personal conversation with the inspectors during their presence in Washington. The inspectors on their return from tours were in a position to answer by first-hand information any complaints regarding sanitary conditions or care of patients at the points visited by them. Their presence for a part of the time in the Office of the Surgeon General enabled them to keep in contact with changing conditions and with new policies of the War Department. All of the inspectors were stationed in Washington except one, who was assigned to duty at San Antonio, Tex., and who inspected stations in the southwestern part of the country, being ordered to Washington for conference from time to time.¹⁴ The findings of inspectors frequently formed the basis for general memoranda or circular letters from the Surgeon General to camp surgeons, or served to initiate recommendations to the War Department for the issuance of orders promulgating sanitary policies or aiming to correct sanitary defects. Procedures of exceptional merit found in use at certain camps were made known to the service in general through the efforts of the inspectors. Much valuable instruction to camp personnel was given by inspecting officers during their visits. Matters of urgency were personally handled by inspectors on their return to Washington, with a view to obtaining more prompt corrective action than could be gained through the usual written channels.

More than 1,400 inspections were made by inspectors from the inspection section of the Surgeon General's Office, and practically every station not under control of a department commander was visited at least once.⁷ All large camps and hospitals were inspected many times. The reports of these inspections, which are on file in the Surgeon General's Office, constitute historical record of the inception, growth, and decline of these stations. The inspections resulted in the alleviation of numberless local sanitary defects, and paved the way for many general recommendations, aiming at the improvement of health conditions in the Army as a whole.

SANITARY INSPECTIONS OTHER THAN BY THE SANITARY INSPECTION SERVICE

As is told in the next chapter, the Surgeon General himself (General Gorgas) made many sanitary inspections during the World War. These pertained principally to the investigation of conditions responsible for disease. Commonly in making such inspections he was accompanied by specialists in

epidemiology, either military or civilian. Special sanitary investigations were also made by boards under direct instruction from the Surgeon General.

As already explained, department sanitary inspectors also were very active during the war. The agencies mentioned, together with those at camp, resulted in a sanitary inspection service at home far in advance of anything we had previously attained in this direction. On request of the Surgeon General's Office, dated August 15, 1919,¹⁵ The Adjutant General informed the Surgeon General on August 27, 1919, that the following letter had been written to commanding generals of the different departments in the United States:¹⁶

The department commanders in the United States are authorized to order their department sanitary inspectors to posts and stations under their control for such sanitary inspections from time to time as they deem expedient.

By order of the Secretary of War:

(Signed) CHARLES J. KINDLER,
Adjutant General.

On March 3, 1920, these instructions were superseded by Section II, General Orders, No. 13, War Department, which read as follows:

II. *Sanitary inspections*.—Department commanders will cause the department surgeon or the department surgeon's assistant to make one sanitary inspection each six months at each post, camp, or station under their control where troops or detachments of the Army are stationed, including the places enumerated in paragraph 2, General Orders, No. 132, War Department, 1919 (jurisdiction of department commanders). The reports of such inspections will be made to department commanders, who will forward one copy of each such report to The Adjutant General of the Army for the information of the Secretary of War and the Surgeon General. (721, A. G. O.)

In order to promote uniform and complete inspection and report, the inspection section of the Surgeon General's Office devised a questionnaire, closely agreeing with that shown on pages 40 to 45. Department surgeons were directed to require their sanitary inspectors to report on the subjects shown in this questionnaire and to forward one copy of the report direct to the Surgeon General's Office.

REFERENCES

- (1) A. R. 1387, 1913 (C. A. R., No. 25); Manual for the Medical Department, 1916, pars. 414, 415, 416, 417, inclusive.
- (2) Form 50, Med. Dept., U. S. A. (revised May 26, 1915).
- (3) Memorandum from Col. D. C. Howard, M. C., to the Surgeon General, November 13, 1917. Subject: Organization and function of sanitary inspection service in S. G. O. On file, Record Room, S. G. O., Correspondence File 024.13 (Sanitation).
- (4) Memorandum from Brig. Gen. T. C. Lyster, to the Surgeon General, August 28, 1918. Subject: Consultants. Approval indorsed thereon. On file, Record Room, S. G. O., Correspondence File, 211 (Consultants).
- (5) Quarterly reports of sanitation division. On file, Record Room, S. G. O., Correspondence File, 024.-13 (Sanitation Division).
- (6) Sanitary inspection charts. On file, Record Room, S. G. O., Correspondence File 024.-13 (Sanitation Division).
- (7) List of Sanitary Inspections made by Officers of the Inspection Section during the Period of the World War. (Up to February 15, 1920.) On file, Record Room, S. G. O., Correspondence File, 721.1.
- (8) Manual for the Medical Department, 1916, 364.

- (9) Reports of sanitary inspectors made during the World War. On file, Record Room, S. G. O., Correspondence File, 721.-1.
- (10) G. O. No. 79, W. D., August 24, 1918.
- (11) Correspondence regarding complaints from various camps, etc. On file, Record Room, S. G. O., Correspondence File, 321.6 (E).
- (12) Sanitary Inspection Reports. On file, Record Room, S. G. O., Correspondence File, 721. (Name of camp) (D).
- (13) Memorandum for all camp surgeons, surgeons of recruit depots, and independent stations, department surgeons and officer in charge, air service division, dated September 30, 1918. Subject: Influenza Epidemic. Copy on file, Mimeograph Room, S. G. O., C-71.
- (14) Personnel reports. On file, commissioned personnel division, S. G. O.
- (15) Indorsement (to a telegram from "Wood" to The Adjutant General) from the Surgeon General of the Army, to The Adjutant General, August 15, 1919 (recommending that a department sanitary inspector be authorized in each department). On file, Record Room, S. G. O., Correspondence File, 210.691-1 (Central Department (AA)).
- (16) Memorandum for the Surgeon General from The Adjutant General, August 27, 1918. Subject: Department sanitary inspectors. On file, Record Room, S. G. O., Correspondence File, 721-1 (General).

CHAPTER II

EPIDEMIOLOGY AND THE WORK OF EPIDEMIOLOGISTS IN CAMPS

CONDITIONS IN THE CAMPS IN THE EARLY WINTER OF 1917 AND THE REMEDIES PROPOSED

In the early winter of 1917 the Surgeon General of the Army, accompanied by a number of officers of the Medical Department, made an inspection of some of the southern and western camps¹ to obtain first-hand information as to their sanitary condition and to observe the precautions which were being taken to protect the soldiers against communicable diseases.^a There had been much public uneasiness concerning the health of the troops and a considerable amount of criticism of the management of certain camps and hospitals had been voiced in the press. The stations visited by the Surgeon General and his party included the following: Wheeler, Sevier, Beauregard, Bowie, Pike, Funston, and Doniphan. The inspections were made between November 26 and December 17, 1917. A description of the conditions found, with recommendations for improvement, were sent by the Surgeon General to the Chief of Staff of the Army from the camps and cantonments as they were visited.

Briefly, an excessive amount of measles, mumps, meningitis, and pneumonia was found at these inspections. The prevalence of disease was attributed to various causes, including overcrowding, lack of proper clothing, want of observation and detention camps, special susceptibility of some troops due to their rural origin, the introduction of drafted men from infected areas, the infection of one camp by infected men from another, and want of proper sanitary conveniences, such as water and sewer systems, at some of the hospitals. It was recommended: (1) That overcrowding be reduced by the erection of more tentage until there should be not less than 50 square feet of floor space per man. (2) That observation camps for all newcomers be established, in which they would be kept under observation for at least 14 days, or as much longer as might be considered necessary, so that those who were infected could be picked out as rapidly as they developed disease, and no new man would be placed in the general camp until he was free from infection. (3) That a similar process of picking out infected men, and thus clearing a command of disease, be observed with troops leaving the camps as long as the camp showed evidence of infection. (4) That each division commander be directed to establish such camps as are described above and that no new men be sent until he was ready to receive them under the above instructions. (5) That tent contacts in measles, meningitis, and pneumonia be immediately removed from the general camp and placed in a separate detention camp for daily observation and treatment during the incubation period of the disease. (6) That detention camps be established for such contacts in addition to the observation camp previously recommended for incoming men. (7) That patients be removed promptly to hospital from the

^a The party consisted of Surg. Gen. William C. Gorgas; Col. Deane C. Howard, M. C.; Maj. Victor C. Vaughan, M. R. C.; and Dr. William H. Welch.

various parts of the camp when taken sick, and that facilities for this be provided. (8) That suitable hospital accommodations be provided with proper water and sewerage connections. (9) That the internal arrangement as regards the isolation and the care of infectious diseases conform with the measures that are generally recognized as applying to those conditions. (10) That these recommendations be carried out immediately.

PROPOSED FUNCTIONS OF EPIDEMIOLOGISTS AND SCOPE OF THEIR INVESTIGATIONS

From observation at the various points visited, the Surgeon General and his associates became convinced that additional technical and professional personnel, attached to the camp surgeon's office, was essential for the proper epidemiological study and control of communicable diseases in the larger stations, especially when extensive epidemics were prevailing. Most of the camp sanitary inspectors possessed the necessary qualifications to handle satisfactorily the communicable-disease problem, but their time was occupied to such an extent by other duties that it was a physical impossibility to give this vast and important work the attention demanded. It was proposed to select a qualified epidemiologist as assistant to the sanitary inspector in each of the larger camps. A sanitary engineer, also, was considered necessary as a technical advisor on engineering problems. These views were expressed to the Surgeon General later, by a member of the inspecting party, in the following letter:

DECEMBER 23, 1917.

From: Maj. Victor C. Vaughan, M. R. C.

To: Maj. Gen. William C. Gorgas, Surgeon General, United States Army.

Subject: Communicable diseases in camps.

1. In reference to our conversation about communicable diseases in the camps, I wish to offer the following statements and suggestions:

There is no adequate provision in any of the camps that we visited except Camp Funston for the study of communicable diseases and for the control of the same. I would suggest the following:

(1) That in each camp there should be under the division surgeon and coordinate with or under the sanitary inspector an experienced epidemiologist. He should have an assistant for at least every regiment of any 4,000 men in the camp.

(2) The books and wards of all hospitals should be subject to inspection by him.

(3) The facilities of the laboratories should be at his disposal as far as the study of epidemics may render this desirable.

(4) He should personally, or through one of his assistants, visit the tent from which each infectious disease comes and ascertain, as far as possible, everything pertaining to that case from an epidemiological standpoint.

(5) He should trace the connection, if there be any, between cases and ascertain where the sick man came from, how long he has been in the camp, where he has been, and what associates he has had.

(6) As far as pneumonia is concerned, he should ascertain in every case whether it is primary or secondary to measles.

(7) He should make daily reports to the chief sanitary inspector with such recommendations as he may see fit, and weekly reports directly to the chief of the sanitary division of the Surgeon General's Office.

(8) He should give especial attention to incoming and outgoing troops.

(9) This camp epidemiologist should be a man skilled in the handling of infectious diseases.

2. To give particular illustration of my ideas, I suggest that Maj. Lindsey Williams, now at Camp Lee, Petersburg, Va., be ordered to Washington to receive instructions from Colonel Howard, then to select such assistants as after consultation may be deemed necessary, and sent to Camp Bowie with instructions to report to the division surgeon and proceed to study the communicable diseases existing in that camp, and authorized to advise through the chief surgeon the commanding officer as to details necessary in order to eliminate—or at least diminish—these diseases.

3. These epidemiologists should be selected with great care, and I believe that it would be necessary for all of these men to be medical men with large experience in the handling of communicable diseases. I believe that we should get big men and not hamper them too much by rules and regulations, but expect each one to show his fitness by results.

4. Permit me to suggest that the chief sanitary inspector of each camp should have at least two departments under his jurisdiction with the biggest men possible at the head of each. The first of these departments, and the most important one under present conditions, is that of epidemiology or the handling of communicable diseases. The second should be what is ordinarily known as camp sanitation. Those assigned to this duty need not be medical men, and it is my opinion that this work will ordinarily be much better done by sanitary engineers than by physicians.

5. It is altogether proper to make our laboratories as complete and as efficient as possible. It is desirable that the different types of pneumococcus be differentiated, but the great problem that lies before us now is the prevention of these diseases. There is in the camps at present no special provision for the study of communicable diseases. The chief sanitary inspector may or may not be fitted for this work. Whether he is or is not, the work is so big and so important that he should have a skilled epidemiologist to assist him.

6. I believe that Doctor Chapin, of Providence; Doctor Abbott, now at Fort Oglethorpe; Doctor Goler, long health officer of Rochester, N. Y.; Dr. Lindsey Williams, now at Petersburg, Va., are men thoroughly competent as epidemiologists. If Doctor Chapin will take charge of this whole matter, I am sure it will be in good hands.

Respectfully submitted.

VICTOR C. VAUGHAN,
Major, Medical Reserve Corps.

Shortly after the return of the Surgeon General to Washington steps were taken to put these recommendations into effect. Several of the camps already had been provided with sanitary engineers, and additional officers of this class were commissioned and assigned as rapidly as possible.² The development of the section on sanitary engineering in the Surgeon General's Office is described in the administrative history of the division of sanitation (Vol. I, Chap. VIII, p. 245).

On January 1, 1918, the section of communicable diseases of the division of sanitation was organized in the Office of the Surgeon General.³ The purpose of this section was to provide a more intensive study of infectious diseases and their control from an administrative standpoint, and to secure more prompt action on measures of disease prevention, many of which were pressing, as indicated above. In this respect the section in question was differentiated from the division of laboratories and infectious diseases in the Surgeon General's Office, which had to do with communicable diseases in their laboratory and scientific aspects rather than from the administrative point of view.

One of the first acts of the new section was the preparation of the memorandum of January 1, 1918, which was issued by the Surgeon General⁴ (quoted on pp. 987-989, Vol. I). This remained throughout the war the standard for the sanitary care of infectious cases in hospital. The next procedures had to do with obtaining and defining the functions of epidemiologists.

In the selection of epidemiologists it was proposed that only medical men of large experience in the handling of communicable diseases should be chosen. The essential was proved executive ability, combined with a thorough knowledge of practicable measures of disease prevention. It was difficult to attain this ideal in all cases. The selection and assignments were made personally by the officer in charge of the section of communicable diseases, who, from his former associations, was most familiar with the individual qualifications and professional standing of physicians engaged in public-health work in civil communities. A short discussion of the type of epidemiologists obtained is given later in this chapter.

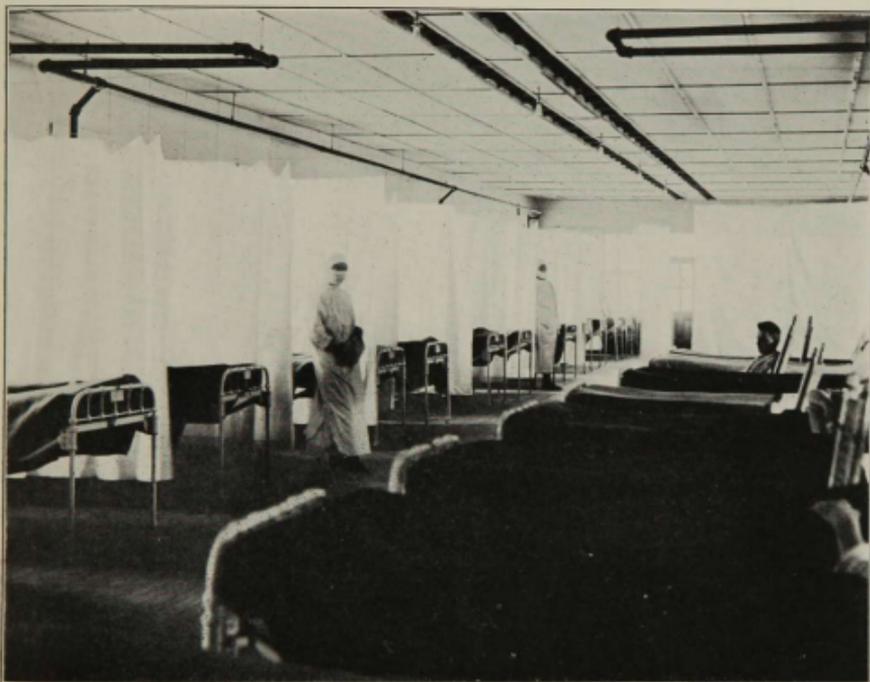


FIG. 1.—Method of forming cubicles in wards by means of sheets hung from cross wires, as required by memorandum of January 1, 1918, from Surgeon General's Office. Note gowns, caps, and masks on attendants

There was issued on January 8, 1918, from the Surgeon General's Office to all division surgeons a memorandum stating that it was the intention to assign epidemiologists to the camps and describing the functions and duties of these officers⁵ (quoted on pp. 989-992, Vol. I). The memorandum is divisible into three parts: The first part defines the status of the epidemiologist, the second part describes his routine duties, and the third sets forth a series of 10 broad research problems upon which the epidemiologist was expected to report to the Surgeon General's Office from time to time. Briefly, the plan was as follows: (a) The epidemiologist was to be a person of special training. He was assigned to the camp. While not an officer of the division, he was to be under the jurisdiction of the division surgeon in that officer's capacity as camp surgeon and

under the immediate control of the sanitary inspector. The epidemiologist was to have free access to the wards of the hospital and the commanding officer of the hospital and the staff were to cooperate with the epidemiologist in every way. The facilities of the base hospital laboratory were to be at his disposal in so far as the study of epidemics rendered this desirable. Provision was made for supplying additional bacteriologists, if needed. (b) In each brigade a suitable medical officer was to be selected and assigned as whole or part time assistant to the epidemiologist, when the amount of sickness warranted such action. One of these was to be trained as an understudy with a view to having him serve as an assistant to the sanitary inspector in handling communicable disease problems when the division left the camp. (c) Educational work was to be

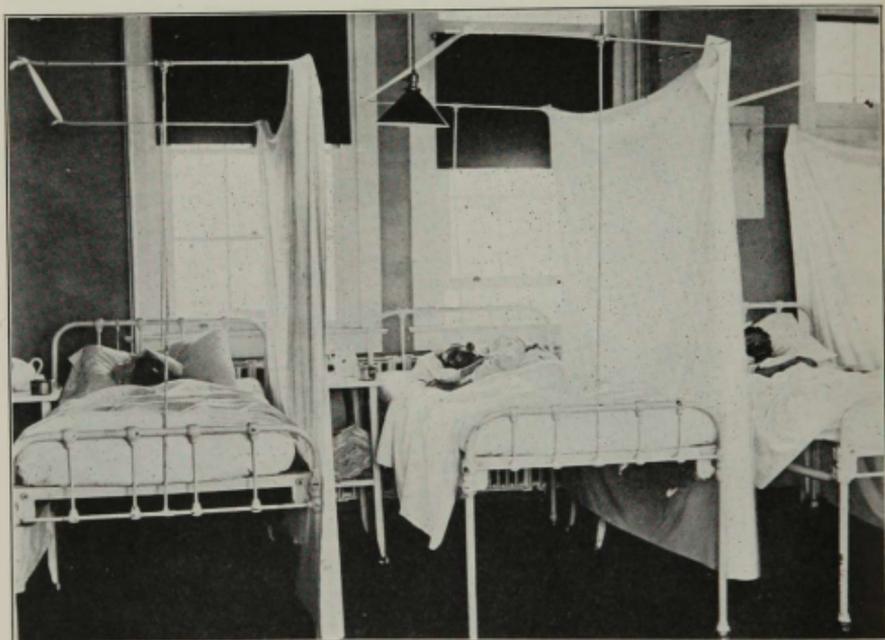


FIG. 2.—Method of forming cubicles by means of sheets suspended from mosquito-net frames

carried out among all the medical officers of the camp. Under the supervision of the camp surgeon the epidemiologist was to give special instructions by lectures and practical demonstrations regarding the most approved methods of handling communicable diseases. (d) The epidemiologist was to make such reports to the division surgeon as the latter might deem necessary. From time to time reports on certain large problems were to be sent to the Surgeon General. No specific forms or periods of time for any of these reports was stated. In fact, careful study of the memorandum shows that it was rather to prevent disease than to report upon it that the epidemiologists were to be sent to the camps. (e) One of the most important duties to be performed by the epidemiologists was the supervision of the detention and quarantine camps, which

it was intended should be established at each camp and cantonment. In the camp proper the epidemiologist, or one of his assistants, was to visit the tent or barracks where each case of infectious disease occurred and observe everything pertaining to that case from an epidemiological standpoint. He was to assure himself that the necessary quarantine measures and daily inspections for incipient cases were promptly inaugurated and carefully carried out, and that proper disinfection of contaminated articles was practiced. In these steps he was to act through and in cooperation with the regimental commander and regimental surgeon. (f) Many details and suggestions as to the conduct of the work were given in the memorandum of January 8. Emphasis was placed upon tracing the connection, if any, between cases of epidemic disease, investigating the air space, arrangement of bunks, heating and ventilation of infected barracks and the clothing of the soldiers in so far as these factors pertained to the prevalence of disease. Particularly, the epidemiologist should give attention to the adequacy of the prescribed examinations of outgoing and incoming troops for the detection of incipient cases. (g) The epidemiologist was to keep spot maps of the infectious diseases in camp, and in this connection give special attention to the frequent movement of whole organizations, and of individuals from one organization to another, and to the constant arrival of new men from outside the camp.

INSTRUCTIONS AND REPORT FORMS

With reference to the handling of specific infections, suggestions of much interest and value for field use were given in the memoranda from the Surgeon General's Office dated January 1 and 8, 1918. The suggestions for the control of epidemic diseases as outlined therein deserve careful attention, as indicating the most advanced sanitary views which were held at the time. The following are condensed examples:

Measles should be regarded as having a high mortality because of its complications and sequelæ, particularly those due to associated streptococci. Every possible provision should be made for the protection of one patient from another and of the physicians, nurses, and male attendants from the patients. Droplet infection probably is an important means of spreading complications. Convalescent cases should be carefully guarded for a long period in well-warmed quarters. All discharges should be disinfected. The period of infectivity probably lasted as long as the abnormal discharges from the mucous membranes persisted. Measles contacts should be quarantined in barracks and carefully inspected twice daily by a medical officer; men showing a rise of temperature up to 100° should be isolated; barracks should be aired daily and bedding sunned.

Pneumonia should be regarded as communicable. Careful cleansing of floors should be practiced in a barrack where pneumonia has developed. Ample ventilation and the widest possible separation of the heads of adjacent sleepers should be insisted on. Pneumonia cases should be immediately removed from measles wards. Ordinary lobar pneumonia, post-measles pneumonia, and post-scarlet-fever pneumonia, should not be treated in the same ward.

Diphtheria should be thought of and cultures made when suspicious throat symptoms are met with by the regimental surgeons. The Schick test should be employed to determine those contacts who are not immune, and, when found, these nonimmunes should be promptly immunized by antitoxin. Articles which have been in contact with the patient or soiled by his discharges should be disinfected.

Scarlet fever contacts should be quarantined for seven days, during which time they should be examined twice daily by a medical officer, particular attention being directed to the throat. All contacts which have been in contact with the patient in barracks or tent, or with his discharges, should be disinfected. Patients should not be released from quarantine until all nasal, aural, glandular, or other abnormal discharges have ceased, nor earlier than six weeks after the onset of the disease in any circumstances.

Smallpox virus was present in all body discharges and probably persisted until all crusts disappeared. Prompt and widespread revaccination of contacts should be practiced and contacts should be inspected twice daily for a period of two weeks, special attention being given to the mouth and to rises of temperature.

Cerebrospinal meningitis carriers should be looked for in ever-increasing circles about a case as rapidly as time and laboratory facilities permit. All men in the same building or company should be regarded as potential carriers and should be prevented from mingling as individuals with others within or without the camp. Spraying and gargling should be employed. All carriers, as detected, should be isolated in a quarantine camp until free from meningococci on three successive examinations with intervals of from three to six days between examinations. Patients should be handled with the same precautions used in measles and pneumonia.

The foregoing suggestions on the control of the epidemic diseases prevalent in the camps were designed to aid the epidemiologist in the daily conduct of his work. He had, of course, no power to carry out any of these procedures on his own initiative. He was not an administrative officer. He could but advise and act under the orders of the camp surgeon and sanitary inspector, whose recommendations, in turn, were subject to the approval or disapproval of the commanding general. Certain broad problems which the memorandum of January 8 stated were of particular interest to the Surgeon General's Office, and upon which the epidemiologist was expected to report from time to time, are as follows: (a) Relationship between bronchitis and pneumonia, measles and pneumonia, and between septic sore throat and pneumonia. (b) Influence of exposure to cold on incidence of pneumonia, especially during convalescence from measles. (c) Influence of length of convalescence in measles on subsequent incidence of pneumonia. (d) The best methods of limiting the spread of pneumonia in camps. (e) Is the raw recruit specially susceptible to meningitis and pneumonia; and if so, why? (f) Influence, if any, of gas masks on spread of infectious diseases. (g) Influence of housing conditions on incidence of measles, pneumonia, and meningitis. (h) The influence of rural and urban residence on development of measles, pneumonia, and meningitis. (i) To what extent is epidemic disease due to transfer of troops from one camp to another. (j) Recommendations which may be of use in preventing the development and spread of communicable diseases among men in the future assemblies of troops.

Investigation of these problems, most of them calling for extensive study and research, were added to the other functions of the epidemiologists, as already stated.

The practical question of making reports, left indefinite at first, was later the subject of special communications to the epidemiologists. What reports were submitted to the camp surgeons are not known, but the early reports which the epidemiologists made to the Surgeon General's Office varied so greatly in form and substance that they are not comparable. It was desirable that they should be comparable, since it was intended that these reports should constitute a valuable source of data from the camps. Something more than the occasional reports on large questions became necessary. The epidemiologists were therefore required to make routine reports to the Surgeon General's Office, these reports containing statistical information from which tables and comparisons of the health conditions could be prepared. On April 25, 1918, the following instructions were issued by the Surgeon General as to the character of the report desired:

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, April 25, 1918.

From: The Surgeon General of the Army.
Subject: Epidemiological reports.

1. Reports received in this office from epidemiologists are noted to vary greatly in form and method of presentation. Because of this fact, an undue amount of time is required for the proper digestion of this information at the central office.

2. To overcome this difficulty it is proposed to have epidemiologists adopt the attached general form in reporting upon disease epidemics.

3. A skeleton summary (p. 1) will serve as the front page of each report.

4. The body of the report will show the headings which have been underlined and the subject matter will be taken up in this order.

EPIDEMIOLOGICAL REPORT

Date of report ----- (Disease.)

Period ----- From ----- to ----- (Place.)

(Number of weeks.) (Date.) (Date.)
Average strength of command during above period -----
Total number of cases occurring in above period -----
Annual morbidity rate per 1,000 -----
Total number of deaths during above period -----
Annual death rate per 1,000 -----
Case mortality (deaths divided by cases times 100) -----
Average noneffective rate (all causes) per 1,000 during above period -----
Number of organizations in command -----
Number of organizations affected by epidemic -----
Causes of epidemic (underline most important factors):
Infection from civil community. Water.
Overwork. Food.
Weather. Flies.
Housing. Susceptibility.
Bedding. General sanitation.
Clothing. Discipline.
Importation of men from other camps. Isolation of sick.
New recruits.

Signed

Epidemiologist.

REPORT OF EPIDEMIOLOGICAL INVESTIGATION

1. *Introductory*.—Brief statement as to nature of epidemic, time, location, and extent, including figures showing:

(a) Annual morbidity rate per 1,000 =

Number of cases ÷ number of weeks × 52 × 1,000 ÷ average strength.

(b) Annual death rate per 1,000: Same as (a) except number of deaths is inserted in place of number of cases.

2. *Distribution of cases*.—Discussion as to source of cases, organization, and home state of organization and any other pertinent facts relating to the distribution of the disease throughout the camp. (Spot maps are useful in this connection.)

3. *Progress of epidemic*.—Chart or table showing number of cases reported each day during the period in question.

4. *Case mortality*.—State total number of cases occurring within the period under discussion, and the number of deaths from this disease. The number of deaths divided by the number of cases times 100 equals the per cent of mortality among the cases.

5. *Complications with other diseases*.—Give data in the following tabular form (this refers to epidemics of pneumonia):

Period -----: From ----- to -----
(Weeks.) (Date.) (Date.)

Total number of cases under consideration -----

Number primary cases -----

Number cases following some other disease:

Measles -----

German measles -----

Mumps -----

Colds, la grippe, bronchitis, influenza -----

All others -----

NOTE.—In pneumonia epidemic give number of cases of lobar and number of bronchopneumonia.

6. *Personal history bearing on contributory causes of disease*:

Period ----- From ----- to -----
(Weeks.) (Date.) (Date.)

Number of cases from whom personal history was secured -----

Number of cases attributing illness to each of the following causes:

Overwork -----

Exposure to severe weather -----

Faulty housing -----

Lack of clothing -----

No reason given -----

7. *Cause of epidemic*.—Discuss here the influence of any of the following factors which are particularly associated with epidemic:

(a) Infection from civil community; (b) overwork or fatigue; (c) weather; (d) housing; (e) bedding; (f) clothing; (g) importation of men from other camps; (h) new recruits; (i) water; (j) food; (k) flies; (l) susceptibility; (m) general sanitation; (n) discipline; (o) isolation of sick.

8. *Personal history—Length of service*.—Give data in following tabular form:

Period ----- From ----- to -----
(Weeks.) (Date.) (Date.)

Number of cases who have come from some other camp within past month -----

Number of cases who have been in service the following length of time:

1 month or less -----

1 to 2 months -----

2 to 3 months -----

Over 3 months -----

9. *Bacteriological studies.*—Give here the number of men cultured and results of bacteriological study.

10. *Post-mortem examination.*—Give here the number of cases examined and the findings.

11. *General discussion and summary.*—Under this heading give additional special data covering this epidemic, variation in incidence among the different organizations, diligence in prosecuting preventive measures, success of preventive measures, etc.

TYPE OF EPIDEMIOLOGISTS OBTAINED

In view of the very limited number of men skilled in this work, it is not to be wondered at that trouble was experienced in finding epidemiologists of suitable ability for detail at the camps. When men of reputation designed for this work were found, generally they were not available. Consequently, persons of less well-known ability were appointed with the idea that they might develop along this line of practice. The commissions granted to these officers usually were in the grade of captain or major, the proportion being about 1 to 3.⁹

Detail as an epidemiologist did not prove attractive in all instances. The reasons therefor are not far to seek. Although the work of the majority of epidemiologists so assigned by the War Department was of a high order, it was impossible for most of these officers, by reason of lack of training, to meet the standard expected of them. The epidemiologist, instead of arriving at camp with an expert knowledge of the military phases of his subject, had to learn how to handle the job after having undertaken it. The practical side of military epidemiology had to be learned by experience. Under these circumstances it is not strange that the epidemiologist sometimes failed to attain the success which had been hoped for. To be conspicuously successful in his position it was essential that he should possess great authority—the authority of superior knowledge and military experience. This he did not always have. Another reason why the work of the epidemiologist proved disappointing was that his position was not clearly defined; his status was not established in the tables of organization.

The number of epidemiologists assigned by the War Department up to the end of July, 1918, was 27.⁹ Of this number 7 were subsequently detailed to other duties, such as that of camp surgeon, sanitary inspector, or surgeon of a depot brigade; 2 were accredited to States, not being at camps; 2 were attached to the Surgeon General's Office in Washington; and 1 was connected with the pneumonia board. On September 16, 1918, the total number had fallen to 14. At many camps, to which no epidemiologist had been assigned by the War Department, an officer was detailed by local authority to perform epidemiological duties.⁶

REPORTS SUBMITTED

Originally expected to make reports to the Surgeon General's Office only from time to time and solely on the larger aspects of their work, the epidemiologists were gradually called upon to submit more comprehensive, frequent, and detailed data to that office. No regular intervals of time were specified for the making of these reports, and all camps were not called upon to make them. In some instances definite forms were prescribed and specific questions were asked as noted above. From some stations, records of all communicable

diseases since the opening of the camp were called for. The first effort to obtain special information was on April 25, 1918, when a letter was sent through the division surgeon to epidemiologists in relation to the comparative morbidity and mortality of certain diseases among officers and men:

The second request for information was contained in a letter to division surgeons dated April 30, 1918.⁷ On this occasion four specific questions were asked concerning the relative incidence of disease among white and negro troops, new men, and those from different sections of the country. It was requested that these questions be assigned to the epidemiologists for reply. On May 1, 1918, the third call for epidemiological information was sent out to all division surgeons. It directed that short reports be made of any and all epidemics that had occurred or were then in existence, or which might occur. These were to give the date of the appearance of the diseases, mode of onset, probable cause, progress, bacteriological findings, extent, treatment, subsidence and other points. To the end that there should be no misunderstanding about the matter, a detailed scheme or skeleton form of report with 16 specifications was forwarded. The work was to be assigned by the division surgeon to "the most competent man" within his jurisdiction. Most of the reports were excellent. Guided by the plan made out for them, a series of deeply interesting, if not wholly satisfactory, reports were submitted. The request for the information, and the scheme for its arrangement are as follows:

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, May 1, 1918.

From: The Surgeon General of the Army.

To: The division surgeon.

Subject: Reports on epidemic diseases.

1. It is desired that short reports of any and all epidemics that have appeared, are now in existence, or may appear in your camp, be made. Will you please assign this work to the most competent man within your jurisdiction.

2. The report should give the date of the appearance of the diseases, its mode of onset, its probable causation, bacteriology, prognosis, number of cases, its treatment, subsidence, and so forth; also attention should be given to any sequelae which follow the disease.

3. A more detailed statement concerning epidemics and infectious diseases that have existed in your division is also desired. A brief statement of what is wanted in this more complete report accompanies this letter.

WM. C. GORGAS,
Surgeon General, U. S. Army.

SCHEME OF REPORT OF COMMUNICABLE DISEASES IN CAMP ----- FROM OCTOBER 1, 1917,
TO APRIL 30, 1918, INCLUSIVE

(If one prefers, the time from the establishment of the camp to the date of making the report may be covered)

1. Mention each communicable disease which has appeared in your camp, giving the number of cases and number of deaths.

2. Give your opinion of the influence of housing conditions, inadequate clothing, climate, weather, and dust on the incidence of each disease.

3. Has the bringing in of troops from other points, or the arrival of new draft increments, had any recognizable effect upon the communicable diseases in your camp? Give any facts you have bearing on this point.

4. Have you noticed any difference in susceptibility to communicable diseases between men from rural and those from urban life? Any particulars bearing upon this point will be of special service.

5. What have been the chief measures practiced in your camp in attempting to prevent or lessen the spread of infections, and what, according to your observation, has been the efficiency of these measures?

6. Have the pneumonias in your camp been typed? If so, give the results.

7. What, if any, evidence have you that meningitis has been spread by contact? Do you regard this disease in your camp as being sporadic or epidemic?

8. What has been your observation concerning the comparative prevalence of pneumonia as a primary disease and as a sequel to other diseases? What disease has pneumonia been prone to follow?

9. Give the States from which your troops have come. Has your division received troops from other States than those for which the camp was primarily intended, and have such increments furnished a large percentage of sick?

10. From the reports sent to the Surgeon General's Office, it appears that about 80 per cent of hospital admissions and confinements in quarters are exclusive of the dangerous respiratory diseases plus venereal diseases. Can you give any information concerning the relative prevalence of the minor diseases which make up the great bulk of hospital admissions and confinements to quarters? Do not include venereal disease among the minor affections concerning which this information is asked.

11. Have bad colds, bronchitis, sore throat, and other kindred affections been prevalent in your divisions? What relation, in your opinion, have these borne to the graver respiratory diseases and especially to pneumonia?

12. In your opinion, has fatigue been a contributing factor in the etiology of the respiratory diseases?

13. Have clothing and bedding, especially blankets on cots occupied by the graver respiratory disease patients been sterilized? If so, to what extent, and how?

14. What proportion of your troops are negroes? What do your observations show concerning the relative susceptibility of the two races to the communicable diseases, excluding venereal diseases?

15. What has been done in your camp in the way of detention, observation, and quarantine of incoming and outgoing troops?

16. Any other information that you can give concerning the communicable diseases which have appeared in your organization will be of value in the compilation of the medical history of the Army.

The fourth special call for information was on August 20, 1918, when the Surgeon General requested an epidemiological report "covering everything of an epidemiological interest" which had occurred since June 1, 1918.⁸

THE EPIDEMIOLOGICAL WORK OF THE SECTION ON COMMUNICABLE DISEASES

As is stated in Chapter III, there was a section of current statistics in the division of sanitation, the duty of which was to compile and tabulate the current telegraphic disease reports received each week from the camps and to issue a weekly statement of health conditions. These statistics, together with other epidemiological information, served as the basis for what was practically a system of disease bookkeeping which the section on communicable diseases maintained. By this system it was possible at short notice to compare present with past conditions, in so far as the prevalence of infectious diseases was concerned, throughout the Army in the United States and in Europe.

The section on communicable diseases was prepared to consider propositions made regarding new procedures, or modifications of existing methods for controlling diseases, and to give expert opinions thereon. Memoranda

and circulars looking to the handling of infectious diseases frequently originated in this section. The conduct of researches, planned with a view to a better understanding of how infectious diseases were transmitted and could be prevented in the Army, was a prominent part of this work. These researches included studies of the conditions which surrounded soldiers in camps and of the statistical records of diseases in the Army from the time of the Civil War. The section developed methods for the graphic handling of data. By this means rising and falling death rates, admission rates, and noneffective rates for the Army as a whole and for the individual camps were made comparable. Extending the system further, the work took cognizance of conditions in the Navy and to some extent in the civil population of the United States. The section on communicable diseases, so far as its supervisory work was concerned, may be said to have resembled the central office of a fire department. Its function consisted in detecting any unusual prevalence of disease and calling the attention of appropriate executive officers to the need of action in regard to it.

Close relations existed between the section on communicable diseases and the epidemiologists in the camps. As stated elsewhere in this chapter, the epidemiologists were called on at times to furnish data and to make routine reports. The section kept files of the information thus obtained. The chief of the section submitted from time to time the names of persons who were thought capable of acting as epidemiologists. A proposed plan that the section provide a definite course of instruction for the epidemiologists and that traveling instructors be sent to the camps was taken under consideration, but neither of these schemes had been put in force at the beginning of the armistice, and therefore both were abandoned.

The section on communicable diseases was transferred on November 2, 1918, from the division of sanitation to the division of infectious diseases and laboratories.⁹

It is proper to explain here that not all of the epidemiological work done in the Army was carried on by or under the section of communicable diseases or within the division of sanitation. Some was done by the division of infectious diseases and laboratories, and some otherwise. From time to time boards made up of officers of various divisions were created to study and report upon certain large problems. There was a board for the study of communicable diseases and a pneumonia board.¹⁰ On the recommendation of the pneumonia board various parties of investigators were sent to the camps to make special studies.¹¹ These parties were composed of officers of the Medical Department who possessed laboratory training and who were believed to be especially qualified to carry out field investigations.

The work of the epidemiologists, together with other material available in the Surgeon General's Office, furnished the basis for a report by the section of communicable diseases regarding communicable diseases in the National Guard and National Army camps of the United States during the six months from September 29, 1917, to March 29, 1918.¹² This report was the first which attempted to cover disease conditions in our Army during the World War in a broad and comprehensive manner and therefore requires special

mention here. It is referred to not as evidence of the value of the epidemiologists but as an indication of the possible usefulness of epidemiological data when placed in competent hands for assimilation. Most of the statistical data in this report were in fact not taken from the epidemiologists' reports at all but were drawn from the routine telegraphic reports sent weekly to Washington from the camps. The data were inaccurate in many respects but were the best available at the time, because the permanent vital statistics of the Surgeon General's Office, based on the sick and wounded cards (Form No. 52, M. D.), are not analyzed and ready for study until several months after the conclusion of the calendar year to which they pertain. The permanent figures do not differ materially from those furnished by the weekly telegraphic reports, except that in the final statistics deaths due to secondary conditions, such as pneumonia following measles, are credited to the primary condition, measles, while in the current reports they are attributed to the immediate cause of death; i. e., pneumonia. The stated object of the report mentioned was to ascertain what diseases had appeared in the Army, the extent of spread, and the avenues through which the infections found their way into the camps, and to give publicity to this information for the benefit of all concerned. Although the title of the report does not so indicate, the contents refer only to troops in the United States and to the principal camps. Among the facts brought out are the following: The death rate in the Army was higher than that of any city with which the rate for the same age group was compared with the single exception of New Orleans. When compared with the statistics of the registration area of the United States, it was found that while the older age groups had higher rates, all the rates below age 49 were lower in civil life than in the Army. The high morbidity and mortality in the camps was not due to faulty sanitation as that term is generally understood; the camps were clean, had unquestioned water supplies, and garbage and sewage were satisfactorily disposed of. The diseases which were responsible for the greatest number of deaths were the so-called respiratory infections, and of these the most important in every respect was pneumonia. The investigations were believed to indicate that natural susceptibility and lack of knowledge of the fundamental laws of sanitation had much to do with the sickness among the men. For example, spitting was promiscuous. Aggravating factors were exposure, fatigue, lack of warm clothing, cold quarters, and insufficient bedding by night. Measles, pneumonia, meningitis, and scarlet fever existed in epidemic form in a number of camps. The case mortality rate for all troops for the six months' period was 23 per cent from pneumonia,^b 27 from meningitis, and 1.1 for uncomplicated measles. Most numerous as causes of sickness were those less immediately fatal ailments, such as colds, influenza, bronchitis, and mumps.

Pneumonia was epidemic in many camps and was especially common among southern troops. The death rate from pneumonia and the admission rates (calculated as the number of cases per 1,000 per year) for some of the large camps are shown below:

^b Much of this pneumonia was secondary to measles or influenza.

TABLE 1.—*Pneumonia rates in camps in the United States from September 29, 1917, to March 29, 1918. Annual rate per 1,000*¹³

Camp	Admissions	Deaths	Camp	Admissions	Deaths
Bowie.....	96	20.0	Meade.....	18.0	2.6
Wheeler.....	95	23.6	Logan.....	16.0	1.0
Travis.....	78	10.6	Gordon.....	15.0	5.3
Pike.....	63	24.9	Sherman.....	15.0	2.5
Cody.....	52	9.7	Upton.....	15.0	3.6
Beauregard.....	42	15.0	Grant.....	14.0	1.5
Taylor.....	37	5.4	Lewis.....	11.0	1.5
Jackson.....	36	11.5	Devens.....	9.8	2.0
Doniphan.....	36	10.7	McClellan.....	9.6	1.1
Dodge.....	33	9.0	Sheridan.....	9.3	1.7
Funston.....	29	5.3	Wadsworth.....	8.8	1.1
Kearny.....	24	10.5	Dix.....	8.0	1.5
Lee.....	24	4.4	Custer.....	7.0	1.5
Shelby.....	21	4.7	Hancock.....	6.7	1.1

The epidemic character of pneumonia in some of the camps was shown by the large number of cases which occurred within a brief period of time. For example at Camp Bowie there were 468 cases, at Camp Wheeler 340 cases, at Camp Sevier 187 cases, and Camp Pike 172 cases, in a week. Some camps, as Travis, had continually high rates.

The practical lessons drawn from this study were reported as follows:

First and foremost it seems necessary to graduate the introduction of civilians into army life. The change has been too abrupt. Men should be called first to a semiactive reserve army. Here they should get drill and the essentials of sanitation and self-care by lecture and by demonstration. The drill and calisthenics should be the hardening process. After two months of this the transfer should be made to a camp where a man's entire time is given over to his military training.

Before entering camp men should be examined for incipient disease. The suspects should be separated and watched before their dispatch to camp. Vaccination for typhoid and smallpox can be completed while in the reserve force.

Once established in camp the transfer of men from one camp to another should not take place without a careful examination and removal of those who show signs of illness. This will prevent the all too frequent transportation of sick men, who are dangerous to others because of their sickness.

These precautions, together with care in the proper mixture of work and rest, judicious selection in the quality and balancing of the food ration, the adequate protection of the man, especially the one from the warm climate, against cold and exposure, his protection against the sick through effective quarantine measures, and discretion in the use of the physical hardening process, should moderate to a large degree the experience of the past winter.

FORT OGLETHORPE REPORTS

The report just discussed dealt particularly with disease as viewed from the Surgeon General's Office. A series of 14 reports was submitted from Fort Oglethorpe, Ga., to the Surgeon General between April 17 and June 15, 1918, with the intention of showing how the Army's system of dealing with disease was actually operating in the camps.¹⁴ Like the report referred to above, which included the whole Army of the United States, the immediate object of these investigations was to find out what epidemic diseases occurred, to what extent they were prevalent, what conditions were responsible for them, and what steps should be taken for their better control. This work was done in the field. It therefore had both a more intimate and a more restricted scope than the report prepared in the Surgeon General's Office.

The studies were made at the office of the camp surgeon at Fort Oglethorpe, Ga.¹⁴ The investigation extended from February 7 to April 26, 1918, and covered the period of July 26, 1917, to March 23, 1918. The tables which were made covered about 102 pages; the text, about 80 pages. To aid in the analysis and illustration of the data many charts and diagrams were prepared.

Attention was given in the reports to the harmful consequences of unnecessary crowding. It was shown that crowding, apparently far beyond what had been generally realized in the War Department, was a common condition. Instead of having a minimum allowance of 45 square feet per man, many soldiers had but half that area in the dormitories. Crowding was found to be a feature of Army life, and the worst conditions did not occur in the barracks by any means. During moving-picture shows, in Young Men's Christian Association houses and at other places, the men sometimes had as little as three square feet of floor space apiece. When seated on benches at lectures and entertainments, the distance from mouth to mouth was often no more than 16 inches.

In the reports on special diseases reference was made to epidemic bronchitis as a condition of first importance. The universal prevalence of the disease, its avenues of spread, the indifference with which it was regarded, and its great medical and epidemiological significance were pointed out. Its relation to pneumonia and the part which it probably played in the spread of other diseases were dwelt upon. Of more than usual interest was an explosive outbreak of influenza which occurred in March, 1918. This epidemic was reported in full. There were approximately 4,000 men sick in a command of about 28,000. The disease in its bacteriological and epidemic aspects was identical with the influenza which became pandemic in the camps in September, 1918, but there was not so much secondary pneumonia.

Practical, intelligent supervision was thought to be the most important single need in the handling of the communicable diseases, and this point was emphasized strongly. One report says:

To get officers and men to do what is required of them in the prevention of disease, discipline is not so much needed as education. First, it is necessary for them to know what they have to do and how to do it. This instruction can not so well be given to the personnel of the new army by means of written orders and memoranda as by personal demonstration. They must be shown, and shown in ways not too severely military, for, in spite of their uniforms, they are still more civilian than soldier.

With respect to the usefulness of an epidemiologist such as was contemplated by the memorandum of January 8, 1918, the Oglethorpe reports state as follows:

The whole question is one of education. Does it seem desirable and is there time in which to make a definite effort to teach the officers and men what they ought to know about the epidemic diseases? If so, there are many promising educational methods to employ. Among these is the plan of traveling experts—persons who would go from camp to camp and put the procedures for the control of the epidemic diseases upon a proper basis.

A good deal of confidence is placed here upon the suggestion for traveling experts. They should go wherever needed and stay long enough to do their work thoroughly. They should work with and through the division surgeon, but should not be under his orders, if that can be avoided. They should have the powers of inspectors. These experts should observe how sick call is held and should show better ways of doing this work, where necessary.

They should teach the early symptoms and diagnostic factors in the epidemic diseases, laying emphasis upon what is simple and practical and carefully excluding the merely academic. The ways of tracing to their sources the hidden foci of disease by inductive reasoning, based on the available clues, should be demonstrated. The means available for establishing quarantine and detention facilities should be explained. The records of disease should be examined and put upon a systematic basis and the usefulness of this source of information explained. Methods for the graphic representation of data in order to facilitate its study should be shown. Many medical officers have never had any instruction in these subjects, but they are a part of the equipment of every properly equipped epidemiologist.

It would seem desirable that each expert should be accompanied by a small group of assistants. These need not be persons of broad training or experience; so long as they know thoroughly what is required of them, that will be sufficient. For the most part noncommissioned officers would do as well as any. These men would be capable of doing the clerical work and attending to the large amount of detail, leaving the head of the party free to look after the matters which required his special ability.

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- (2) Correspondence on assignment of sanitary engineers. On file, Record Room, S. G. O., Correspondence File, 210.3 (Assignments). Also: Circular No. 67, War Department, November 15, 1918. Subject: Status and Duties of the Sanitary Engineer. On file, Record Room, S. G. O., Document File.
- (3) Section on communicable diseases, Division of Sanitation, created by verbal order of the Surgeon General, January 1, 1918.
- (4) Memorandum from the Surgeon General to all division surgeons and surgeons at ports of embarkation, and for commanding officers of general, base, embarkation, and other hospitals, January 1, 1918. Subject: Care and isolation of infectious diseases in hospitals. On file, Record Room, S. G. O., Correspondence File, 710.-1 (General).
- (5) Memorandum from the Surgeon General to division surgeons, January 8, 1918. Subject: Epidemiologists. On file, Record Room, S. G. O., Correspondence File, 211 (Epidemiologists).
- (6) Report on epidemiologists by Maj. George A. Soper, Sanitary Corps, August 19, 1919. On file, Record Room, S. G. O., Correspondence File, 211 (Epidemiologists). Also, letter from the Acting Surgeon General to The Adjutant General, October 16, 1918. Subject: Camp Epidemiologists. On file, Record Room, S. G. O., Correspondence File, 211 (Epidemiologists).
- (7) Letter from the Surgeon General of the Army to division surgeons, April 30, 1918. Subject: Request for Information. On file, Record Room, S. G. O., Correspondence File, 710 (Camp Pike) (D).
- (8) Letter from the Surgeon General of the Army to the camp epidemiologists (at various camps), through the division surgeon, August 20, 1918. Subject: Epidemiological report. On file, Record Room, S. G. O., Correspondence File, 319.1 (Epidemiological, Camp Wheeler) (D).
- (9) Office Order No. 91, Surgeon General's Office, November 2, 1918. On file, Record Room, S. G. O., Correspondence Files, 024.-1.
- (10) Special Orders No. 118, War Department, May 20, 1918, paragraph 161. Also minutes of the Pneumonia Board. On file, Record Room, S. G. O., Correspondence File, 334.7-1 (Boards).
- (11) Minutes of the Pneumonia Board. On file, Record Room, S. G. O., Correspondence File, 334.7-1 (Boards).

- (12) Vaughan, Victor C., Colonel, M. C., and Palmer, George T., Captain, S. C.: Communicable Diseases in the National Guard and National Army of the United States during the Six Months from September 29, 1917, to March 29, 1918. *Journal of Laboratory and Clinical Medicine*, St. Louis, 1917-18, iii, No. 11, 635; also: *The Military Surgeon*, Washington, 1918, xliii, No. 2, 251, and No. 3, 392. Communicable Disease in the United States Army during the summer and autumn of 1918. *Journal of Laboratory and Clinical Medicine*, St. Louis, 1918-19, iv, No. 10, 587 and No. 11, 647.
- (13) Compiled from Weekly Telegraphic Reports. On file, Record Room, S. G. O., Correspondence File, 721.6.
- (14) Epidemiological Reports from Fort Oglethorpe, by Maj. Geo. A. Soper, Sanitary Corps, April 17 to June 15, 1918. On file, Record Room, S. G. O., Correspondence File, 710.-1, 720.-1, 721.6-2, 729.1-1, and 730 (Fort Oglethorpe) (N).

CHAPTER III

CURRENT VITAL STATISTICS*

HEALTH REPORTS

As indicated elsewhere in this chapter, the permanent annual vital statistics of the Medical Department, based on the register and report cards (Form 52, M. D.), are not codified and analyzed in the Office of the Surgeon General until several months after the conclusion of the year to which they pertain. Consequently, these permanent figures are of no value in keeping the War Department informed regarding current health conditions in either peace or war. Moreover, the sanitary reports rendered on the last day of each month from every military station deal only to a slight degree with vital statistics, and are delayed in reaching the Surgeon General's Office by reason of the fact that they pass through military channels. At all recent mobilizations before the World War the War Department felt the need for more frequent reports regarding sickness than were provided for by the reports mentioned above though they were the only ones provided for by regulations at the outbreak of the World War. This need arose during the expedition to Vera Cruz in 1914, and a report was then put into use.¹ The importance of weekly health reports was again recognized by the Surgeon General at the time troops were mobilized on the Mexican Border in the early summer of 1916, and consequently on July 7, 1916, a letter was addressed to The Adjutant General recommending that the morbidity and mortality of the troops be reported weekly.

This request was approved by the War Department on July 12, 1916, and use of the form began at once.² Telegraphic reports from all stations or districts in the Southern Department were made to the department surgeon at San Antonio, who consolidated the individual telegrams and on each Tuesday wired to the Surgeon General a health statement covering the entire department for the period of the preceding week.³

When war was declared with Germany weekly telegraphic reports were still being received from the Southern Department, where a considerable force of Regulars and some National Guard troops remained. The importance of extending the current statistics system to the entire Army became apparent, and representations made by the Surgeon General to the War Department resulted in the rendition from each department surgeon of weekly consolidated telegraphic reports covering all the troops under the control of the department commander.

With the issue of General Orders, No. 96, W. D., July 20, 1917, the 32 National Guard and National Army divisions, after arrival at their divisions camps, were exempted from the control of department commanders; the numerous aviation fields which developed rapidly in all parts of the country were likewise outside the jurisdiction of department commanders, as were also the arsenals, schools, disciplinary barracks, prison camps, and miscellaneous

* Permanent vital statistics appear in Vol. XV, Pt. Two, Medical and Casualty Statistics.

stations for staff corps organizations,⁴ which grew up in large numbers throughout the eastern half of the United States. Within a short time the major portion of the Army was located in stations of this description, exempt from departmental jurisdiction, and it became necessary to require weekly telegraphic reports direct from the camp or division surgeon to the Surgeon General.

Thus the plan had been extended to all the independent stations by the time any considerable bodies of men were assembled at the 16 National Army cantonments and the 16 National Guard camps and to the aviation camps as well, thereby covering practically all troops at home for the time being. With the formation of approximately 600 Students' Army Training Corps units during the fall of 1918, the system of weekly telegraphic reports was put in force in these commands which were located in schools and colleges scattered all over the country.⁵

As the troops began moving overseas the weekly reports were required also from abroad.⁶ While the American Expeditionary Forces necessarily were independent and not subject to control in sanitation and hygiene from the United States, except as regards general policies which were not immediately related to current health conditions, nevertheless, it was highly important that the War Department should have up-to-date information regarding sick rates, and to effect this the same system for the collection of statistics which had been used in the United States was extended to the American Expeditionary Forces and a weekly consolidated cable report was rendered therefrom to the War Department, beginning with October, 1917.⁷ The information thus obtained usually was delayed somewhat in collection and transmission, so that it did not represent the figures for the week immediately preceding the date of the cablegram. Weekly cable reports also were required from the forces in Siberia. It should also be noted that in addition to weekly statistics many special cable reports of health conditions were received from the American Expeditionary Forces which gave information regarding infectious diseases arriving there from this country and formed the basis for preventive measures here in the direction of more rigid inspections and quarantine of troops before moving to ports of embarkation and prior to going on shipboard.⁸

In addition to weekly statistical reports, more frequent reports were deemed necessary at home at certain times for some of the specially serious diseases. During the measles-pneumonia and meningitis epidemics of 1917 and the influenza-pneumonia pandemic of 1918 there was required a daily telegraphic report showing, in 1917, for the preceding 24 hours the number of new cases of measles, meningitis, pneumonia, and the deaths therefrom, and, in 1918, new cases of influenza, pneumonia, and the deaths therefrom.⁹ The daily telegrams in question were used to keep the Surgeon General constantly informed regarding conditions at each camp during epidemic periods, but were discontinued in each case as soon as it was established definitely that the peak of the epidemic had passed.

Form No. 211, S. G. O., in accordance with which the weekly health reports first were made, was originally prepared as an office blank for use in consolidating telegraphic information received by the Surgeon General, being approved on June 5, 1917, by the Secretary of War.¹⁰ Ultimately the original

text of Form 211 was slightly revised and issued as Form 86, Medical Department, which was distributed to all stations.¹⁰ As then prepared it remained in force in the Army throughout the war; however, minor changes in its use for vital statistical purposes were made from time to time by circular letters from the Surgeon General's Office, and also as a matter of convenience directions were given that these reports should contain certain data regarding bed capacity, personnel, etc., which had nothing to do with sanitary statistics but were required by some of the divisions in the Surgeon General's Office other than the sanitary division.

The following is a copy of Form No. 86, as used at Camp Sevier, S. C., for the week ending November 9, 1917. Subsequent to that time instructions which modified it in minor details were issued from time to time by the Surgeon General.

[Telegram dated November 9, 1917]

Form 86
MEDICAL DEPARTMENT, U. S. A.
Authorized June 5, 1917

CAMP SEVIER, *Greenville, S. C.*

WEEKLY REPORT OF SICK AND INJURED IN 30TH DIVISION FOR WEEK ENDING
NOVEMBER 9, 1917

A. Mean strength: Officers and men, 23,264

Cases of sickness	Totals					Pneumonia	Dysentery	Malaria	Venereal	Paratyphoid	Typhoid	Measles	Cerebro-spinal meningitis	Scarlet fever	All other diseases
	Hospital	Quarters	Total	Disease	Injury										
B. Remaining from last week	462	129	691	512	79	9	8	148				214	2		241
C. Admitted this week	247	186	433	347	86	7	9	162				119	1		49
D. Total treated this week	709	315	1,024	859	165	16	17	310				333	3		290
E. Died			2												
F. Transferred to home station, etc.			8												
G. Otherwise disposed of			578												
H. Remaining sick end of week	294	142	436	349	87	8	9	168				124	2		38

Causes of death: Pneumonia, lobar, 1; cerebrospinal meningitis, 1.
After first report is rendered it will not be necessary to report under B.
Send promptly by night letter *Friday night* of each week.

INSTRUCTIONS FOR USE OF FORM 86, M. D., AND PREPARATION OF WEEKLY TELEGRAPHIC REPORT OF SICK

1. Form 86, Medical Department, will be completed and figures verified. The sum of the numbers in hospital and quarters on each line will be the total; the sum of the numbers under diseases and injuries will likewise equal the total; the sum of the numbers under the different diseases enumerated (including "all other diseases") should equal the number in the disease space; the sums of the figures on lines B and C should be entered on line D; the sums of the figures on lines E, F, G, H, should equal the figures on line D. Venereal cases, carded for record only, should be entered on line C under "Quarters" and under "Venereal diseases" and dropped on line G, "Otherwise disposed of." In addition to the diseases enumerated on Form 86 should be added "Dengue fever." In giving causes of death a brief statement of the cause only is required, viz, lobar pneumonia 2. It is not necessary to specify on this report the location of the lobar pneumonia, nor is it necessary to give the patient's name and company. In any case in which the number remaining under treatment at the

end of the week exceeds 50 for any one disease, the name of the disease and the number under treatment will be noted as a part of line H and included in the telegraphic report. Separate reports for Regulars, National Army, and National Guard are not required. Officers and enlisted men on the active list of the Army only should be included in this report. In the preparation of this report the surgeon will exercise care that admissions are not duplicated. No entry should be made on line F unless the case is transferred away from the post or station.

2. For the preparation of the weekly telegraphic report, use the letters on the left margin to denote the line referred to. The first report should include lines B, C, and H complete, and the totals only under E, F, G, and a brief statement of the causes of death. Line D will be completed in this office by combining lines B and C. As line H of the preceding week becomes line B of the current week, after the first report has been rendered it will not be necessary to report line B. This report should be forwarded promptly by night letter Friday night of each week.

3. The following is a model telegram:

A twenty three two sixty four B hospital four sixty two quarters one twenty nine injuries seventy nine pneumonia nine malaria eight venereal one thirty eight measles one fourteen meningitis two others two forty one C hospital two forty seven quarters one eighty six injuries eighty six pneumonia seven malaria nine venereal one fifty two new nine measles one nineteen meningitis eleven others forty nine died pneumonia one meningitis one F eight G five seventy eight H hospital two ninety four quarters one fortytwo injuries eighty seven pneumonia eight malaria nine venereal one sixty eight measles one twenty four meningitis two others thirty eight.

The section of current statistics in the Surgeon General's Office received the code telegraphic reports, which were ordinarily dispatched on Friday night. Circumstances sometimes led to a delay in preparation or transmission, but in general by the following Monday morning all reports had reached Washington, where they were classified and made the basis of a consolidated health bulletin, entitled "Summary of Health Conditions Among Troops," which was furnished by the Surgeon General to the Secretary of War, the Chief of Staff, and the public press. A statistical survey, entitled "Disease Conditions Among Troops in the United States for the Week Ending ——," based on the weekly and daily telegrams, was issued on Tuesday or Wednesday, covering the weekly period ending the preceding Friday.¹¹ This statistical survey was mimeographed and distributed to all military stations, where it enabled the responsible authorities to compare the health situation in their commands with that at other stations, and to take necessary action to reduce morbidity and mortality rates which appeared unduly high; it was also sent to various Government bureaus and to public health officials throughout the country.

In addition, special quarterly and semiannual consolidated reports were prepared and distributed by the Surgeon General's Office. The data contained therein furnished the basis for much of the work in the section of communicable diseases (see Chap. II). These weekly, quarterly, and semiannual health bulletins form a valuable picture of the rise and fall of epidemic disease during our mobilizations and are worthy of detailed study by epidemiologists. A complete file of them is available in the Office of the Surgeon General (File No. 721.6-2).

At first separate report was required from Regular troops, National Guardsmen, and drafted men of the National Army. As the mingling of the three classes of troops increased, and as drafted men were added in large numbers

to Regular and National Guard divisions, this plan was abandoned as impracticable, and ultimately, it will be remembered, the War Department abolished the distinction between the three types of soldier, except in so far as necessary in certain matters relating to the Regular Army. For a short time during 1918 separate reports were required for colored troops in an effort to secure important data concerning the susceptibility of negroes to certain diseases as compared with white soldiers. These statistics were not found to be of sufficient value as current information to justify the labor involved, and consequently the separate reports were discontinued.

There were several unavoidable sources of error in the method of collecting current statistics which prevented them from being absolutely accurate. The basic data at the stations had to be hurriedly prepared; often they concerned great numbers of cases. Final diagnosis could not of course be reached at once in certain instances, and doubtless an erroneous diagnosis was frequently reported in the statistics for one week which did not receive proper correction in the figures of the succeeding week. Errors also sometimes resulted, especially at first, from duplication of admissions, as when a patient was admitted to sick report in a regimental infirmary and in a few hours was transferred to the base hospital, both reporting. Efforts were made to correct such errors as they were observed in the Surgeon General's Office. In spite of all endeavors, complete accuracy was not obtainable and consequently the sum of the weekly data does not accord exactly with the permanent vital statistics of the Surgeon General's Office; moreover, the current vital statistics, in certain respects do not record disease in the same way. Regardless of minor errors, the current figures were sufficiently accurate to serve their purpose and the weekly telegraphic reports proved of the greatest importance. Their value was particularly emphasized during the measles and meningitis outbreaks in the fall and winter of 1917 and at the time of the influenza pandemic in September and October of 1918. The information then furnished by the weekly and daily telegrams was vitally necessary for determining at what points help was most urgently needed for checking the ravages of the epidemics; to what places, and at what times, it would be safest to move healthy troops; and in what localities more rigid sanitary measures should be put into effect in order to halt the further spread of contagion. Based on the telegraphic statistics, the division of sanitation prepared numerous comparative tables and graphic charts which visualized in a readily appreciated manner the current health conditions of the whole Army and of the individual camps.

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- (2) First indorsement from The Adjutant General to the Surgeon General, July 12, 1916. On file, Record Room, A. G. O., Correspondence File, 2427504 (Old Files).
- (3) Telegraphic Reports, on file, Record Room, S. G. O., Correspondence File, 158465 (Old Files).
- (4) A. R. 191, 1913, corrected to April 15, 1917.

- (5) Letter from Acting Surgeon General to department surgeons, division surgeons, camp surgeons, surgeons of ports of embarkation and independent stations, October 3, 1918. Subject: Daily and Weekly Telegraphic Reports of Sick. On file, Record Room, S. G. O., Correspondence File, 721.6.
- (6) Weekly telegraphic reports. On file, Record Room, S. G. O., Cablegram File. Also: Correspondence File, 721.6 (Y).
- (7) Letter from the Surgeon General to The Adjutant General, August 28, 1918. Subject: Weekly Reports from Siberia. On file, Record Room, S. G. O., Correspondence File, 721.6 (Siberia) (Y).
- (8) Special cable reports. On file, Record Room, S. G. O., Cablegram File.
- (9) Letter from Acting Surgeon General to department surgeons, division surgeons, camp surgeons of ports of embarkation and independent stations, October 3, 1918. Subject: Daily and Weekly Telegraphic Reports. On file, Record Room, S. G. O., Correspondence File, 721.6.
- (10) Letter from the Surgeon General, May 2, 1917. Subject: Weekly sick report by telegraph; also first indorsement from The Adjutant General to the Chief of Staff, for approval, and approval therein. On file, Record Room, S. G. O., Correspondence File, 158465 (Old Files).
- (11) Copies on file, Record Room, S. G. O., Correspondence File, 721.6-2.

CHAPTER IV

SELECTION OF SITES FOR CAMPS AND CANTONMENTS

At the time we declared war on Germany, April 6, 1917, no sites had been selected for the mobilization of our troops for war. Before the World War the Regular Army of the United States at home was scattered in numerous and, for the most part, small stations throughout the country. These stations, which were practically all we had ready to accommodate Federal troops, were generally satisfactory from the sanitary standpoint and the majority, subject to their limited size, served a useful purpose throughout the war, often being greatly expanded to that end.¹ In the beginning of the war they were used especially for Regular troops and to a less extent for the National Guard. They will not be discussed further in the present connection nor will the National Guard armories and camps in which the guard was assembled before being sent to the great camps as Federal troops.

As it proved, and as was inevitable in the circumstances, our great war army in the main had to be provided for on quite new camp and cantonment sites.² It is the purpose of the present chapter to describe how these sites were selected.

The duties of the Medical Department in reference to the selection of camp sites were covered by the Army Regulations and the Field Service Regulations. The paragraphs in point are as follows:

The Medical Department is charged with the duty of investigating the sanitary condition of the Army and making recommendations in reference thereto, of advising with reference to the location of permanent camps and posts * * *.³

When troops are sheltered under canvas, they are in camp. * * * When occupying buildings in towns or villages, they are in cantonment.⁴

Boards for the selection of permanent or semipermanent cantonment sites will include in their membership an officer of the Medical Corps.⁵

* * * When tactical questions are not involved, and especially when the camp is to be occupied for some time, great care is exercised in selecting the site. Through no fault of their own, troops occupying an insanitary site may suffer greater losses than in the battles of a long campaign. A medical officer assists in the selection of camp sites.⁶

It is to be noted that the last quoted paragraph applies to "shelter in the theater of operations" and not to "shelter in the service of the interior." However, as it announces certain general principles regarding the selection of camp sites, it is considered appropriate to quote it in the present connection.

SELECTION OF SITES FOR NATIONAL ARMY CANTONMENTS AND NATIONAL GUARD CAMPS

GENERAL CONSIDERATIONS

In the World War, for the purpose of training and mobilizing of man power, the United States was divided into 16 training areas as follows:⁷

Area No. 1.—Maine, New Hampshire, Vermont, Rhode Island, Massachusetts, Connecticut, northeast corner of New York.

¹ The word cantonment was actually used during the war to designate a camp where buildings instead of tents provided shelter, or a great part of the shelter.

Area No. 2.—Long Island, New Jersey, New York City, Delaware.

Area No. 3.—Southern and western New York.

Area No. 4.—Eastern half of Pennsylvania, Maryland.

Area No. 5.—Western half of Pennsylvania, Virginia, West Virginia.

Area No. 6.—North Carolina, South Carolina, Florida.

Area No. 7.—Tennessee, Georgia, southeastern half of Alabama.

Area No. 8.—Ohio, southwestern corner of Pennsylvania.

Area No. 9.—Indiana, Kentucky, eastern Missouri.

Area No. 10.—Michigan.

Area No. 11.—Wisconsin, city of Chicago.

Area No. 12.—Western Alabama, Arkansas, Mississippi.

Area No. 13.—Iowa, Minnesota, North Dakota, south corner of Illinois.

Area No. 14.—South Dakota, Nebraska, Kansas, western Missouri, Colorado, New Mexico, Arizona.

Area No. 15.—Oklahoma, Texas.

Area No. 16.—Montana, Wyoming, Washington, Oregon, Idaho, Utah, Nevada, California.

In anticipation of the selective service law, which was passed on May 18, 1917,⁸ the chief of the War College division of the General Staff, on April 23, 1917, issued to his division the following instructions relative to camp sites:⁹

1. The Secretary of War having approved division of United States into 16 training areas, steps should be taken without delay definitely to select camp sites to enable the supply departments to make arrangements necessary for sheltering, feeding, and equipping the forces.

2. The War College division can not of itself do this intelligently, but it is a proper function of the General Staff to outline a policy to govern in selecting sites. Such questions as sanitary requirements and transportation facilities are self-evident. Other questions are: Should there be division, brigade, or regimental camps? Should foot and mounted service be trained separately? Size of camps to afford space for maneuvers and firing?

3. Your committee having charge of drafting of regulations for carrying out the National Army plan is designated to study this question and to submit recommendations as early as practicable. Your recommendations should include the agency to make selection of camp sites, whether department commanders or special boards of officers acting directly under War Department.

Under date of May 4, 1917, the chief of the War College division of the General Staff, in a memorandum to the Chief of Staff,¹⁰ expressed the opinion that department commanders should be charged with the duty of making such selections for the troops to be raised or trained within their respective departments, and that they should appoint boards of officers to investigate and report upon available camp sites; also, that the department commanders should be guided in their selections, and boards of officers in their investigations and recommendations, by the following general rules:

(1) Property owned or leased by the United States and controlled by the War Department should be utilized wherever suitable and available.

(2) Whenever practicable troops should be grouped by divisions; therefore, sites should be selected which will accommodate a complete division.

(3) In case it is impracticable to secure divisional sites, effort should be made to select sites for brigades or larger parts of a division, so located with respect to one another as to facilitate supply from one central point and the administration and the supervision and

coordination of the training of the division from its headquarters. This object will have been attained when no two camp sites of units of any division are more than 15 miles apart.

(4) Sites for commands smaller than a brigade will not be selected unless it is impracticable to secure brigade camp sites.

(5) It is impracticable to specify the amount of terrain that will be required for the training of commands of the various sizes. Local conditions and the differences in terrain will have to be considered in each case by the department commanders and the boards concerned. It is essential, however, that each camp site: (a) Be of sufficient size to accommodate the command without crowding. (b) Have an adequate water supply for both the men and animals to be encamped thereon. (c) Contain within itself or be located within convenient distance of an adequate training area. (d) Contain within itself or be located within convenient distance of suitable ground for target practice. (e) Be located upon or near a railroad of sufficient capacity to insure the convenient supply of the command and its prompt movement in case of need. (f) Can be leased (if not already owned or leased by the Government) for one or two years, with the option of renewal from year to year for about five years. (g) Be immune from floods and inundations.

(6) The following very desirable features should be secured whenever practicable: (a) The soil should be sandy loam with good drainage. (b) The surroundings should be healthful. (c) An "A" and a "B" range within convenient distance. (d) An artillery range within convenient distance. (e) The site should afford natural bathing facilities, such as streams, lake, or the sea. (f) The site should be adjacent to a city or large town containing facilities for healthful and attractive recreation.

(7) The following desirable features are not so important as those enumerated under (a) 6, but they should not be overlooked, as they tend toward efficiency, economy, and the welfare and contentment of the command: (a) Roads, good or potentially good. (b) Infrequent interruptions to training by inclement weather. (c) Grazing for animals within convenient distance. (d) Absence of insect pests. (e) Good strategical location. (f) Location central with respect to training area. (g) Material for temporary shelter locally obtainable in sufficient quantities at reasonable prices. (h) Mechanical, skilled, and common labor locally obtainable at reasonable wages. (i) Site and training areas donated or offered at low rental. (j) Good markets at reasonable prices. (k) Adequate local control of social evil and the liquor traffic. (l) Adequate local regulations of monopolies and price discrimination.

5. The War College division is of the opinion that cantonments for one Infantry division, certain corps auxiliaries and unassigned troops should be constructed upon sites selected in accordance with the foregoing general rules in each of the 16 training areas shown on the accompanying map marked "A."

6. It has been learned from the Office of the Chief of the Militia Bureau that in the near future the National Guard will probably consist of 16 Infantry divisions (organized in the areas shown on the accompanying map marked "B"). It is therefore believed that sites for cantonments for these several divisions of the National Guard should also be selected at once and shelter erected thereon. Selection of the camp sites for the new troops and for the National Guard divisions can best be made at the same time. In this way confusion and duplication of work will be avoided and considerable economy effected.

7. It is assumed that expeditions will eventually be sent to the European theater of war, and that the National Guard will form part of these expeditionary forces. It is upon this theory that the War College division recently recommended that steps be taken to relieve the National Guard from its present duties and assemble it for training as soon as practicable (WCD 9948-17, April 27, 1917). Unless this is done it can receive but little military training, and the benefits derived from the recent mobilization and training on the border will be greatly diminished.

8. Intensive training of the kind required to prepare troops for participation in the present war can be had in the United States during the winter months only in certain Southern States and upon the Pacific coast. The National Guard, even if assembled for training in the very near future, can not be equipped or properly trained for war before the early part of 1918.

9. It therefore seems wise to assemble the National Guard in camps where its training will not be seriously interrupted by inclement weather and whence it can easily be dispatched to not far-distant ports of embarkation. Such camp sites can be found in the Southeastern, Southern, and the Western Departments. Troops trained on the Pacific coast possibly might be dispatched to Europe by the Panama Canal at no greater expense than will be required to send them from Atlantic ports in tonnage which would have to be there assembled.

10. To put this plan into complete operation with the least amount of travel and at the smallest cost requires the location of 14 divisional camps for the National Guard in the South-eastern, Southern Departments, and two on the Pacific coast. By the time that the National Guard has been trained and dispatched to Europe, the new troops raised and partially trained in their respective training areas can be moved south to the cantonments vacated by the National Guard. The cantonments in the 16 training divisional areas can then be utilized for training the additional 500,000 men.

11. Cantonments located as follows and constructed to accommodate the organizations specified will meet such needs with respect to shelter and facilities for training troops as can be foreseen at this time. The cantonments hereafter specified for each of the 16 Infantry divisions of the National Guard and its attached units should, of course, be constructed in the particular divisional area in which the division and its attached troops are to be raised.

(A) Northeastern Department:

- (1) Cantonment for the I National Army Infantry Division and 1 telegraph battalion, 1 aero squadron, 1 balloon company, 1 regiment of Heavy Artillery.

(B) Eastern Department:

- (1) Cantonment for the II National Army Infantry Division and 1 aero squadron, 2 balloon companies, 2 regiments Heavy Artillery.
- (2) Cantonments for the III National Army Infantry Division and 1 aero squadron, 1 balloon company, 1 regiment of Heavy Artillery.
- (3) Cantonments for the IV National Army Infantry Division and 1 regiment of Infantry, 1 aero squadron.
- (4) Cantonments for the V National Army Infantry Division and 2 regiments of Infantry, 1 aero squadron, 1 balloon company, 2 regiments of Heavy Artillery.

(C) Southeastern Department:

- (1) Cantonment for the VI National Army Infantry Division and 1 regiment of Infantry, 1 telegraph battalion, 1 aero squadron, 1 balloon company, 1 regiment of Heavy Artillery.
- (2) Cantonment for the VII National Army Infantry Division and 1 regiment of Infantry, 1 regiment of Heavy Artillery.
- (3) Cantonment for the XII National Army Infantry Division and 1 regiment of Infantry.
- (4) Cantonment for the 5th National Guard Division.
- (5) Cantonment for the 6th National Guard Division.
- (6) Cantonment for the 7th National Guard Division.
- (7) Cantonment for the 8th National Guard Division.
- (8) Cantonment for the 9th National Guard Division.
- (9) Cantonment for the 10th National Guard Division.
- (10) Cantonment for the 16th National Guard Division.
- (11) Cantonment for the 17th National Guard Division.
- (12) Cantonment for the 18th National Guard Division.

(D) Central Department:

- (1) Cantonment for the VIII National Army Infantry Division and 1 telegraph battalion, 1 regiment of Heavy Artillery.
- (2) Cantonment for the IX National Army Infantry Division and 2 regiments of Infantry.
- (3) Cantonment for the X National Army Infantry Division.
- (4) Cantonment for the XI National Army Infantry Division and 1 regiment of Heavy Artillery.

(D) Central Department—Continued.

- (5) Cantonment for the XIII National Army Infantry Division and 2 regiments of Infantry, 1 telegraph battalion, 2 regiments of Heavy Artillery.
- (6) Cantonment for the XIV National Army Infantry Division and 1 brigade of Infantry, 1 telegraph battalion, 1 regiment of Heavy Artillery.

(E) Southern Department:

- (1) Cantonment for the XV National Army Infantry Division and 2 regiments of Infantry, 1 aero squadron, 1 regiment of Heavy Artillery.
- (2) Cantonment for the 11th National Guard Infantry Division.
- (3) Cantonment for the 12th National Guard Infantry Division.
- (4) Cantonment for the 13th National Guard Infantry Division.
- (5) Cantonment for the 14th National Guard Infantry Division.
- (6) Cantonment for the 15th National Guard Infantry Division.

(F) Western Department:

- (1) Cantonment for the XVI National Army Infantry Division and 2 regiments of Infantry, 1 telegraph battalion, 3 aero squadrons, 22 balloon companies, 1 brigade of Heavy Field Artillery.
- (2) Cantonment for the 19th National Guard Infantry Division.
- (3) Cantonment for the 20th National Guard Infantry Division.

12. The War College division is of the opinion, formed after a most careful study of all available data, and based upon our most probable requirements, that cantonment accommodations for the 500,000 first raised new troops which will be trained in the 16 divisional areas and for the 16 Infantry divisions of the National Guard will become absolutely necessary in the near future and that their construction should begin as soon as possible.

13. Action is therefore recommended as set forth in the accompanying memorandum for The Adjutant General of the Army.

JOSEPH E. KUHN,
Brigadier General, General Staff,
Chief of War College Division,
Assistant to the Chief of Staff.

On May 3, 1917, the Surgeon General, in a memorandum to the Chief of Staff, advised always having the Medical Department represented in the selection of camp sites, either as a member of the board concerned with the selection, or as a consultant.¹¹

On May 6, 1917, the Chief of Staff issued the following memorandum to The Adjutant General, which memorandum was approved by the Secretary of War on the same date:¹²

Subject: Cantonment sites for the National Guard and additional forces.

The Secretary of War directs:

1. That a copy of the memorandum for the Chief of Staff dated May 4, 1917 (WCD 6374-29) be furnished at once to each department commander in the United States and to the chief of each staff corps and department.⁵

2. That each department commander in the United States be furnished at once with all papers relating to land within their respective departments which has been offered for lease or without cost for military purposes.

3. That the Quartermaster General be instructed to furnish at once to each department commander in the United States a copy of the "Tentative layout for cantonment for one division of Infantry," prepared in the office of the Quartermaster General to accompany "Temporary buildings for mobilization camps, April, 1917," and with any other available data showing the areas required for cantonments for the different organizations of divisions and Army corps.

⁵ See p. 93 et seq., supra.

4. That the department commanders in the United States be directed to proceed at once to select, in accordance with the provisions of the memorandum described in paragraph 1, the sites for the cantonments and training of the troops designated for their respective departments in paragraph 2 of said memorandum; to lease on the behalf of the United States any selected tracts not already owned or leased by the Government, and to make report of the sites selected not later than June 10, 1917.

5. That all reports of selected sites be furnished to the Chief of Staff and to the chief of each staff corps and department as soon as received by The Adjutant General; that the Quartermaster General be instructed to provide the shelter and other construction required on each site for the accommodation of the troops to be maintained thereon as soon as practicable after he is notified of its selection; and that the chief of each supply bureau be instructed to prepare to supply the organizations to be camped on each site.

H. L. SCOTT,
Major General, Chief of Staff.

I concur and think there should be no delay.

TASKER H. BLISS,
Major General.

Approved:
NEWTON D. BAKER,
Secretary of War.

Complying with this memorandum The Adjutant General, on May 7, 1917, issued identical instructions to the department commanders of the Northeastern, Eastern, Central, Southeastern, Southern, and Western Departments, of which the following is used as an illustration:¹³

War Department, A. G. O., May 7, 1917. To the commanding general, Southeastern Department, with instructions to proceed at once to select, in accordance with the provisions of the accompanying copy of memorandum dated May 4, 1917, the sites for the cantonments and training of the troops designated for his department, and to lease, on behalf of the United States, any selected tracts not already owned or leased by the Government.

It is desired that individual reports of these sites be submitted as quickly as they become ready in each case, so that the information may be in the War Department at the earliest possible date. All reports must be in before June 10, 1917. Each report submitted should consist of an original and 10 copies, in order that copies may be immediately available for the staff corps and departments concerned.

2. The Quartermaster General will be instructed by this office to furnish department commanders at once a copy of the "Tentative layout for cantonment for one division of Infantry," prepared in his office to accompany "Temporary buildings for mobilization camps, April, 1917," and any other available data showing the areas required for cantonments for the different organizations of divisions and army corps. The Quartermaster General will arrange to provide shelter and other construction required on each site as soon as practicable after he is notified of its selection.

3. Any papers that may be on file in this office relative to land that may have been offered for lease or without cost for military purposes will be sent to department commanders at an early date.

4. The maps referred to in paragraphs 5 and 6 of the memo. of May 4, will be forwarded as soon as they can be obtained.

By order of the Secretary of War:

WM. M. CRUIKSHANK,
Adjutant General.

Reed. Hq. S. E. D., May 10, 1917.

These instructions were supplemented by telegrams to each department commander sent by The Adjutant General on May 10, 1917, the substance of which is as follows:¹⁴

To the commanding general, Central Department, informing him that the five cantonments for National Army Infantry divisions will be selected in his department.

To the commanding general of the Eastern Department, informing him that four cantonment camps for National Army Infantry divisions will be selected in his department.

To the commanding general, Northeastern Department, informing him that one cantonment camp for National Army Infantry division will be selected in his department.

To the commanding general, Southeastern Department, informing him that cantonment camps for three National Army Infantry divisions and nine National Guard divisions will be selected in his department.

To the commanding general, Southern Department, informing him that cantonment sites for one National Army division and five National Guard divisions will be selected in his department.

To the commanding general, Western Department, informing him that cantonment camps for one National Army Infantry division and two National Guard Infantry divisions will be selected in his division.

The following comprehensive questionnaire was formulated by the General Staff, War Department, for transmittal by departmental boards to all cities or towns making applications for the location of camps in their vicinity.¹⁵ It was required that this questionnaire be answered in full, and it was intended that upon the replies given would depend the decisions as to whether or not the sites would be inspected by the selection board. Not many prospective sites were eliminated in this manner, for, as was natural, all communities interested sent in favorable accounts of their multiform advantages.

1. Character of country in immediate vicinity of your city; i. e., the open and wooded areas.
2. Character of the soil.
3. Extent of cultivation.
4. Character of roads. (Attach map showing roads and character of same.)
5. Whether or not country is fenced in to an extent which would interfere with the maneuvers of troops.
6. Feasibility of securing within a short distance of camp site a small-arms target range of 1,000 yards in length and approximately 400 yards across where small-arms practice with a service rifle could be safely and uninterruptedly conducted.
7. Possibility of securing within 20 miles a reasonable range for practice of field artillery fire, which would necessitate comparatively open country 8 miles long by 2 miles broad.
8. Approximate areas which might be available within a radius of 50 miles for field maneuvers of troops without interfering seriously with the local agriculture or other interests.
9. Possibility of securing an area near the city for the cantonment of 500 to 800 acres, all suitably drained and with a good water supply for the camp of the troops.
 - (a) Probable cost per acre of land selected.
 - (b) Price at which land can be leased.
 - (c) Any lands offered rent free.
 - (d) Any lands owned by Government, or lands which will be donated to the Government.
10. Transportation facilities. Transportation facilities in the way of steam and electric railroad lines into the site, with possible extension of existing facilities in this respect.
11. Whether the wagon roads in the vicinity to a distance of approximately 50 miles are suitable for transportation by heavy auto truck; are bridges and culverts built to stand such traffic?
 12. Navigable waters—character, depth, etc., in the vicinity of the city.
 13. Street cars.
 - (a) Interurban railway and jitney service connecting the possible camp sites with the city, with cost of fare.
 14. City.
 - (a) Population.
 - (b) Amusements.

(c) Possibilities of swimming, boating, etc., in the vicinity of the site and the cantonment, including rivers, lakes, etc.

15. Accommodations. Whether or not the city could accommodate officers' and enlisted men's families at reasonable rates, in the way of hotels, apartment houses, cottages, and boarding houses. State rates of rental of apartments and cottages for those of moderate and those of limited incomes.

16. Schools. General outlay of public-school education.

17. Prostitution. Is this controlled, and is the city attempting to minimize venereal diseases?

18. Liquor traffic. How controlled?

19. Health statistics (from report of Board of Health).

(a) Elevation above sea level.

(b) Water supply.

(c) Report of last water analysis.

20. Vital statistics for year 1916.

21. Deaths per thousand from common contagious diseases.

22. Epidemics.

23. Water-borne infections.

24. System of sanitary sewers.

25. Hospitals.

26. Climatic conditions (from reports of Weather Bureau).

(a) Mean relative humidity for the last 10 years.

27. Average minimum mean and maximum temperatures.

28. Mean rainfall.

29. Prevailing winds by months.

30. Highest temperature recorded.

31. Heat prostrations.

32. Violent storms.

33. Floods.

34. Possibility of forest fires with respect to camp sites.

35. Camp site. Approximately 500 acres are needed suitable for building, and an additional three or four hundred acres for ceremonial drill and instruction.

36. Character of soil; sandy or otherwise.

37. Natural drainage.

38. Possibility of flooding in heavy rains.

39. Character of water supply, whether natural or would it be necessary to pipe, and if the latter, probable cost of installation and subsequent supply (1,000,000 gallons per day required).

40. Any special features not mentioned.

41. Markets. Notes as to shops, dry goods, grocery, hardware, drug, department stores, and markets.

(a) Normal cost of meat, fish, poultry, eggs, dairy products, fruits, and vegetables.

(b) Notes of laundry facilities.

(c) Possibility of securing ice.

42. Any grazing in vicinity for animals.

43. Lighting of cantonment. (Systems suggested by city.)

44. Fuel for camp.

(a) Average price of wood.

(b) Average cost for soft coal f. o. b. mines.

(c) Fuel oil.

45. Labor.

(a) Average cost of unskilled labor per day.

(b) Same for skilled and mechanical labor.

(c) Average hiring of servants, cooks, laundresses; and whether or not easily obtainable.

46. Pests.

(a) Mosquitoes, fleas, and flies.

(b) Please state prevalence of these in the area over which the troops may have to maneuver.

47. Cost of construction.

(a) Average cost of lumber, flooring, ceiling, and siding per thousand feet.

(b) Present cost of lime, cement, gravel, sand, crushed rock, asphalt, brick, building stone, concrete blocks, all delivered at sites you may believe are available for cantonments.

It may be seen that much consideration was given to matters of sanitation in this questionnaire.

There was naturally at the War Department, especially in the Construction Division, a great desire to start work on construction, for within four days after the instructions had been issued to department commanders relative to forming boards of officers for selection of camp sites, the following telegram was dispatched:¹⁰

COMMANDING GENERAL, SOUTHERN DEPARTMENT,
Fort Sam Houston, Tex.

A. G. O., *May 15, 1917.*

If you are able from the data on hand to decide upon any of the cantonment sites for the National Guard and divisional forces, do not wait for the action of boards as previously directed, but telegraph sites selected. It is urgently necessary to start shipment of materials and begin construction immediately. If we can learn at once one or two sites in your department it will greatly facilitate getting all work done on time.

MCCAIN.

War Department Telegraph Office:

Please send same telegram to commanding general, Central Department, Chicago, Ill.; commanding general, Western Department, San Francisco, Calif.; commanding general, Northeastern Department, Boston, Mass.; commanding general, Southeastern Department, Charleston, S. C.; commanding general, Eastern Department, Governors Island, N. Y.

It is not apparent that any of the department commanders were able to comply with the instructions given in the above telegram. So the work of selection as carried out in the various departments may now be taken up in detail.

CENTRAL DEPARTMENT

In accordance with War Department instructions,^{10, 12} the Central Department, with headquarters at Chicago, Ill., issued Special Orders No. 87, May 15, 1917, paragraph 3, appointing boards of officers to investigate and report upon available camp sites for cantonments to be located in this department. These boards were composed of officers, as follows: (a) For cantonment to be located in VIII divisional area (Ohio, West Virginia): Infantry, 2; Corps of Engineers, 1; Quartermaster Reserve Corps, 1; Medical Corps, 1. (b) For cantonment to be located in IX divisional area (Indiana, Kentucky): Infantry, 1; Cavalry, 1; Medical Corps, 1; Engineer Corps, 1; Quartermaster Reserve Corps, 1. (c) For cantonment to be located in X divisional area (Michigan, Wisconsin): Infantry, 2; Engineer Corps, 1; Medical Corps, 1; Quartermaster Reserve Corps, 1. (d) For cantonment to be located in XI divisional area (Illinois): Infantry, 1; Engineer Corps, 1; Medical Corps, 1; Quartermaster Reserve Corps, 1; Cavalry, 1. (e) For cantonment to be located in XIII divisional area (North Dakota, South Dakota, Minnesota, Nebraska, Iowa): Cavalry, 1; Engineer Corps, 1; Infantry, 1; Quartermaster Reserve Corps, 1; Medical Corps, 1. (f) For cantonment to be located in

XIV divisional area (Colorado, Kansas, Missouri): Cavalry, 1; Engineer Corps, 1; Infantry, 1; Medical Corps, 1; Quartermaster Reserve Corps, 1. After naming the personnel of the different boards, the following instructions were given:

None of these sites were recommended as suitable from a military and sanitary standpoint. The only site in the VIII divisional area recommended by the board was at Chillicothe, Ohio (Camp Sherman).¹⁷ This was selected for the following reasons:¹⁸

The proposed site is immediately adjoining the town of Chillicothe; covers 3,000 acres; maneuver area suitable for rifle and artillery ranges; excellent sandy loam soil; drainage very good; establishment of sewers necessary; water supply excellent, town can furnish 1,200,000 gallons per day; in addition wells will have to be driven; natural gas; climate excellent; altitude 650 feet; mosquitoes few; railroad facilities excellent; roads excellent; markets cheap; labor and building materials plentiful; good bathing; liquor traffic well controlled. The sanitary condition of the city was inspected and appeared to be excellent. Hospital facilities small, only 1 hospital with 50 beds. This recommendation was approved by General Barry on June 6, 1917.

BOARD FOR IX DIVISIONAL AREA, INDIANA AND KENTUCKY

Sites considered and inspected were as follows:¹⁹ Indianapolis, Ind.; Evansville, Ind.; Columbus, Ind.; Marion, Ind.; Huntington, Ind.; Fort Wayne, Ind.; Terra Haute, Ind.; New Albany, Ind.; Rochester, Ind.; Ligonier, Ind.; Crawfordsville, Ind.; Logansport, Ind.; Fort Benj. Harrison, Ind.; Jeffersonville, Ind.; Louisville, Ky.; Lexington, Ky.; Bowling Green, Ky.; Paducah, Ky.; West Point, Ky.; Danville, Ky.; Hopkinsville, Ky.

Of these sites the following were recommended as suitable from a military and sanitary standpoint, in the order named: Louisville, Ky.; Lexington, Ky.¹⁹ The department commander approved and recommended the site at Louisville, the board having reported upon it as follows:^{19, 20}

1. General conditions: Central location of Louisville. In regard to the training area site is not too thickly settled; terrain is varied.

2. Rent free for a period of two years with option to lease from year to year; thereafter for a period of three years at a rental of \$10,000 per year. Suitable building sites; area 1,630 acres, well drained, not muddy or dusty; not possible to be flooded; partly rolling and partly flat.

3. Transportation facilities: All surface roads are metal or macadam, in excellent condition. Southern Railroad and main line of the L. & N. run through the ground. Other facilities for transportation from Louisville are Pennsylvania, B. & O., New York Central, C. & O. Site is $4\frac{1}{2}$ miles from center of Louisville.

4. Health: Water from city of Louisville taken from the Ohio River. Sedimented and filtered through mechanical sand filter; excellent quality and abundant. The city proposes to construct a 12-inch sewer which will care for 450 acres; the other site being level can not connect with this sewer, and if used for building, latrine pits would be necessary. Hospital facilities in Louisville are of the best. There are only a few mosquitoes; the climate is suitable for training the entire year. The liquor laws in Louisville are well controlled.

5. Supplies: Electricity and natural gas can be obtained from the city. Wood, coal, and ice are abundant. Labor is plentiful; building materials of all kinds are obtainable; housing facilities for relatives and families excellent.

6. Recreation: Louisville furnishes all the recreation of a large city.

7. Rifle range: The site is adequate.

8. Artillery range: Suitable.

9. Remount depot: A proper site of 50 acres level sown in grass is obtainable.

10. Advantages:

- (a) Central location for training area.
- (b) Water and railroad transportation.
- (c) Located near a large city.
- (d) Excellent water.
- (e) Sewer for large part of the camp.
- (f) Amusements excellent.
- (g) Excellent hospital facilities in city.
- (h) Climate good for training many months of the year.
- (i) Low rental.
- (j) Excellent roads.
- (k) Excellent labor market.
- (l) Abundant building material.
- (m) Adequate housing in the city for visitors and families.

Disadvantages:

- (a) No bathing facilities near the site.
- (b) Necessity for building on two different sites and on irregular line.
- (c) Country immediately surrounding under garden truck cultivation.

BOARD FOR X DIVISIONAL AREA, MICHIGAN AND WISCONSIN

Medical member.

The board reported to the department commander that the following sites had been inspected and rejected for the reasons given:²¹

Eau Claire, Wis., rejected. The reason, long cold winters.

Sparta, Wis. Poor water supply and long cold winters. Scarcity of building materials; difficulty in disposing of sewage.

Janesville, Wis. Long cold winters.

Marinette, Wis. Long cold winters; water supply of doubtful purity; sewage problem difficult; soil too sandy.

Ludington, Mich. Soil too sandy; poor railroad transportation; no local market.

Muskegan, Mich. No building materials locally; no rifle or artillery range.

Grand Rapids, Mich. Long cold winters; poor bathing facilities; no building materials locally; no rifle range.

Jackson, Mich. No good rifle or artillery ranges; high rental; no building materials locally.

Kalamazoo, Mich. High rental; no suitable rifle range; no building materials locally; poor bathing facilities.

Miscauno Island, Mich. Long cold winters; no electric light; no water system.

Holland, Mich. No building materials; too far from the city.

Benton Harbor, Mich. Too far from town; roads poor; difficult to dispose of sewage.

Stiles, Wis. Cold climate; no town near by.

Manistee, Mich. Poor railroad facilities; poor markets; ground would practically all have to be cleared.

It will be seen that this board considered sanitation to a notable degree. Battle Creek, Mich. (Camp Custer), was recommended for the following reasons and this site was approved and recommended by the department commander on May 20, 1917:²¹

This site possesses the following advantages: Electric current available; excellent railroad facilities; good soil; good rifle range; good water from artesian wells or from the city; easy sewage disposal; excellent markets; site near city; good theaters; moving pictures, etc. It has the disadvantages of having no lumber locally, indifferent bathing facilities, no artillery range, and long cold winters.

BOARD FOR XI DIVISIONAL AREA, ILLINOIS

This board considered the following sites:²² Cairo, Ill.; Carbondale, Ill.; Murfreesboro, Ill.; Clinton, Ill.; Decatur, Ill.; Danville, Ill.; Dixon, Ill.; Effingham, Ill.; Peoria, Ill.; Elgin, Ill.; Greenville, Ill.; Greenup, Ill.; Moline, Ill.; Mount Vernon, Ill.; Metropolis, Ill.; New Milford, Ill.; Ottawa, Ill.; Quincy, Ill.; Rockford, Ill.; Rock Island, Ill.; Salem, Ill.; Sinnissippi Farm Ill.; Sparta, Ill.; Springfield, Ill. and Vandalia, Ill.

The board recommended the following as suitable from both a military and sanitary standpoint in the order named: Rockford, Dixon, Springfield, Peoria.²² The Rockford site was approved June 4, 1917, by the department commander for the following reasons contained in the report of the board: ²²

Rockford, Ill. (Camp Grant). Area 2,500 acres, more can be obtained if necessary; climate cool, dry, and invigorating, making it possible for men to receive more intensive training in a shorter time than would be possible in the hot, humid climate of the South; also it is believed that much open-air winter training can be done on account of the absence of rain, mud, and slush; also the board believes that men can be hardened quicker and better than in a southern camp site. Near a city of 60,000 inhabitants. Excellent center for building materials and labor. Prohibition town; no social evil; suitable site for cantonment base hospital; the water supply can be obtained from the Rock River, which is not subject to fluctuations.

BOARD FOR XIII DIVISIONAL AREA, NORTH DAKOTA, SOUTH DAKOTA, MINNESOTA, NEBRASKA, AND IOWA

The site at Des Moines, Iowa (Camp Dodge), was the only one recommended by this board as suitable.²³ It was approved and recommended by the department commander.²³ In the report of the board, dated June 3, 1917, the following advantages were recorded; it will be noted that much attention was given to sanitary considerations:

1. Area, 4,184 acres.
2. Water ample and of good quality obtainable by laying mains from the gravel pits near the Des Moines River to the cantonment site and installing sufficient pumps, at a cost of \$150,000.
3. Good railroad facilities.
4. No danger of floods.
5. Sandy loam soil which is well drained.
6. Healthful surroundings.
7. Good bathing facilities in the Des Moines River.
8. Ten miles from Des Moines.
9. Excellent roads.
10. Free from insects.
11. Good weather conditions.
12. Labor and building material very good.
13. Markets excellent.
14. Good local control of the social evil and liquor traffic.
15. Satisfactory site for a base and cantonment hospital can be obtained.

BOARD FOR XIV DIVISIONAL AREA, COLORADO, KANSAS, AND MISSOURI

The following locations were inspected and recommended as suitable from military and sanitary standpoints, in the order named: ²⁴ Colorado Springs, Colo.; Fort Leavenworth, Kans.; Carrollton, Mo.; Fort Riley, Kans. Fort Riley was placed last in this list of suitable sites for the following reasons: ²⁴

The ground is too low for the establishment of anything like a permanent camp. There is extreme heat in summer; insect pests are numerous; there is a possibility of floods; there is but one railroad passing through the reservation; there are no suitable natural bathing facilities; the grazing for animals is limited.

The department commander, however, selected and recommended Fort Riley (Camp Funston) in opposition to the opinion of the board, basing his action on the fact that the Government owned the reservation, and that there were approximately 22,000 acres available for artillery and small arms rifle ranges and maneuver purposes. He considered that these reasons outweighed the disadvantages reported by the board.²⁴

In the Central Department the records show that in all instances proposed sites for National Army cantonments were actually inspected by a medical officer, and also that due consideration was given to sanitary advantages and disadvantages.²⁵

SOUTHEASTERN DEPARTMENT

In addition to selecting sites in the VI, VII, and XII divisional areas for National Army divisions, this department was directed to select locations for 9 National Guard divisions, making 12 camp sites in all to be chosen, more than twice the number in any other department.¹⁰ Several reasons prompted the General Staff to mobilize the National Guard divisions in the Southern States for training,¹⁰ the principal one being the fact that it was not possible to construct cantonment buildings to accommodate them in the allotted time, this making it necessary to shelter the men in tents, which would serve for shelter far less satisfactorily in a cold climate. It was thought also that National Guard divisions would require much less training before departure for Europe than would divisions made up of drafted men; consequently, it was planned to move the first increment of drafted men from the northern cantonments to the National Guard camps in the south as fast as the latter were vacated by troops going to France, and to utilize the northern cantonments for the second draft contingent, and so on. The department commander, upon receipt of War Department instructions of May 4, 1917, quoted above, appointed two boards to inspect sites, only one of which contained a medical officer. The first board, created by special orders, headquarters, Southeastern Department, Charleston, S. C., May 16, 1917, was comprised of the following officers: Engineer Corps, 1; Medical Corps, 1; Infantry, 1.

This board was directed to inspect proposed sites in the XII divisional area (Arkansas, Louisiana, Mississippi, and Tennessee).

The other board, for the remainder of the Southeastern Department, organized by Special Orders No. 9, issued by headquarters of department on May 16, 1917, was composed of the following officers: Corps of Engineers, 2; Quartermaster Corps, 1. The Medical Department was not represented on this board.

The first board which, as already noted, had a medical member, on June 7, 1917, reported having inspected the following locations in the XII divisional area on the dates shown after their names:²⁶ Little Rock, Ark., May 23, May 31, June 6; Shreveport, La., May 24; Alexandria, La., May 25, June 5; Hattiesburg, Miss., May 25, June 5; Holly Springs, Miss., May 28; Memphis, Tenn., June 1; Vicksburg, Miss., June 2; Meridian, Miss., June 3; Jackson, Miss., June 4.

Of the foregoing the following sites were recommended as suitable from military and sanitary standpoints, in the order named:²⁶ Alexandria, La., Hattiesburg, Miss., Meridian, Miss. The reasons for the selection follow:

Alexandria, La. (Camp Beauregard). Camp site 5 miles northeast of the city; cut-over long-leaf pine district. Ample size for two divisions. Water supply from Alexandria excellent; available over the whole camp and training area by sinking deep wells. Unlimited ground suitable for training; suitable target ranges; excellent railway facilities; immune from floods and inundations; soil, sandy loam, excellent porosity, excellent drainage; comparatively free from mosquito breeding places; roads fair; climate excellent, flies present in moderate numbers; will not be fly infested when sanitary precautions are observed. Building material and labor obtainable; good markets; social evil controlled; no liquor sold in this district; in the city saloons are closed from midnight to 5 a. m. only, but it is believed the authorities will make such regulations as the Government desires. Ice excellent; a sewer system could be installed on the camp site.

Conclusions: Alexandria is satisfactory both from a military and sanitary standpoint.

Hattiesburg, Miss. (Camp Shelby). Five miles from the city. Area, 5,000 acres; water supply could be obtained by drilling artesian wells on or near the camp sites, as there are several large springs which demonstrate the presence of an underground water supply; artillery range available; ample railroads; sandy loam soil with gravel beds giving excellent drainage. There are some mosquito-breeding conditions in the suburbs of Hattiesburg, but these could easily be controlled. There are no bathing facilities. Roads fairly good; excellent climate; few flies; markets fair; prohibition State; social evil controlled; sewer system could be installed on the camp site. The local supply of ice would have to be increased or ice would have to be shipped in.

Conclusions: Hattiesburg is satisfactory from a sanitary and military standpoint.

The following sites were inspected and rejected by the board for the reasons given:²⁶

Little Rock, Ark. The water supply, area of the camp, small-arms target range, railroad facilities, roads, climate, location, building materials, and labor markets were satisfactory, but the site was rejected mainly because the board concluded that while it would be possible to rid the camp site proper of mosquito-breeding places, it would be impossible to make the lowlands in the vicinity of the camp site free from mosquitoes except by the expenditure of an enormous amount of money. The board further stated that the cities of Argenta and Little Rock were mosquito infested and that malaria was endemic in all of the surrounding country, that the restrictions which would have to be imposed upon the movement of troops by the sanitary conditions would seriously interfere with training, and that placing troops in the vicinity of Little Rock would result in heavy malarial infections; also that the social evil was uncontrolled in the surrounding towns. The board therefore recommended that the Little Rock site be omitted from further consideration.

Shreveport, La. This site was rejected as being unsatisfactory from a sanitary standpoint.

Holly Springs, Miss., was rejected by the board for sanitary reasons on account of unsuitable water supply, mosquito breeding, and fly breeding.

Memphis, Tenn., was rejected for sanitary reasons on account of unsatisfactory water supply, poor soil, giving poor drainage, mosquito breeding, and high death rate in Memphis.

Vicksburg, Miss., was rejected on account of heavy malarial infections in the surrounding country; also that the large amount of chemicals required to produce a potable water would not be conducive to health.

Jackson, Miss., was rejected from a sanitary standpoint on account of the heavy malarial infection in the surrounding country. This, however, was satisfactory from a military standpoint.

The department commander approved the Alexandria and Hattiesburg sites, but disapproved the Meridian site and substituted for it Little Rock (Camp Pike), as explained in the following telegram to The Adjutant General dated June 8, 1917:²⁷

I recommend that the XII divisional cantonment be established on the terrain consisting of 3,000 acres offered free to the Government by the city of Little Rock. The board of officers, of which Col. George P. Howell, Corps Engineers, is senior member, has recommended Alexandria, La.; Hattiesburg, Miss.; Meridian, Miss.; and Little Rock, Ark., in the order named. It appears that the prevalence of malaria and certain undrained area in the vicinity of Little Rock are the causes of this locality being recommended last. The city has appropriated \$50,000 to be expended in mosquito eradication, and it is believed that much can be done to remedy the situation prior to arrival of troops in camp, when mosquito season will be nearly over. The unusual railroad facilities of Little Rock, including the many land-grant roads, size of city, desire and ability of citizens to cooperate, and climatic conditions, especially as to low relative humidity during the summer months, make me feel justified in this recommendation in spite of the adverse report of the board.

WOOD.

An extract from a letter from the department commander, Southeastern Department, to The Adjutant General of the Army, dated June 13, 1917, further recommends the Little Rock location:²⁶

3. The department commander still feels that Little Rock, all things considered, will prove to be the best site in the XII divisional area for the establishment of a divisional cantonment. This entire area is more or less infested with the malaria-carrying mosquito, and it will be necessary for the troops to be equipped with mosquito bars during the mosquito season, both in camp and while on maneuvers, no matter in what part of the XII divisional area they may be maneuvering.

4. It is believed that the general health conditions and the climatic advantages of Little Rock, combined with the efforts of the citizens to cooperate in the matter of mosquito eradication, will serve to compensate for the present disadvantages of that site in the matter of malarial infection.

C. E. KILBOURNE,

Major, General Staff, Chief of Staff,

In the absence of the Department Commander.

The second board, upon which there was no medical representative, failed to make complete reports, evidently from the lack of time and the large amount of territory it had to cover. The records show that this board inspected the following sites:²⁶ Atlanta, Ga. (Camp Gordon); Augusta, Ga. (Camp Hancock); Macon, Ga. (Camp Wheeler); Marietta, Ga.; Gainesville, Ga.; Athens, Ga.; Spartanburg, S. C. (Camp Wadsworth); Columbia, S. C. (Camp Jackson); Greenville, S. C. (Camp Sevier); Aiken, S. C.; Hamlet, N. C.; Pinehurst, N. C.; Aberdeen, N. C.

The board in question recommended all of the above sites on different dates, though no reports giving reasons could be found in most instances.²⁶ In addition, the following sites were inspected by officers other than members of the above boards:²⁶ Anniston, Ala. (Camp McClellan); Birmingham, Ala.; Charlotte, N. C. (Camp Greene); Huntsville, Ala.; Johnson City, Tenn.; Knoxville, Tenn.; Lawrence, S. C.; Montgomery, Ala. (Camp Sheridan); Murfreesboro, Tenn.; Nashville, Tenn.; Tullahoma, Tenn.; Wilmington, N. C.

The only records bearing on the selection of the foregoing sites that were accepted and which could be found have to do with Atlanta, Ga. (Camp Gordon), and Greenville, S. C. (Camp Sevier):²⁶

Camp Gordon, Atlanta, Ga. Ten miles northeast of Atlanta on the Southern Railway, near the town of Chamblee; area consisting of 2,258 acres rolling wooded country; a good part under cultivation, the balance in woodland. The soil is partly sandy loam and partly clay loam; and while it is not as well situated for camping purposes as the more sandy soil

farther south, it is reasonably quick in draining and probably is as good as any in the vicinity of Atlanta. Immune from floods and inundations. The city of Atlanta has agreed to extend the city water main to the site. The water is taken from the Chattahoochee River, filtered, and is of reasonably good quality. The sewage-disposal system must be constructed at the expense of the United States. Gas and electricity will be furnished locally. The roads are excellent. There is a small-arms target range at Fort McPherson, 14 miles away. An artillery range can be found at Kennesaw Mountain, 25 miles away. Climatic, weather, and health conditions are favorable; liquor traffic prohibited; local regulations of other evils and disorders may be presumed to be adequate. The conditions in regard to soil, maneuver areas, and target ranges are not so favorable as those of localities farther south, but the advantages of Atlanta in other respects overcome these.

Camp Sevier, Greenville, S. C. Extent, 1,800 acres; broad level terrain; soil sandy loam; immune from floods and inundations. The city of Greenville agreed to extend the city water mains to the camp site and to furnish 2,000,000 gallons a day free of charge. Water analysis showed the water to be satisfactory. It would be necessary for the Government to install the entire sewer system. Roads in fair condition; climate, weather, and health conditions satisfactory; liquor traffic under good control; social evil is well controlled by the town authorities. Approved by General Wood, July 7, 1917.

The final approval of all camp locations in the Southeastern Department was not made until the middle of July, 1917.²⁶ From the foregoing it will have been noted that only 3 of the 12 camp sites were inspected by a medical officer prior to acceptance. However, the department commander, Southeastern Department, in a letter to The Adjutant General dated July 18, 1917, stated that the department surgeon acted in an advisory capacity, both to the boards and to the department commander, regarding health conditions in the areas under discussion.²⁸

SOUTHERN DEPARTMENT.

Two boards for the selection of sites in the Southern Department were appointed.²⁹ One, to convene at Fort Sam Houston, Tex., was composed of the following officers: Brigadier general, United States Army, 1; Medical Corps, 1; Engineer Corps, 1; Infantry, 1; Quartermaster Corps, 1. The other, to convene at El Paso, Tex., consisted of the following officers: Brigadier general, United States Army, 1; Engineer Corps, 1; Medical Corps, 1; Quartermaster Corps, 1; Cavalry, 1. The following instructions were contained in the orders:²⁹

The San Antonio board inspected the following sites in Oklahoma:³⁰ Chandler, Oklahoma City, Tulsa, Fort Gibson, El Reno, Sulphur, Dustin, Durant, Marietta, Ardmore, McAlester, Muskogee.

Of the above-named, the following were recommended in the order named:³⁰

McAlester. Entirely satisfactory except that the water supply is doubtful as to quantity, and the road to camp site unimproved.

Muskogee. This site met the requirements except that only ordinary country roads lead to the camp site. The city agreed to rebuild these roads if the site was selected.

In conclusion the board stated that McAlester was the best site in Oklahoma, but the training would probably be interrupted during the winter by the severe cold weather for the four months beginning November 1.

The following sites in Texas were then inspected by the San Antonio board:³⁰ Del Rio, Fort Clark, Uvalde, Laredo, San Benito, Brownsville, San Angelo, Amarillo, San Marcos, Smithville, Sherman, Victoria, Denison, Orange,

Beaumont, Marble Falls, Texarkana, Rockport, Cleburne, Marlin, Aransas Pass, Sutherland Springs, New Braunfels, Wichita Falls, Austin, Corpus Christi.

The following places were recommended as suitable both from a military and sanitary standpoint, in the order named:³⁰

Fort Worth (Camp Bowie). This was stated by the board to be the best camp site. Natural training area found. Satisfactory in all respects.

Dallas. Camp site $4\frac{1}{2}$ miles from the center of the city. Ten miles long and $4\frac{1}{2}$ miles wide. Satisfactory in all respects.

Waco (Camp MacArthur). Excellent site, 1 mile from city. Satisfactory in all respects, affording every facility necessary.

Houston (Camp Logan). Satisfactory in all respects except that the camp site is very low and is regarded as less desirable than Waco, Dallas, or Fort Worth.

San Antonio (Camp Travis), Tex., was not recommended by the board for the following reasons:³⁰

There would be insufficient ground for the cantonment and training area. The climatic conditions are inferior to those of Dallas, Waco, and Fort Worth and no better than Houston. The southerly location of San Antonio would increase the cost of transportation and supplies. The liquor traffic and social evil in San Antonio are extremely unsatisfactory, and the board is of the firm belief that these evils would be less troublesome and better cared for at Dallas, Fort Worth, Waco, and Houston.

The El Paso board inspected the following places:³⁰ Douglas, Ariz.; Tucson, Ariz.; Phoenix, Ariz.; Prescott, Ariz.; Fort Wingate, N. Mex.; Albuquerque, N. Mex.; Las Cruces, N. Mex.; Deming, N. Mex.; Columbia, N. Mex.; El Paso, Tex.

All of these sites were rejected with the exception of Deming, N. Mex. (Camp Cody), which was recommended for the following reasons:³⁰

Town location: In southeastern portion of State, Luna County; latitude $32^{\circ} 15'$ and longitude $107^{\circ} 45'$, approximately; 88 miles from El Paso, Tex.

Camp site: Northwest of city in extension of existing camp now laid out for 6 regiments Infantry, 1 squadron Cavalry, 1 regiment Artillery, 1 field hospital, 1 field bakery company, 1 truck company and quartermaster's supply company. There is also a 250-bed base hospital inside the city limits and connected with city water and sewage systems. This hospital capable of extension in so far as available land is concerned.

Training area: Ample ground within 1 mile of cantonment site.

Altitude, 4,300 feet.

Soil: The soil is a sandy loam mixed with gravel; water drains off very quickly after the heaviest rains—no mud. Streets of camp site would require surfacing with gravel.

Sanitary conditions: Drainage toward south and east very good. Site on highest ground in vicinity. Free from floods and inundations. The town sewer system is not available for disposal of any form of camp sewage. Would be necessary to dispose of both liquid and solid sewage (garbage) by camp methods. As to former by evaporation and cesspool, or by superficial evaporation. Of the latter, by hauling and burning or by cooperation of neighboring farmers who might be able to utilize swill or fertilizer. No epidemic diseases prevalent.

Water: City water company able to produce 3,000,000 gallons a day, leaving in reserve a plant capable of producing 1,000,000 gallons a day. Present combined consumption of city and S. P. Railway is about 535,000 gallons per diem. Price $12\frac{1}{2}$ cents per thousand gallons. No dependable natural surface water in vicinity. Total supply pumped from deep surface wells—camp connected with city sewage by 6-inch main. Portion of distributing pipes in camp now in situ. Character of water as per analysis is excellent. No liability to contamination. Camp also connected with city water main by a 4-inch main.

Lights: City Ice & Electric Co., of Deming, furnishes electric lights.

Ice: Present capacity about $7\frac{1}{2}$ tons a day; increase under contemplation this summer. In six weeks possible to increase to 25 or 30 tons a day. Meantime shipments from Las Vegas practicable.

Transportation: Camp is located on the joint tracks of the A. T. & S. F. and the S. P. Railroad yards and is near the E. P. and S. W. yards. The combined trackage of the three railroads within their Deming yards is approximately 20 miles, and all is in available position for camp site.

Meteorological: No exact figures furnished, but it is reported that in the summer months the days are hot and nights cool, and very low degree of humidity which prevents the heat from being oppressive. Sunstroke and heat prostration unknown. Winters are mild; snow in limited quantities falls occasionally, but rarely lies on the ground more than a few hours. There would be practically no interruptions to training on account of climatic conditions.

General remarks: Population about 4,000. Mexican component less than 15 per cent, claimed to be less than any other town in the southwest in proportion. Excellent public schools and numerous churches of all denominations. Saloons and prostitution strictly regulated; said to be the strictest regulations in the southwest. The city and county authorities promise hearty cooperation with the military authorities in any additional regulations the latter may impose.

San Antonio, Tex., was substituted for the McAlester site on recommendation of the department commander.³¹

It is evident from the records that both of the selection boards gave due consideration to matters of sanitation.

WESTERN DEPARTMENT

The War Department directed that three camps be located in this department, and the department commander appointed a board, consisting of the following officers, on June 5, 1917, to investigate the proposed sites:³² Infantry, 1; Field Artillery, 1; Quartermaster Corps, 1; Medical Corps, 1; Engineer Corps, 1.

The following sites in California were considered and inspected:³² Los Angeles, San Diego, Hackstaff, Raye, Honey Lake Valley, Rio Vista, Antioch, Byron, Englewood, San Pedro, Centinela, Linda Vista, Lone Spring Valley, Palo Alto.

Of the foregoing, the following sites were recommended, in the order named, the medical member of the board concurring:³² Palo Alto (Camp Fremont), Linda Vista (Camp Kearny). Linda Vista was selected for the following reasons:

The county of San Diego is now obtaining through the State legislature authority to issue bonds and purchase 50,000 acres of land, including and surrounding that now offered, with the view of presenting the entire tract to the United States on condition that the site be selected as a permanent divisional station. This fact had considerable weight with the board in making its final recommendation.

The climatic and terrain conditions at the San Diego site are excellent. The water supply of San Diego is abundant and certain. In addition Cuyamaca water system has a reservoir within 6 or 7 miles of the camp site.

The camp site at American Lake, afterward known as Camp Lewis, was not inspected at this time by a board of officers. It was recommended on May 15, 1918, by the department commander and approved May 18, 1917, by the Secretary of War as a camp site for two divisional camps.^{32 33} Afterwards

Palo Alto (Camp Fremont) was substituted for one of these divisions.³⁴ The following is quoted from a letter from the department surgeon, Western Department, to the Surgeon General of the Army, dated March 11, 1919:³⁵

The American Lake tract, which ultimately became Camp Lewis, was for years prior to the war a maneuver ground owned by the War Department and used for the instruction of troops on the Pacific coast. About January, 1917, Pierce County, State of Washington, acquired 70,000 acres of land and transferred it to the War Department for military purposes. Shortly after the declaration of war, the War Department directed the department commander to select sites for the cantonments of certain divisions, and on May 16 the department commander recommended the American Lake location for the 16th National Army Division and 20th National Guard Division. This selection was approved by War Department telegram, May 18, 1917. There is no record of the appointment of a board on the suitability of this site. The War Department's action was doubtless based on the fact that American Lake had for years been utilized for military purposes, and its expansion into a divisional cantonment, by the acquisition of adjacent land, was merely a routine procedure.

Camp Lewis may therefore be regarded as having been a wholly acceptable site to all concerned.

EASTERN DEPARTMENT

The records available concerning the selection of camp sites in this department are very meager, no board reports having been found. The department commander was directed to choose four sites, and records show that seven locations were inspected, viz:³⁶ Yaphank, Long Island, N. Y.; Wrightstown, N. J.; Farmingdale, N. J.; Allaire, N. J.; Annapolis Junction, Md.; Carlisle, Pa.; Petersburg, Va.

Of the foregoing, Yaphank, Long Island, N. Y. (Camp Upton), Wrightstown, N. J. (Camp Dix), Annapolis Junction, Md. (Camp Meade), and Petersburg, Va. (Camp Lee), were recommended in the order named. That a medical officer was on the board which selected these sites is evidenced by the following telegram:

GOVERNORS ISLAND, N. Y., *June 18, 1917.*

ADJUTANT GENERAL OF THE ARMY,

Washington, D. C.

Maj. Charles Y. Brownlee, Medical member board, inspected all cantonment sites this department period Colonel Harry Taylor, Engineer member, inspected site near Yaphank, Long Island period Colonel W. C. Brown, Cavalry, detailed member, vice Taylor, sent to France, inspected all other sites.

NORTHEASTERN DEPARTMENT

BELL.

No board proceedings were ever received at the War Department from the Northeastern Department in so far as can be determined. Numerous sites were undoubtedly inspected, but the following in Massachusetts, are the only ones on record:³⁷ Framingham, Barnstable, Brockton, Ayer (Camp Devens), Marthas Vineyard.

Of these sites, all were rejected for various reasons with the exception of the one at Ayer. A medical officer was a member of the board which inspected all sites in this department.³⁷

SELECTION OF SITES FOR AIR SERVICE STATIONS

Flying fields in our Army originally were known as aviation stations, aviation schools, and stations for aero squadrons. Beginning with 1915, a few scattered fields were established in various parts of the country under the supervision of the Signal Corps. These were located at College Park, Md.; San Antonio, Tex.; Hazlehurst Field, Long Island, and in the vicinity of San Diego, Calif. There was also the balloon school at Fort Omaha, Nebr.³⁸ Not until 1917, however, was any definite policy announced by the War Department in regard to the location of flying fields. A memorandum from the Assistant Chief of Staff to the Chief of Staff, under date of January 19, 1917, gives the recommendations of the War College division of the General Staff regarding the general placing of aviation stations and training schools.³⁹ This memorandum recommended locating an aviation station in each of the following places: Puget Sound district, the State of California, the North Atlantic States, the Middle West, at Fort Sill, Okla., and at San Antonio, Tex. It also recommended the establishment of air squadrons in the vicinity of the following places: Boston, Mass.; New York, N. Y.; Philadelphia, Pa.; Fort Monroe, Va.; Seattle, Wash.; San Francisco, Calif.; Wilmington, N. C.; Pensacola, Fla.; Galveston, Tex.; Portland, Oreg.; Los Angeles, Calif.

For aviation schools it was recommended that there be one in southern California, one near New York City, one near Chicago, one in the southern Mississippi Valley, and one in the Rocky Mountain region.

This memorandum gave no instructions relative to the actual selection of these sites, and the records show that they were all chosen by various officers of the Aviation Section of the Signal Corps between January and June, 1917.⁴⁰

A memorandum from the Chief Signal Officer, dated June 8, 1917, and approved by the Secretary of War, June 22, 1917, requested authority for selection and lease of the following additional stations which were to be located by a board of officers as follows: One each near San Antonio, Tex.; Atlanta, Ga.; Wichita Falls, Tex.; Fort Worth, Tex.; seven additional sites in the Southern and Southwestern States and five in the Northern and Northwestern States.⁴¹ It was at this time that boards of officers were first formally appointed to inspect sites for flying fields, these boards including a medical officer in their personnel.⁴² Aside from sanitary considerations, the chief points which demanded consideration in the choice of fields were flatness of terrain, absence of timber, and favorable meteorological conditions.⁴³ This rendered it difficult and at times impossible to obtain sanitary locations, and made the entire question of sanitation a subordinate one in the original selection. Furthermore, for the purpose of linking up with other fields in cross-country flying, some sites were of necessity chosen which might otherwise have been rejected as insanitary.⁴³ As stated before, these prime aviation requisites made questions regarding natural healthfulness of secondary military importance. The requirements as to terrain and meteorological conditions prevented many communities from making application, and one central board in Washington selected the majority of sites instead of relying upon the method practiced in choosing National Army cantonments and National Guard camps.⁴⁴ The records indicate that approximately 100 sites were examined in person by this

central board.⁴³ Before inspecting a site the following questionnaire was sent to the community, and upon the answers depended the decision as to whether or not the proposed location would be considered. Sanitary matters received due attention:⁴⁵

1. General conditions:

- (a) Name and population of nearest town or city.
- (b) County map showing surrounding terrain for a distance of 10 miles on either side, location of sites indicated thereon, railroad, roads, etc. A general description of the character of the country for at least 50 miles in each direction, whether hilly or flat, wooded or cleared, and percentage of cleared land.
- (c) Map of field drawn to scale of 100 feet to inch, showing 5-foot contours and all fences, buildings, roads, ditches, wooded areas, brush, etc., permanent bench marks and cross section stakes showing grades, to be preserved for future reference.
- (d) Meteorological data extending as far back as the existence of the Weather Bureau in the nearest location to the site offered (map and information showing same to be attached).
- (e) Nature of soil.
- (f) General sanitary conditions and state in particular conditions as to mosquitoes and insects.
- (g) Show telephone, telegraph, light and power lines in vicinity of sites.

2. Conditions as to sites:

- (a) Three sites are desired, two not less than 206.61 acres each (the narrowest dimension of same must not be less than 3,000 feet) and the center or main site containing about 436 acres, being 5,280 feet long and 3,600 feet wide.
 - (b) Fields must be located not less than half a mile and not over 3 miles apart from outside boundaries.
 - (c) The ground must be practically smooth with a slope not exceeding 2 feet in 100.
 - (d) There must be a good road with fairly direct communication between the sites.
 - (e) There must be telephone connections between said sites. The center one of these sites, called the "main site," must, in addition to the above requirements, have:
 - a. Railroad siding to site and 3,600 feet additional siding on the long side of the site. Name of railroad.
 - b. Passenger transportation.
 - c. Electric power and light (250 horsepower required, 3-phase, 60-cycle, 220 volts desired).
 - d. Telephone and telegraph connections.
 - e. Water—300 gallons per minute of good water required.
 - f. Gas—desirable but not absolutely necessary.
 - g. Sewer or stream to receive effluent from septic tanks and storm-water drainage.
 - h. Sanitation of surrounding property 500 yards each side of the site. This is understood to mean that all ditches shall be cleared of vegetation and obstructions, all stagnant water will be oiled, all underbrush cleared, all insanitary drains, surface wells, privies, manure, and offal removed and so maintained during period of lease and any renewal thereof.
 - i. Trees, stumps, fences, and all other obstacles must be removed from the property.
 - j. Immediate possession of property, with right to remove all buildings, pole lines and wires, and destroy crops, will be required.
 - k. Roads on property. All roads on or crossing property must be closed.
 - l. Roads to property (good road—state kind of road—to nearest town—giving name—will be required).
 - m. State definitely which of the foregoing improvements, utilities, and requirements can be furnished and the cost of each, if any, to the Government.
 - n. There should be no obstructions such as trees, buildings, telephone lines, etc., within 100 yards of the boundaries of fields, as such obstructions cut down landing room.
3. A surety bond guaranteeing full performance by the lessor will be required.

Above information is necessary before any proposed aviation site can be taken up for investigation.

The Government does not contemplate the establishment of small aviation schools. All schools established are to be under complete Government control and administration.

A medical member was on the board which, on the dates given, selected the following sites:⁴² Park Field, Millington, Tenn., August 2, 1917; Love Field, Dallas, Tex., August 3, 1917; aviation repair depot, Dallas, Tex.; Taliaferro Field, Hicks, Tex., August 4-5, 1917; Barron Field, Everman, Tex., August 4-5, 1917; Carruthers Field, Fort Worth, Tex., August 4-5, 1917; Call Field, Wichita Falls, Tex., August 6, 1917; Rich Field, Waco, Tex., August 7, 1917; Ellington Field, Houston, Tex., August 10, 1917; Gerstner Field, Lake Charles, La., August 11, 1917; Air Service depot, Garden City, Long Island, N. Y.; aviation repair depot, Indianapolis, Ind., October 21, 1917; Eberts Field, Lonoke, Ark., October 23, 1917; Brooks Field, San Antonio, Tex., November 1, 1917; Payne Field, West Point, Miss.; Taylor Field, Montgomery, Ala., November 6, 1917; Carlstrom Field, Arcadia, Fla., November 9, 1917; Dorr Field, Arcadia, Fla., November 9, 1917; March Field, Riverside, Calif.; Mather Field, Sacramento, Calif.

None of these fields was selected against the advice of the medical member.⁴² He reported several fields as not measuring up to a good sanitary standard; for instance, Eberts Field, Lonoke, Ark., Gerstner Field, Lake Charles, La., and Park Field, Millington, Tenn.; in these cases, however, very grave consideration was given to the health factor, and it was finally decided that with proper sanitary engineering procedures these fields could be made safe. It will also be noted in this connection that one of the conditions exacted before choosing a site was that the community should make sanitary a zone of 500 yards around the reservation.⁴² In certain instances this clause was embodied in the lease.⁴⁰

Another medical officer was a member of the board which selected the aviation repair depot, Montgomery, Ala., and the flying field in connection with school of aerial photography, Rochester, N. Y.⁴⁷ Still others were on the boards which inspected Chapman Field, Miami, Fla., the Army balloon school at Lee Hall, Va., Army balloon school, Arcadia, Calif., the coast-defense aviation stations for the Atlantic coast, and the coast-defense aviation stations for the Pacific coast.⁴⁷

The following sites were selected without reference to the Medical Department, in so far as can be determined:⁴³ Aviation general supply depot, Middletown, Pa.; Hazelhurst Field, Mineola, Long Island, N. Y.; Scott Field, Belleville, Ill.; Chanute Field, Rantoul, Ill.; Acceptance Park, Buffalo, N. Y.; Acceptance Park, Dayton, Ohio; Acceptance Park, Detroit, Mich.; Acceptance Park, Elizabeth, N. J.; Rockwell Field, San Diego, Calif.; Bolling Field, Va.; Chandler Field, Essington, Pa.; Camp Dick, Dallas, Tex.; John Wise Balloon School, San Antonio, Tex.; Post Field, Fort Sill, Okla.; Souther Field, Americus, Ga.

SELECTION OF SITES FOR MISCELLANEOUS STATIONS

In addition to the National Army and National Guard camps and those for aviation, many other military stations were established for special purposes.

For example, the following corps had one or more camps for their exclusive use:⁴⁸ Medical, Quartermaster, Ordnance, Engineers, Coast Artillery, Field Artillery, Signal, Tank, Chemical Warfare, and Motor Transport. In addition, there were numerous officers' training camps scattered throughout the country, as well as embarkation and debarkation camps, camps for colored stevedores, arsenals, proving grounds, hospitals, etc. Some occupied military reservations, previously used as such, but the great majority were on new sites. Most of these stations proved to be of a semipermanent or permanent nature, though a few, of course, were only temporary. The latter are not considered in the following discussion. Likewise the sites of the various supply depots and the munition plants, at most of which enlisted guards were stationed, are not dealt with in this chapter, since the location of these establishments was of necessity governed wholly by commercial and manufacturing possibilities. Finally, no consideration has been given herein to the sites of the permanent military posts, nearly all of which, as already noted, were greatly enlarged during the war by the construction of temporary buildings.

The following miscellaneous stations will be considered: Camp Alexander, Va.; Aberdeen Proving Ground, Md.; Camp Bragg, N. C.; Camp Benning, Ga.; Camp Colt, Pa.; Camp Crane, Pa.; Edgewood Arsenal, Md.; Camp Eustis, Va.; Camp Forrest, Ga.; Camp Greenleaf, Ga.; Camp Holabird, Md.; Camp Humphreys, Va.; Camp Hill, Va.; Camp Jesup, Ga.; Camp Belvoir, Va.; Camp Johnston, Fla.; Camp Kendrick, N. J.; Camp Leach, D. C.; Camp Merritt, N. J.; Camp Mills, N. Y.; Camp Meigs, D. C.; Camp Normoyle, Tex.; Camp Polk, N. C.; Camp Robinson, Wis.; Camp Summerall, Pa.; Camp Stuart, Va.; Camp Stanley, Tex.; Savanna Proving Ground, Ill.; Camp Syracuse, N. Y.; Camp Vail, N. J.; Camp Willoughby, Ohio.

Camps Belvoir, Humphreys, Leach, Laurel, and Forrest were used exclusively by the Engineer Corps for mobilization and training purposes.⁴⁸ Camp Belvoir was located on a peninsula extending into the Potomac River a short distance from Mount Vernon, the land having been owned by the Government for several years prior to the war. It had been used as a target range and maneuver ground for Engineer troops of the Regular Army and Militia prior to the war. This reservation was under control of the commanding officer, Washington Barracks. Camp Humphreys may be considered as an outgrowth of Belvoir, being a direct continuation westward of this camp. The site was selected by Engineer officers. The Belvoir and Humphreys areas contained numerous breeding places for malaria-bearing mosquitoes.⁴⁹ Camp Laurel was a temporary tent camp located on the race track at Laurel, Md. The records show it to have been a low wet location, poorly drained, with mosquitoes and flies prevailing; evidently a poor site. It was selected without reference to the Medical Department.⁴⁹ Camp Leach was on the grounds of the American University, D. C., and was used as an Engineer officers' training camp. It was selected by Engineer officers and proved to be a good site except for insufficient area for the purpose required.⁴⁹ Camp Forrest was an Engineer replacement camp located on the Government reservation at Fort Oglethorpe, Ga. It was selected by Engineer officers and proved an excellent site from a sanitary standpoint.⁴⁹

Camp Abraham Eustis, Va., was the only camp of any size used exclusively by the Coast Artillery Corps, and was located 2 miles from Lee Hall and 20 miles from Newport News, on low swampy ground between the York and James Rivers.⁵⁰ It was undoubtedly the poorest camp site, from a sanitary viewpoint, of any selected during the war, and was criticized by every sanitary inspector who visited it.⁴⁹ Used as a training center and target range, it owes its origin to the first indorsement, A. G. O., Washington, D. C., January 11, 1918, to the commanding officer, Fort Monroe, Va., which directed him to appoint a board for the selection of a camp site for the purposes mentioned above, which could be used in conjunction with the permanent Artillery garrison at Fort Monroe. In compliance with these instructions the commanding officer appointed a board of three Coast Artillery officers on June 17, 1918.⁴⁹ The board reports having recommended this site as the only one with sufficient area for target purposes and located within reasonable distance of Fort Monroe. The question of sanitation was evidently entirely disregarded in its selection. There is no natural drainage and swamps exist everywhere. A large amount of malaria developed among the personnel of this station. Adequate drainage procedures were by no means completed at the end of the war; and though a sanitary engineer and a force of laborers for antimosquito work were maintained at this camp long thereafter, the results were never thoroughly satisfactory.⁴⁹

Camps Holabird, Jesup, and Normoyle were motor transport stations.⁵⁰ Holabird, near Baltimore, Md., and Jesup, at Atlanta, Ga., were selected by two officers of the Motor Transport Corps. The choice was made for purely military reasons, but the records do not show any serious objections to the sites from a sanitary point of view.⁴⁹ The surroundings of Camp Holabird were rather poor and mosquito control offered a moderately difficult problem, but the prevailing mosquitoes were not malaria-bearing.⁴⁹ Normoyle was practically a Motor Transport Corps repair shop located at San Antonio. It was selected by a Motor Transport Corps officer for strategic reasons. It proved unobjectionable from a sanitary point of view.⁴⁹

Camp Greenleaf, Ga., and Camp Crane, Pa., were Medical Department stations,⁵⁰ the former used as a training school for medical officers and the latter as a training and mobilization center for the Ambulance Corps. Though the records do not show who selected these sites primarily, it may be safely assumed that this was done by medical officers. Both were satisfactory.⁴⁹

Camps Colt and Polk were Tank Corps training camps,⁴⁸ and were not used for any great length of time owing to the late organization of the Tank Corps. Camp Colt was located in the Gettysburg National Park⁵⁰ at a point previously camped on by the Regular Army during maneuver seasons.⁴⁹ It was occupied by Regular troops in the summer of 1917, and in 1918 was assigned by the operations division of the General Staff to the Tank Corps, neither the Tank Corps nor the Medical Department being consulted in its selection, so far as known. The site was a good one except for the presence of many more or less insanitary farm buildings scattered over the area occupied by camp units.⁴⁹ Camp Polk, Raleigh, N. C., was selected by an officer of the Tank Corps. This was one of several sites from which the Tank Corps was ordered

to make selection by the operations division of the General Staff. The records indicate this to have been an excellent site from a sanitary point of view.⁴⁸

Camp Kendrick was erected in connection with the Lakehurst Proving Ground to provide accommodations as a training camp for officers and men of the Chemical Warfare Service.⁴⁸

Camps Joseph E. Johnston and Meigs were Quartermaster Corps stations. Camp Johnston was located 12 miles south of Jacksonville, Fla., on the St. Johns River.⁵⁰ This site was recommended as suitable for a National Guard camp by the chief of staff, Southeastern Department, in June, 1917.²⁰ It was not approved by the department commander, however, on account of its limited area—4,000 acres. It was later selected as a site by the Quartermaster Corps without primary inspection by the Medical Department. It proved an excellent site from a sanitary viewpoint after certain antimosquito work had been accomplished.⁴⁹ Camp Meigs was located in Washington, D. C., being a small, compact station accommodating 4,000 troops. It was used exclusively as a Quartermaster Corps camp⁴⁸ and was selected without primary medical inspection. The site was entirely satisfactory as to sanitary matters.⁴⁹

Camp Alfred Vail, Long Branch, N. J., used as an experimental station and as a training camp by the Signal Corps,⁴⁸ was selected by a Signal Corps Officer in June, 1917.⁴⁹

Camp A. A. Mills, Mineola, Long Island, was one of the original National Guard camp sites recommended by the commanding general, Eastern Department, and was approved by the Secretary of War, June, 1917.³⁰ It was selected by a board of officers with a medical member. This area was occupied by the 42d and 41st Divisions, under canvas, and upon the departure of the latter was abandoned for a period of several months until the spring of 1918, when it was brought into service as an embarkation and debarkation camp under the jurisdiction of the commanding general, port of embarkation, Hoboken, N. J., and was built over with two-story frame cantonment barracks. It was a very good site.⁴⁹

Camps Alexander, Hill, and Stuart were all in the near vicinity of Newport News, Va., an important port of embarkation, and all were ultimately used as embarkation and debarkation camps.⁵⁰ They were essential to the operation of this port, so that in any event military reasons would have been paramount in establishing camps here. Unfortunately, no good sites existed near Newport News, so the best that could be done was to put the camps on the higher grounds along the James River.⁴⁹ Back of this all the land available was veritable swamp. These swamps are among the worst breeding grounds for malaria-bearing mosquitoes in the whole United States. So far as Stuart and Hill are concerned, the available records are not definite as to the original choice of these locations. They do show, however, that a medical officer was appointed by the War Department a member of the board of officers to investigate and recommend suitable camp sites in the vicinity of Newport News.⁴⁹ This was in July, 1917. No report of this board can be found, but it may be safely assumed that Camps Hill and Stuart were on the areas recommended, since they sprang into being shortly after this officer's inspection trip.⁴⁹ There were serious sanitary objections to these sites, but they were as good as could be obtained in the vicinity of Newport News.

Considerable confusion exists in respect to the camp known as Camp Alexander. The first camp so designated was in a very bad swamp.⁴⁹ This camp had nothing to do with the port of embarkation in the beginning. It was originally used by negro stevedores who belonged to the Quartermaster's Department. Who selected the site is unknown. Later this camp, then known as Camp Alexander and used for negro labor battalions under the port commander, was in the main moved to high land near the James River. Then Camp Alexander had as good a site as any of those which had had to be established at Newport News on account of the shipping facilities there. The second Camp Alexander site was selected by the port commander, due weight being given sanitary considerations through the port surgeon.⁴⁹

Camp Merritt, Tenafly, N. J., was chosen by a board of officers appointed by the War Department in July, 1917, on which there was a medical member. It was used as an embarkation and debarkation camp under jurisdiction of the commanding general, port of embarkation, Hoboken, N. J.⁵⁰ The records show it to have been a satisfactory site from a sanitary viewpoint.⁴⁹

The Savanna Proving Ground, under control of the Ordnance Department, was located at Savanna, Ill.⁵⁰ It was selected by ordnance officers. The records bearing on this camp are extremely meager, and no information was secured as to its sanitary advantages and disadvantages.

Camp Syracuse was a temporary tent camp originally selected for the use of several regiments of Regular troops in the early summer of 1917. During the latter months of the war it was operated as a classification camp for limited-service men.⁵⁰ No record of its establishment can be found beyond the fact that it was not selected by a regularly appointed board. No adverse sanitary criticism can be found concerning this camp. It had insufficient hospital accommodations.⁴⁹

Camp Robinson was used at the beginning of the war as a Regular Army Artillery camp.⁴⁹ It was located on the Government reservation at Sparta, Wis. It was not selected by a board, nor was the Medical Department consulted, a fact hardly to be expected, as the Government had owned this land for some years. This has always been a healthful location.⁴⁹

Camp Stanley, Leon Springs, Tex., was located on a Government reservation which was used for troops from time to time before the war.⁴⁹ It was selected as a site for an officers' training camp and approved by the Secretary of War June, 1917.⁵¹ It was so used and also for troops. There was much difficulty in providing a sufficient amount of water here.⁴⁹

Edgewood Arsenal and Aberdeen Proving Ground are on the same tract of land, the area comprising some 20,000 acres, and are located in Maryland on the Chesapeake Bay near the town of Edgewood.⁵⁰ Aberdeen was used as a proving ground by the Ordnance Department, and Edgewood as a gas-shell filling plant for the Chemical Warfare Service.⁵¹ The land was purchased by the Government prior to the war and selected by a board of Ordnance officers designated by War Department order. The Chemical Warfare station at Edgewood was established in the fall of 1917, the site being selected by an Ordnance officer.⁵² Fifteen hundred acres of marsh land on this reservation, breeding many mosquitoes, and an insufficient water supply were two sanitary objections to the site.⁴⁹

Camp Knox, Stithton, Ky., was located on a tract of land selected in the fall of 1917 by a Field Artillery officer.³³ It was chosen with a view to providing a firing range for Field Artillery from Camp Taylor, Ky. In April, 1918, this same officer reported it as being a suitable location for the construction of a cantonment to shelter Artillery brigades then being mobilized. The actual location for the barracks at this station was decided upon by officers of the construction division and Field Artillery without reference to the Medical Department. During the construction of the cantonment a temporary tent camp was occupied at West Point, Ky. Camp Knox is entirely surrounded by the village of Stithton, which was a sanitary objection. Considerable drainage and mosquito-control work was necessary, but this was not a serious problem. With these exceptions the site was excellent.⁴⁹

Camps Benning and Bragg were selected by a board of officers, with a medical member.⁵⁴ The proceedings of this board are dated May 21, 1918, and show that the board inspected sites at Columbus, Ga.; Fayetteville, N. C.; Raleigh, N. C.; McAlester, Okla.; and Knoxville, Tenn. Of these sites the board reported that Columbus, Ga. (Camp Benning), and Fayetteville, N. C. (Camp Bragg), were satisfactory from both military and sanitary standpoints. Subsequent sanitary inspections have shown Camp Benning to be an excellent site, while at Camp Bragg it was necessary to install a water-purification plant and institute considerable drainage work. However, these were not considered serious sanitary defects.⁴⁹

SUMMARY OF METHODS FOLLOWED IN SELECTING CAMP SITES

Of the 111 camps for which there are records of any value in the premises, 57 were selected with reference to the Medical Department and 54 without. Camp Lewis and Camp Stanley are included among the former, as while favorable opinion was apparently not elicited from the Medical Department at the time, this was merely a matter of form, as these sites had been approved by Medical Department authorities before the war.

Of the 16 National Army cantonments, Jackson and Gordon (12½ per cent) were selected without reference to the Medical Department; of the National Guard camps, Sevier, Wheeler, Wadsworth, McClellan, Sheridan, Hancock, and Greene (43 per cent of the total 16) were chosen without Medical Department advice. (Camp Fremont is included in National Guard camps, though not actually occupied by the Guard.) Twenty-four out of forty-nine stations in use by the Aviation Corps were selected by boards having no medical member, and about 213 miscellaneous stations had no primary Medical Department inspection.

The failure to provide representatives from the Medical Department on the boards concerned in the choice of such a large percentage of the camp sites in this country appears to have been due to three causes: First, the lack of time in some instances; second, the large number of sites to be inspected before selection was made; and, third, the absence of any specific instructions on the subject from the War Department in many cases, especially with reference to the selection of the miscellaneous stations.

Table 2 gives the facts in respect to the various camp sites which were elected.

TABLE 2.—Data concerning the more important sites considered from a sanitary viewpoint 31

Name of station	Purpose	Water supply	Disposal of excreta	Drainage	Mosquito control	Remarks	Character
Alexander, Camp, Newport News, Va.	Embarkation, stevedore and labor battalions.	Inadequate at beginning, later adequate. Otherwise excellent.	Satisfactory; finally sewers; early, unsatisfactory incinerators.	Difficult and expensive.	Difficult and expensive.	Mosquitoes numerous; later eliminated at great expense.	Very poor site early; made fair.
Arcadia, Calif., Balloon School, Camp, Alexandria, La.	Balloon school.	Difficult.	Difficult while pit latrines were used; ground nonabsorptive.	Excellent.	Excellent.	Control of mosquitoes failed.	Poor site.
Bening, Camp, Columbus, Ga.	Infantry school.	Not difficult.	Not difficult; satisfactory.	Not difficult; soil sandy.	Not difficult, but never completely carried out for various reasons.		Satisfactory.
Bowie, Camp, Fort Worth, Tex.	National Guard.	Satisfactory.	Difficult while pit latrines were used; ground nonabsorptive and pits had to be blasted out.	Satisfactory.	Satisfactory.	Very dusty at times; city very close and somewhat intermingled with camp.	Fair site.
Bugg, Camp, Fayetteville, N. C.	Field Artillery.	Satisfactory but required purification.	Satisfactory.	Not difficult.	Not difficult, but never completely carried out.	Limitation of mosquitoes satisfactory.	Satisfactory.
Brooks Field, San Antonio, Tex.	Aviation.	Excellent.	Excellent.	Excellent; soil very pervious.	Excellent.		Do.
Black, Camp, Wichita Falls, Tex.	do.	Limited.	Satisfactory.	Satisfactory.	Satisfactory.		Do.
Carlisle, Camp, Field, Arcadia, Fla.	do.	Satisfactory.	do.	Satisfactory; many swamps surrounding.	Extremely difficult.	Mosquitoes somewhat reduced.	Poor site.
Camp Cody, Deming, N. Mex.	National Guard.	do.	do.	Satisfactory; sandy.	Satisfactory.	Site dusty; dust storms frequent and severe.	Fair site.
Cole, Camp, Gettysburg, Pa.	Tank Corps.	Fairly satisfactory.	Fairly satisfactory.	Excellent; sandy loam soil.	Excellent.		Satisfactory.
Custer, Camp, Battle Creek, Mich.	National Army.	Excellent.	Excellent.	Excellent; sand and gravel soil.	do.		Do.
Deans, Camp, Ayer, Mass.	do.	Satisfactory.	Satisfactory.	Numerous ponds and swamps, but no serious problem.	Numerous ponds and swamps, but no serious problem.		Satisfactory.
Dix, Camp, Wrightstown, N. J.	do.	do.	do.	Fairly satisfactory; top soil sandy loam.	Considerable work required.	Sewage treated inadequately.	Do.
Dodge, Camps, Des Moines, Ia.	do.	do.	do.	do.	do.		Do.
Doniphan, Camp, Fort Sil, Okla.	do.	Limited; objectionable in taste, sand, and appearance at times.	do.	do.	do.	Site dusty and dust storms frequent.	Poor site.
Dorr Field, Arcadia, Fla.	Aviation.	Satisfactory.	do.	Difficult and expensive.	Difficult and expensive.	Very difficult problem in drainage of landing field.	Do.
Eberts Field, Lonoke, Ark.	do.	do.	do.	Very difficult and expensive; soil impervious; site surrounded by rice fields.	Very difficult and expensive.		Very poor site.

TABLE 2.—Data concerning the more important sites considered from a sanitary viewpoint—Continued

Name of station	Purpose	Water supply	Disposal of excreta	Drainage	Mosquito control	Remarks	Character
Edgewood Arsenal, Md.	Chemical Warfare.	Satisfactory; required purification.	Satisfactory.	Difficult and expensive.	Difficult and expensive.	Mosquitoes reduced, but not eliminated.	Fair site.
Ellington Field, Houston, Tex.	Aviation.	Satisfactory.	do	do	Very difficult.	Mosquitoes not controlled.	Poor site.
Camp Eustis, Lee Hall, Va.	Coast Artillery Corps.	do	do	Extremely difficult and expensive; never completely carried out.	Extremely difficult and expensive; never completely carried out.	Mosquitoes never controlled; much malaria contracted in camp.	Very poor site.
Forrest, Camp, Chickamauga Park, Ga.	Engineers.	do	do	Satisfactory.	Satisfactory.		Satisfactory.
Fremont, Camp, Palo Alto, Calif.	Regular Army.	Excellent.	Excellent.	Very good; some adjacent swampy areas, not important.	Excellent.	Considerable closely contiguous population, in part intermingled with camp.	Good.
Funston, Camp, Fort Riley, Kans.	National Army.	Very good.	do	Site level and drainage only fair.	Easy.	Much mud and dust, numerous dust storms; site subject to flood, site protected by ditches and a time of encampment construction.	Fair site.
Gerstner Field, La.	Aviation.	Satisfactory.	Satisfactory.	Very difficult and expensive.	Very difficult and expensive.	Mosquitoes continued numerous.	Poor site.
Gordon, Camp, Atlanta, Ga.	National Army.	Difficult.	do	Satisfactory.	Satisfactory.	Mosquitoes practically eliminated.	Satisfactory.
Grant, Camp, Rockford, Ill.	do	Satisfactory.	do	Difficult because of level site and impervious soil; very muddy; subsoil is muddy.	do		Do.
Greene, Camp, Charlotte, N. C.	National Guard.	do	Pit system; very difficult because of impervious soil.	Fair site extremely muddy.	do	Extremely muddy in wet weather mosquitoes practically eliminated.	Poor site.
Greenleaf, Camp, Chickamauga Park, Ga.	Medical officers' training camp.	do	Satisfactory.	Satisfactory; soil sandy.	do		Satisfactory.
Hancock, Camp, Augusta, Ga.	National Guard.	do	do	Not difficult.	Not difficult.	Mosquitoes not eliminated.	Do.
Hill, Camp, Newport News, Va.	Stevenson and embarkation.	Inadequate in beginning; gradually satisfactory.	do	Difficult and expensive.	Difficult and expensive.		Poor site.
Hobbs, Camp, Baltimore, Md.	Motor Transport Corps.	Very good.	do	Moderately difficult.	Moderately difficult.	Surroundings poor.	Fair site.
Jackson, Camp, Columbia, S. C.	National Army.	Satisfactory.	do	Very difficult and expensive.	Very difficult and expensive.	Satisfactory results ultimately obtained.	Satisfactory.
Johnston, Camp, Jacksonville, Fla.	Quartermaster Corps.	do	do	Not difficult, but rather expensive.	Not difficult, but rather expensive.	Mosquitoes greatly reduced.	Do.

Kearny, Camp, Linda Vista, Calif.	National Guard	do	do	Satisfactory	do	Do.
Kelly Field No. 1, San Antonio, Tex.	Aviation	do	do	do	do	Do.
Kelly Field No. 2, San Antonio, Tex.	do	do	do	do	do	Do.
Knox, Camp, Stithson, Ky.	Field Artillery	do	do	Offers a decided problem.	do	Do.
Langley Field, Va.	Aviation	Inadequate at beginning; new project expensive.	Expensive because of need for oyster-bed protection.	Difficult and expensive.	The camp entirely surrounds village of Stithson. Very expensive drainage required for flying field.	Poor site.
Leach, Camp, American University, D. C.	Engineers	Satisfactory	Satisfactory	Satisfactory	do	Satisfactory.
Leach, Camp, Petersburg, Va.	National Army	do	do	Difficult and expensive.	Excellent results in drainage and mosquito control.	Do.
Lewis, Camp, American Lake, Wash.	do	Excellent	Excellent	Excellent	do	Do.
Logan, Camp, Houston, Tex.	National Guard	Satisfactory	Satisfactory	Moderately difficult.	Control results fairly satisfactory.	Fair site.
Love Field, Dallas, Tex.	Aviation	do	do	Satisfactory	do	Satisfactory.
Marathon, Camp McCallan, Camp Aniston, Ala.	National Guard	do	Pit latrines; unsatisfactory because of character of soil.	do	do	Do.
March Field, Riverside, Calif.	Aviation	do	do	do	do	Do.
Mather Field, Sacramento, Calif.	National Army	Difficult, but well served by filters and chlorination.	do	do	Excellent mosquito control results attained.	Do.
Meade, Camp, Md.	do	Satisfactory	do	do	do	Do.
Meigs, Camp, Washington, D. C.	Quartermaster	do	do	do	do	Do.
Merritt, Camp, Tenn., N. J.	Embarkation and debarkation.	do	do	Fairly satisfactory; soil excellent.	Mosquito control work satisfactory.	Do.
Mills, Camp, Mineola, Long Island.	do	do	do	Satisfactory	do	Do.
Morrison, Camp Newport News, Va.	Aviation	Inadequate at beginning; later requires qualitative laboratory.	do	Difficult and expensive.	Camp was practically in a swamp; mosquito situation much improved by work.	Poor site.
Park Field, Millington, Tenn.	do	Satisfactory	do	Extremely difficult and expensive.	Mosquito control very good in view of difficulties.	Very poor site.
Payne Field, West Point, Miss.	do	do	Expensive	do	Control of mosquitoes not satisfactory.	Satisfactory
Pike, Camp, Little Rock, Ark.	National Army	Difficult and expensive.	Satisfactory	Very difficult; was solved in a satisfactory manner, but at great expense.	A notable example of successful mosquito control in a difficult area	Poor site.
Polk, Camp, Raleigh, N. C.	Tank Corps	Expensive; required purification.	do	Satisfactory	do	Satisfactory.

TABLE 2.—Data concerning the more important sites considered from a sanitary viewpoint—Continued

Name of station	Purpose	Water supply	Disposal of excreta	Drainage	Mosquito control	Remarks	Character
Post Field, Fort Sill, Okla.	Aviation	Limited and unsatisfactory.	Satisfactory	Satisfactory	Satisfactory	(See Camp Doniphan)	Poor site.
Sover, Camp, Greenville, S. C.	National Guard	Satisfactory	do	do	do		Satisfactory.
Safridge Field, Mount Clemens, Mich.	Aviation	Poor	do	Impossible of complete solution.	Impossible of complete solution.	Fortunately not in a malarious region.	Poor site.
Shelby, Camp, Hattiesburg, Miss.	National Guard	Satisfactory	Difficult in pits because of impervious soil.	Difficult and expensive.	Difficult and expensive.	Mosquitoes much reduced by work carried out.	Fair site.
Sheridan, Camp, Montgomery, Ala.	do	do	Satisfactory	Fairly satisfactory; soil permeable.	Not difficult	Control results satisfactory.	Satisfactory.
Sherman, Camp, Chillicothe, Ohio	National Army	Excellent	Excellent	Excellent	Excellent		Do.
Souther Field, Americas, Ga.	Aviation	Satisfactory	Satisfactory	Fairly satisfactory	Satisfactory	Good control results attained.	Do.
Stanley, Camp, Leon Springs, Tex.	O. T. C.	Insufficient and difficult of improvement.	do	Satisfactory	do		Fair site.
Stuart, Camp, Newport News, Va.	Embarkation and debarkation.	Inadequate at beginning; later satisfactory.	do	Difficult and expensive.	Difficult and expensive.	Mosquito situation solved.	Do.
Taliferro Field, Fort Worth, Tex.	Aviation	Satisfactory	do	Satisfactory	Satisfactory		Satisfactory.
Taylor, Camp, Louisville, Ky.	National Army	do	do	do	do		Do.
Taylor Field, Montgomery, Ala.	Aviation	do	do	do	do		Do.
Taylor Camp, San Antonio, Tex.	National Army	do	do	Satisfactory; soil very impervious.	Satisfactory as regards malarial-bearing types.	Mosquito problem considerable as related to salt marshes and non-malaria-bearing mosquito control.	Do.
Union, Camp, Yapbank, Long Island.	do	do	do	Satisfactory; fairly excellent.	Satisfactory		Do.
Wadsworth, Camp, Sparta, S. C.	National Guard	do	do	Satisfactory; soil rather impervious.	Satisfactory	Results of antimosquito work were not satisfactory.	Do.
Wheeler, Camp, Macon, Ga.	do	do	do	Somewhat difficult, but constituted no very serious objection to site.	Somewhat difficult, but constituted no very serious objection to site.		Fair site.
John Wise, Camp, San Antonio, Tex.	Balloon school	do	do	Satisfactory	Satisfactory		Satisfactory.

INFLUENCE OF CAMP SITE ON MILITARY EFFICIENCY

The situation which faced us when we entered the World War was the necessity of training the maximum number of officers and men in the minimum time. The question arises: What influence did the camp sites which were selected have on the result?

It should be noted that the attitude of the War Department ¹⁰ in respect to locating so many camps in the South was based on the milder winter climate there—a perfectly good reason for so locating them, both from the military and the strictly sanitary standpoint.

Viewing the camp sites selected in the light of subsequent events, one is impressed by the fact that the camp site per se had relatively little influence upon the health of the troops occupying it. This at once leads to the conclusion that camp sanitation has advanced to a point where practically any site in this country likely to be chosen can be rendered healthful provided the necessary funds and labor are available for the purpose. Sound medical advice in this matter therefore is of more advantage for saving time, thereby promoting military efficiency, and money to the Government and for increasing the morale of troops in camp than it is for assuring actual healthful conditions, in so much as sanitation, at a price, can render habitable practically any location likely to be chosen.

The amount of money required for the sanitation of a naturally poor location is by no means a small item. For example, at Camp Pike, Ark., it was necessary to spend a large sum for labor alone to control the mosquito situation on the reservation; the cost of screening and of oil, tools, and transportation was very great, but can not be estimated.⁴⁹ Furthermore, a large sum was expended by other agencies, notably by the United States Public Health Service, for extra cantonment work of the same nature.⁴⁹ Camp Pike is chosen merely as an illustration; many other sites required heavy expenditures for limiting the breeding of mosquitoes. Aside from the pecuniary aspects of the question, other disadvantages accrued as a result of a malarious camp site, such as the waste of the time consumed by soldiers in ditching and policing which might otherwise be spent in military drill and instruction, the diminution in man power as represented by civilian laborers employed, and the physical discomforts experienced by troops occupying localities heavily infested by mosquitoes. A station located in a swampy region, as is Camp Eustis, Va.; one which owing to the nature of the soil becomes converted into a sea of mud during rains,⁴⁹ as did Camp Greene, N. C.;⁴⁹ one infested with mosquitoes, such as Camp Beauregard, La.;⁴⁹ or one served with a turbid, malodorous water, as Camp Doniphan,⁴⁹ while not necessarily unhealthful, is nevertheless very uncomfortable and has a decided tendency to lower the morale of its occupants.

It is not intended to convey the impression that all sites selected without medical advice were poor sites, for such was not the case. In fact, most of the sites thus chosen proved entirely satisfactory from a health standpoint. It is believed, however, that in lieu of some of the sites selected others might have been found which would have proved just as suitable from a military viewpoint, and which could have been rendered healthful at a far less expenditure

of time and money. Also, let it be stated in all fairness, that at least one bad site was chosen by a board having a medical representative (Camp Beauregard).⁴⁹

As previously mentioned in this chapter, four camps were approved in opposition to board recommendations, namely, Camps Pike,²⁶ Travis,³³ Doniphan,³⁰ and Funston.²⁴ The Camp Travis site was not recommended by the board for a number of reasons (see p. 108), among which were its relatively poor climate compared with Fort Worth and Waco, and for lack of vice control. As far as sanitary reports and observations go, the judgment of the Department Commander in selecting it appears to have been fully confirmed. Yet the records show that this station had the highest admission rate of any camp and the second highest noneffective rate in 1918, but its death rate was lower than most of the large camps.⁵⁵ In 1919 all of these rates, as compared with other camps, were much more favorable than during the preceding year.⁵⁶ In the case of Camp Doniphan, the board rejected the site on account of supposed insufficient water supply.³⁰ A shortage did not actually develop, though at one time it appeared imminent. Sufficient water was obtained at much less expense than in the majority of other camps, but the quantity would doubtless have proved inadequate if a water-carriage sewer system had been installed.⁴⁹ The supply did possess a serious sanitary disadvantage not recognized by the board at time of inspection; this was the foul odor and taste which the water at this site periodically develops, due to the excessive growth of algae; also the presence in it of many actively motile animal forms visible to the naked eye. These disadvantages had not been overcome many months after the abandonment of the camp, but they did not unfavorably affect the health rates.⁴⁹ The Camp Pike area was rejected by a board of officers on account of the great prevalence of anopheles mosquitoes and the high malarial incidence in the surrounding country.³⁰ It has not actually proved an unhealthful site in so far as malaria is concerned, but it has required the expenditure of an enormous amount of money and the use of hundreds of men to control mosquito breeding in the cantonment itself and in the extra cantonment area.⁴⁹ Camp Funston was rejected by the board because of liability to floods, insect pests, and climatic extremes of heat and cold.²⁴ Opinions vary somewhat regarding the suitability of this site, as determined by its use during the war. Gen. Leonard Wood criticized it very severely⁵⁷ and it did possess rather an unenviable health record during the first year of its establishment, its noneffective rate being the seventh highest in the list of large camps; its admission rate was fourth and its death rate sixth.⁵⁸ It is not believed that the site was directly responsible for these rather high rates, but it has proven to be an uncomfortable camp, on account of extreme heat and cold, high winds, dust storms, mud, and the high iron content in the drinking water.⁴⁹ Floods were guarded against by the construction of a dike.

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- (2) *Ibid.*, 39.
- (3) A. R. 1386, 1913.
- (4) F. S. R. 233, 1914.
- (5) F. S. R. 236, section 5, 1914.
- (6) F. S. R. 238, 1914.
- (7) Copy of Memorandum, War Department, A. G. O. (revised April 28, 1917). Cites authorization for 16 training areas. On file, Record Room, S. G. O., Correspondence File 160608 (Old Files).
- (8) Selective Draft, Act of May 18, 1917, Bulletin, War Department, No. 32, May 24, 1917.
- (9) Letter from Chief of War College Division of General Staff to General Staff, April 23, 1917. Subject: Instructions. On file, Record Room, A. G. O., Correspondence File 2593945 (Old Files).
- (10) Memorandum from Chief of War College Division, General Staff, to Chief of Staff, May 4, 1917. Subject: Designation of Camp Sites for Training New Troops. On file, Record Room, A. G. O., Correspondence Files 2593945 (Old Files).
- (11) Memorandum from the Surgeon General, May 3, 1917, for the Chief of Staff, with indorsements (2d, 3d, 4th, 5th, abstract of June 5, Quartermaster to The Adjutant General, and 8th). All on file, Record Room, S. G. O., Correspondence File, 172968 (Old Files).
- (12) Memorandum from Chief of Staff to The Adjutant General, May 6, 1917. Subject: Cantonment Sites for the National Guard and Additional Forces. Approved by Secretary of War, same date. On file, Record Room, A. G. O., Correspondence File, 2593945 (Old Files).
- (13) Letters of instruction from The Adjutant General to the various department commanders, May 7, 1917. On file, Record Room, A. G. O., Correspondence File, 2593945 (Old Files).
- (14) Telegram from The Adjutant General to department commanders, May 10, 1917. On file, Record Room, A. G. O., Correspondence File, 2593945 (Old Files).
- (15) Copy of Questionnaire re Location of Camps. On file, Record Room, A. G. O., Correspondence File, 2593945.
- (16) Copy of telegram from The Adjutant General to commanding generals of the various departments, May 15, 1917. On file, Record Room, S. G. O., Correspondence File, 175339 (*L*) (Old Files).
- (17) Report on Board of Officers, Central Department, VIII Divisional Area, Ohio and West Virginia, dated, Chillicothe, Ohio, May 24, 1917. Subject: Sites considered and recommended. On file, Record Room, A. G. O., 2593945 (*M*) (Old Files).
- (18) Memorandum from Chief of Staff to The Adjutant General, June 7, 1917. On file, Record Room, A. G. O., Correspondence File, 2593945 (*M*) (Old Files).
- (19) Report of Board of Officers, Central Department, IX Divisional Area, Indiana and Kentucky, dated Chicago, May 15, 1917, forwarded by Major General Barry, Department Commander, June 4, 1917. Subject: Sites considered and recommended. On file, Record Room, A. G. O., Correspondence File, 2593945 (*O*) (Old Files).
- (20) Copy of telegram from The Adjutant General to commanding general, Central Department, June 11, 1917, approval of Louisville, Kentucky. On file, Record Room, S. G. O., Correspondence File, 187854 (Old Files).
- (21) Report of Board of Officers, Central Department, X Divisional Area, Michigan and Wisconsin, dated, Chicago, Ill., May 15, 1917. Subject: Sites considered and recommended. Forwarded approved by Major General Barry, June 4, 1917. On file, Record Room, A. G. O., Correspondence File, 2593945 (*K*) (Old Files).
- (22) Report of Board of Officers, Central Department, XI Divisional Area, Illinois, dated, Chicago, Ill., June 3, 1917. Subject: Sites considered and recommended. Forwarded approved by Major General Barry, June 4, 1917. On file, Record Room, A. G. O., Correspondence File, 2593945 (*Q*) (Old Files).

- (23) Report of Board of Officers, Central Department, XIII Divisional Area, North Dakota, South Dakota, Minnesota, Nebraska, and Iowa, dated St. Paul, Minnesota, June 3, 1917. Subject: Sites considered and recommended. Forwarded approved by Major General Barry, June 4, 1917. On file, Record Room, A. G. O., Correspondence File, 2593945 (N) (Old Files).
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- (25) Reports of the Various Boards of Officers, Central Department. Subject: Camp sites considered and recommended. On file, Record Room, A. G. O., 2593945 (K, L, M, N, O, Q) (Old Files).
- (26) Reports of Boards of Officers and Correspondence, Southeastern Department, XII Divisional Area, Arkansas, Louisiana, Mississippi, and Tennessee, dated Charleston, S. C. Subject: Sites recommended and approved, May 16, 1917, forwarded June 26, 1917. On file, Record Room, A. G. O., Correspondence File, 2593945 (P); 2601887; and 2573568 (Old Files).
- (27) Telegram of recommendation, Headquarters Southeastern Department, Charleston, S. C., to The Adjutant General, June 8, 1917. On file, Record Room, A. G. O., 2593945 (Old Files).
- (28) Letter from the department commander, Southeastern Department, to The Adjutant General, July 18, 1917. Subject: Cantonment sites. On file, A. G. O., File No. 333.01 (Cantonment sites).
- (29) Copy of orders for appointment of boards in Southern Department. On file, Record Room, A. G. O., Correspondence File, 2593945 (R) (Old Files).
- (30) Reports, Boards of Officers, Southern Department, XV Divisional Area, May 12 and 14, 1917. Subject: Sites considered and recommended. On file, Record Room, A. G. O., Correspondence File, 2593945 (R) (Old Files).
- (31) Reports made by Major General J. Franklin Bell. Subject: Camp sites in Texas, On file, Record Room, A. G. O., Correspondence File, 2388968 (Old Files).
- (32) Reports of Board of Officers, Western Department, XVI Divisional Area. Subject: Sites considered and recommended. On file, Record Room, A. G. O., Correspondence File, 2593945 (S) (Old Files). Also, 354.1 and 601.52 (Flat Files). Also, Reports on Tracts of Land for Permanent Mobilization Training and Supply Stations in the Western Department. On file, Record Room, A. G. O., Correspondence File, 2475831 (L) (Old Files).
- (33) Telegram from The Adjutant General to commanding general, Western Department, May 18, 1918. Subject: Approval American Lake District for 16th National Army Division and 20th National Guard Division. On file, Record Room, A. G. O., 2597435 (Old Files).
- (34) Telegram from The Adjutant General to commanding general, Western Department, June 30, 1917, states Secretary of War withdrew approval of American Lake as site for National Guard Cantonment, and approved Palo Alto, Calif., as site for National Guard Division assigned to American Lake. On file, Record Room, S. G. O., Correspondence File, 187852 (Old Files).
- (35) Letter from department surgeon, Western Department, to Surgeon General, March 11, 1919. On file, Record Room, S. G. O., Correspondence File, 680.1 (Camp Sites, Western Department) AA.
- (36) Reports from Major General J. Franklin Bell, Eastern Department. Subject: Sites selected and recommended. On file, Record Room, A. G. O., 2593945 (X), and 2475831 (G) (Old Files). Approval of Yaphank, Long Island, New York, by Secretary of War: Telegram from The Adjutant General to the commanding general, Eastern Department, June 18, 1917. On file, Record Room, A. G. O., Correspondence File, 2625937 (Old Files). Approval of Annapolis Junction, Maryland: Telegram from The Adjutant General to the commanding general, June 22, 1917. On file, Record Room, A. G. O., Correspondence File, 2629631 (Old Files). Approval

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- (39) Memorandum from Assistant Chief of Staff to the Chief of Staff, January 19, 1917. Subject: Placing of Aviation Stations and Training Schools. On file, Record Room, Office of the Chief of Staff, War College Division File, 7112-25. Also, Memorandum for Chief of Staff from Assistant Chief of Staff, March 3, 1917. Subject: Memorandum of January 19, 1917. On file, Record Room, Office of the Chief of Air Service, General Files 686 A (Miscellaneous Aviation Fields and Stations).
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- (42) History of the Supply Section, Division of Military Aeronautics, p. 6. Subject: Selection of sites. Page 14, Exhibit E, list of aviation fields. On file, Library Division, Office of the Chief of Air Service (no file number). Also, Data re boards. On file Record Room, Office of Chief of Air Service, General Files, 334.1 (Boards). Also, Authority for medical officer on boards. Memorandum from the Surgeon General, U. S. Army, to Chief of Staff, May 3, 1917. Subject: Medical Department represented on boards selecting camp sites. On file, Record Room, Correspondence File, 172968 (Old Files). List of Aviation fields, showing composition of board, or officer selecting sites for same. See Exhibit E, History of the supply division of military aeronautics, p. 14. On file, Library Division, Office of Chief of Air Service (no file number).
- (43) Report on selection of fields, by Col. George H. Crabtree, M. C. On file, Historical Division, S. G. O.
- (44) Central Board in Washington. Aircraft Production Board, created by resolution of Council of National Defense, April 12, 1917. Proceedings of this board, on file with the Library Division, Office of the Chief of Air Service (no file number). Also, see proceedings of aircraft production board, created by Act of Congress, October 1917 (published in War Department Bulletin No. 61, October 23, 1917) which was the outgrowth of the aircraft production board. On file, Library Division, Office of Chief of Air Service (no file number).
- (45) Questionnaire re information required regarding proposed sites (undated). On file, Record Room, Office of the Chief of Air Service, General Files, 686 A (Miscellaneous Aviation Fields and Stations), General.

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- (49) Sanitary Inspectors' Reports. On file, Sanitation Division, S. G. O.
- (50) Army Posts, Camps, Cantonments, Depots, etc., in the United States, November 15, 1918, 250. War Department, Office of The Adjutant General (Washington, Government Printing Office).
- (51) *Ibid.*, 108.
- (52) Annual Report of the Chief of Ordnance, 1918, Page 28.
- (53) Completion Report, Camp Knox, Ky., by Construction Division of the Army September 1, 1919, 7. On file, Construction Division, Q. M. G.
- (54) Par. 60, S. O., 119, W. D., May 21, 1918.
- (55) Annual Report of the Surgeon General, U. S. Army, 1919, Vol. I, 125-126.
- (56) Annual Report of the Surgeon General, U. S. Army, 1920, 140-145.
- (57) Second indorsement, Hq. 89th Division, Camp Funston, Kans., November 13, 1917, to The Adjutant General. Copy on file, Record Room, S. G. O., File No. 721-1 (89th Division) G.
- (58) Based on monthly sick and wounded reports made to the Office of the Surgeon General.

CHAPTER V

HOUSING OF TROOPS

Accommodations for troops in the United States during the World War, as stated in connection with the selection of camp sites, had to be furnished, in great part, after the war began. At the Regular Army posts which had been occupied before the war, the barracks were generally well fitted for this purpose, but they were limited in size. As it proved, they were not less overcrowded than were the buildings at the camps.¹ These, however, are not included in the present discussion, which will be confined to the shelter that the troops had at camps and cantonments. The distinction between camp and cantonment will be maintained here, it being understood that at camps the troops occupied tents, and at cantonments, buildings, in the main.² It should also be noted that the plan was to use tent camps for the National Guard³ and cantonments for selective service men.⁴ The fact should also be mentioned that a good many accessory buildings were provided at the tent camps, and the miscellaneous stations generally had buildings.⁵ In many instances at the great cantonments, tents from time to time supplemented the shelter as the barrack proved inadequate.¹

In the Council of National Defense, which, as is well known, was organized several months before our declaration of war with Germany, various committees and subcommittees were formed to assist in the prosecution of the war.⁶ Among others was a committee on emergency construction with a subcommittee on preliminary planning, sanitation, and engineering relative to cantonment construction; this subcommittee assisted in the organization of the cantonment division of the War Department.⁷ The cantonment division was charged with the duty of developing plans and specifications for the camps and cantonments and with their construction.⁸ It should be explained that previous to the war all new construction work, as well as repairs to existing structures, had been executed under the direction of the construction and repair division of the Quartermaster Corps. This division, at the time of the declaration of war, consisted of 3 commissioned officers, 20 clerks and stenographers, and about 20 engineers, architects, and draftsmen.⁹ On May 19, 1917, the cantonment construction division of the Quartermaster General's Office was authorized, as an outgrowth of the construction and repair division, and was organized in five subdivisions, with duties so far as is pertinent to the present subject, indicated in the following quotations from the original office orders, cantonment construction division, dated May 24, 1917:¹⁰

4. *Engineer division.*—The officer in charge of the engineering division will prepare typical plans of cantonments, including water distribution, internal sewer and draining lines, lighting distribution, tracks, roads, etc. He will prepare or secure through the consulting architect detailed plans of the different buildings required. He will secure * * * the services of consulting engineers to do all the engineering involved in water supply and sewage disposal, as this is work which must be done in the field.

Designs prepared for such works will be submitted * * * to the consulting engineers of the committee on emergency construction for approval or comment.

He will determine and define the requirements in the way of laundry, incinerators, refrigerating plants, etc. * * *

5. *Material division.*—The officer in charge of the material division will make recommendations as to placing all contracts for material to be purchased by this organization. He will consult freely with the engineer officer and the officer in charge of cantonment construction, in connection with the purchases of such equipment as power plants, pumping machinery, refrigerating plants and similar items. * * *

6. *Construction division.*—The officer in charge of the construction division will be in charge of all operations in the field * * *

He will select assistants, assigning each one to follow in detail the work located in several cantonments as assigned later on.

7. *Accounting division.*—The officer in charge will have charge of the accounting legal matters and with the general administration of the office * * *

8. *Constructing quartermaster's office.*—Each constructing quartermaster will report to this office through one of the assistant construction officers outlined above. He should have an assistant who shall be a civil engineer, and under him will be whatever force of surveyors, draftsmen, auditors, etc., as needed by particular circumstances.

The constructing quartermaster will have the responsibility of adapting to the topographical conditions typical plans furnished by this office.

As outlined above he will have the assistance of civilian engineers in the planning of water supply, sewage disposals, and if he requires other help he should promptly notify this office of such requirements * * *

The conditions in various cantonments will differ and matters of this kind will have to be left largely to the judgment of the construction quartermaster to be decided for each cantonment on its own merits, after consulting with this office.

Many prominent engineers from civil life were commissioned and brought into the cantonment division and placed in charge of various features of the work. Later the constructing quartermasters, supervising engineers, camp planners, and contractors for the camps were selected and assigned to such duties. As the case might be, typical plans for camps, buildings, and utilities were drawn up, and much detailed study and outlining of policies was carried out in order to hasten the work as much as possible while the selection of the camp sites by the department commanders was proceeding. At this time there was little or no knowledge of the sites upon which the camps were to be built, of their topography, or of their distance from transportation lines. Even the ultimate size of the company and regiment was not known, on account of certain proposed changes in tables of organization which were held in abeyance pending report from General Pershing, who had just gone abroad. However, the construction work was outlined and many details were settled, partly on the basis of recent experience gained during the mobilization on the Mexican border in 1916. After the camp locations were actually chosen, the typical plans which had been developed by the organization in Washington were fitted to the site by the local constructing quartermasters, with the help of the field supervising engineers, such changes as appeared necessary being then made.¹¹

CANTONMENT CONSTRUCTION

Plans for cantonment shelter for troops during the World War were based on barrack plans originally drafted by the construction division of the Quartermaster Corps in 1911 and classified under the heading of "temporary buildings

for mobilization camps." ¹² These were commonly known as "mobilization barracks" in contradistinction to cantonment barracks. Except to note the fact that the 1911 plans were the original ones and that they were slightly revised in 1914 and again in 1916, ¹³ it is not necessary here to go back of the 1916 model, as that was the one actually in effect when war came. The plans contemplated rough one-story frame structures 20 feet wide and built in different lengths to accommodate units consisting of varying numbers of men, the size per unit to depend upon the tables of organization in force for the Army at the time of construction; for example, they were designed for 37, 43, 49, 55, 61, 67, 73, 79, 85, 91, and 97 men, respectively. ¹³ It will be seen from the illustration (Fig. 3) that this type contained no means of ventilation save through sliding windows, 34 by 37 inches, arranged at intervals of 7 feet, and when filled to authorized capacity allowed each soldier only 27 square feet of floor space and about 291 cubic feet of air space. To accommodate the required number of men necessitated placing their cots parallel with the long axis of the building, arranged in a series of double rows, 3 deep, making 6 cots to a block, each of the 6 being in actual contact with its neighbor. A space of approximately 18 inches intervened between these double rows and there was one central aisle across the building about 8 feet in width, part of which was to be occupied by the stove during cold weather. Barracks of this type were used along the Mexican border in 1916. ¹⁴ Buildings on essentially the same plan were constructed to house students at the officers' training camps which were hastily established in April and May, 1917. ¹⁵ Generally speaking, as these buildings were utilized for the number of men originally planned, they were greatly overcrowded. ¹⁶ It was this type of barracks that the construction division of the Quartermaster Corps contemplated using for the National Army cantonments, as evidenced by the following letter from the Quartermaster General to The Adjutant General, March 22, 1917: ¹⁷

1. Inclosed herewith are 45 sets of mobilization plans for construction of temporary cantonment buildings which will be needed to shelter troops, animals, and supplies at regimental, brigade, or division training points, with request that 15 sets be transmitted to each of the department commanders of the Eastern, Western, and Central Departments for use of the quartermasters under their respective commands, in order that they can familiarize themselves with them and can study the resource of local markets in their departments for the supply of the material, and in general to adapt the plans to particular sites as rapidly as the latter are determined. Reference in this connection is made to first indorsement of this office of the 21st instant, No. 652-C. R. (general) on letter of The Adjutant General, of the same date.

In an indorsement to this letter, dated March 26, 1917, The Adjutant General informed the Quartermaster General that copies of his letter, each copy accompanied by 15 sets of the plans that were inclosed, had been sent that day to the commanding generals of the Eastern, Central, and Western Departments for action as recommended. ¹⁷

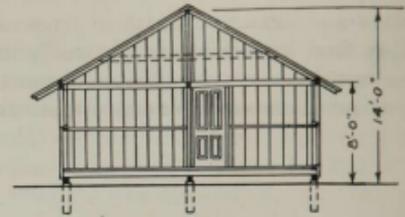
These plans were approved by the Secretary of War some time between March 22 and 26, 1917, and were then dispatched to department commanders. ¹⁸ The records do not show that the Medical Department had been consulted with reference to the sanitary features involved. Incidentally, a few barracks of the 1916 type were erected at Fort Myer, Va., in April and May of 1917. ¹⁹

Each barrack has 2 bents for office, etc.		Dormitory Bents							No. of Men.			
		Windows and Doors				Totals						
Length of Bays	No. of bents	Windows	Door	Windows	Door	Windows	Door	Windows	Door	Total		
65'	9	3	1	3				6	1	7	37	
70'	10	3	1	4				7	1	8	43	
77'	11	4	1	4				8	1	9	49	
91'	13	3	1	3	1	3		9	2	11	55	
98'	14	3	1	4	1	3		10	2	12	61	
105'	15	3	1	4	1	4		11	2	13	67	
112'	16	4	1	4	1	4		12	2	14	73	
126'	18	3	1	3	1	4	1	3	3	16	79	
133'	19	3	1	4	1	4	1	3	4	3	85	
140'	20	3	1	4	1	4	1	4	5	3	18	91
147'	21	4	1	4	1	4	1	4	6	3	19	97

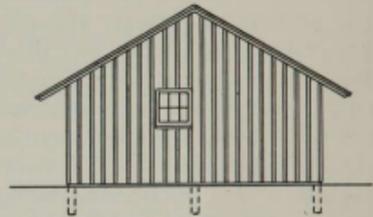
SCHEDULE OF BARRACKS

NOTE:

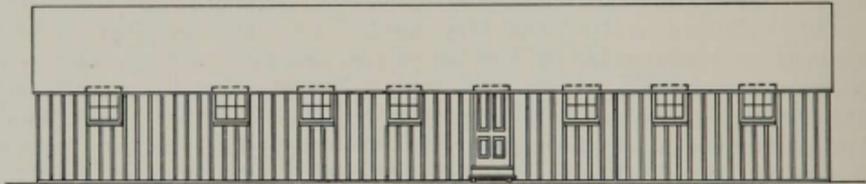
Each door bent to have a flue.



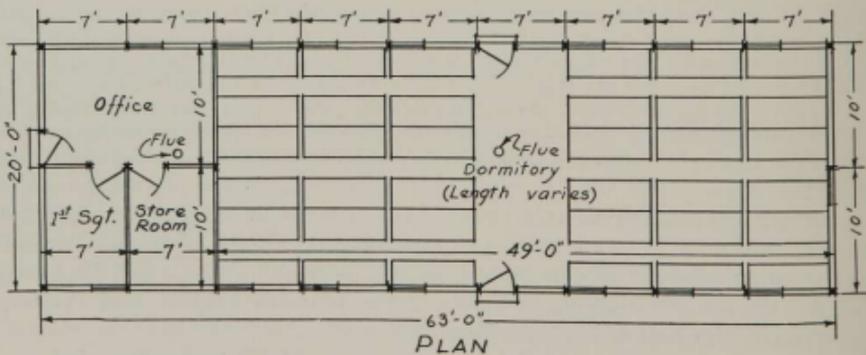
SECTION



END ELEVATION



SIDE ELEVATION



PLAN

FIG. 3.—Barrack 20 feet wide, providing about 27 square feet of floor space and 291 cubic feet of air space per man in the dormitory. Ventilation through windows only. This plan was the original sent out March 26, 1917, without reference to the Medical Department

Because of their proximity to the War Department, they afforded opportunity to the Quartermaster General and the Surgeon General to reconcile their views on the character of barracks construction. In so far as this construction character is concerned, the Surgeon General, on May 3, stated to the Chief of Staff ²⁰ that, in his opinion, we should guard against the tendency to build barracks to accommodate large numbers of men because of the dangers of respiratory diseases.

In commenting on this statement the Quartermaster General replied:

* * * * *

2. The general plan proposed by this office for housing the increased army contemplates the use of two buildings for each company for barracks. These are temporary frame structures in accordance with plans which have been approved by the General Staff and the Secretary of War. These buildings are well ventilated, and it is believed that troops housed in this manner will be as healthy as those housed in the ordinary post barracks. The cubic air space is not so great, but on account of the nature of the construction the ventilation will be much greater than the figures would indicate.

* * * * *

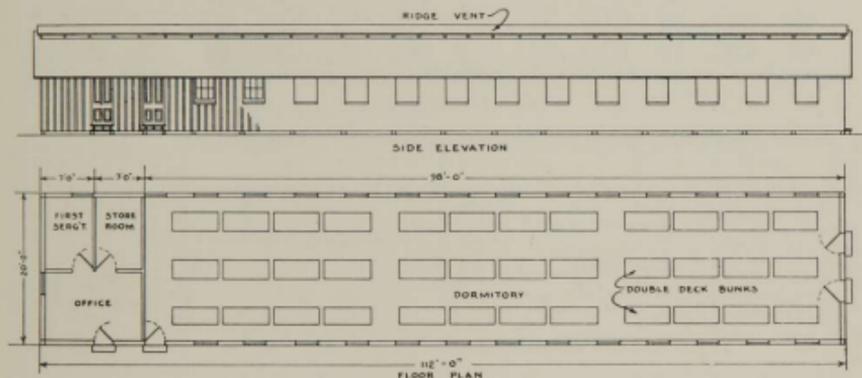


FIG. 4.—One-story barracks, 20 feet by 112 feet, with full ridge ventilation. Provides 54 square feet of floor space for each double-deck bunk and about 283 cubic feet of air space per capita for 72 men

4. It is not understood why the spread of contagious disease should be more feared in buildings of this type than for barracks constructed for occupancy of posts. It is well understood that there is no more healthful or sanitary way of caring for large bodies of troops than under canvas. It has been demonstrated on a number of occasions that troops sheltered by tents have better health than troops alongside of them sheltered in buildings. It is impossible, however, to obtain canvas for any of these troops on account of the shortage of material. This has rendered necessary the construction of the buildings submitted, which are in fact in the nature of a substitute for tentage.

5. For summer occupancy the construction consists of thin walls of one layer of boards; in fact, just enough to keep out the weather. It is proposed to line these buildings with some kind of patent board material for winter use so that they might be heated.

* * * * *

7. Several types of the kind of buildings, the use of which we are anticipating, have been constructed at Fort Myer, and it is the hope of this office that the authorities concerned in the sanitary arrangements which are being made relative to the increased Army and to the method of housing them in general will inspect these buildings and offer such suggestions as they may deem proper in improving them. In fact, the buildings built at Fort Myer were constructed as samples with that end in view. There is time left, to remedy any defects that might be noted and make these structures as suitable as possible for the purpose for which intended.

On May 17, 1917, the Quartermaster General forwarded to the Surgeon General a memorandum from the officer in charge of the construction division, in which the statement was made that plans for a two-story barrack had been prepared as a substitution for the single-story barrack.²¹ The purpose of this memorandum was not only to acquaint the Surgeon General with the fact that plans for a two-story barrack had been prepared but also to get an expression of opinion from him as to the suitability for housing our troops in the cantonments to be constructed.

On May 17, 1917, The Adjutant General directed the Surgeon General to report any defects he might note in the temporary buildings which had been erected at Fort Myer, Va., together with his recommendations thereon.²⁰ On

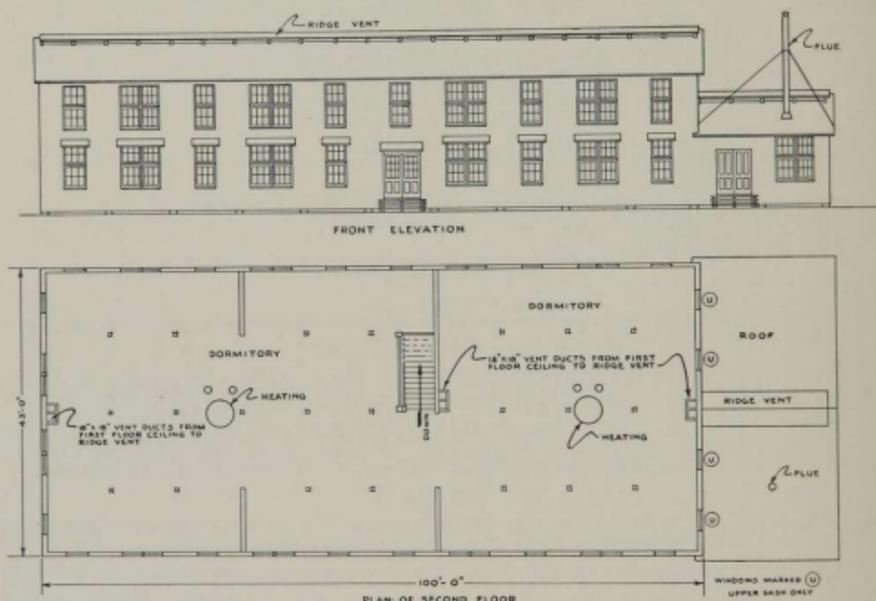


FIG. 5.—Two-story barrack for 167 men, providing about 36 square feet of floor space and 360 cubic feet of air space per man. Provides full ridge ventilation for upper story and three shafts for lower story

May 21, 1917, the Surgeon General reported²⁰ that the following defects were noted in the buildings at Fort Myer: Some buildings were too long and all contained too many men. The floor space was about 30 square feet, and in those using camp cots the cots were practically side by side. The cubic space was from 200 to 230 cubic feet, and with a 7-foot 9-inch wall, the room would be intolerable, if ceiled.

The following changes were recommended: Full length ridge ventilation in all buildings. Air inlets under windows to deflect the air current upward. Higher side walls. Ventilators and windows to be screened. For each man, 60 square feet and 600 cubic feet, the square surface being reducible to 50 feet if double bunks were to be used. The kitchen to be larger.

Most of the above suggestions were carried out in the newly adopted two-story plans. The square and cubic space had been increased slightly,

though not up to the above standard, but under the circumstances they were acceptable to the Surgeon General.

In further explanation of these newly-adopted two-story barracks the Quartermaster General stated that:²⁰

* * * These buildings are temporary frame structures, in accordance with plans which have been approved by the General Staff and the Secretary of War. They are well ventilated, and it is believed that the troops housed in this manner will be as healthy as those housed in the ordinary post barracks. The cubic air space is not so great, but on account of the nature of the construction the ventilation will be much greater than the figures would indicate.

It is further believed that buildings 20 feet wide, with windows longitudinally, and with doors on each side of every 28 feet, will not be intolerably hot with the doors and windows open.

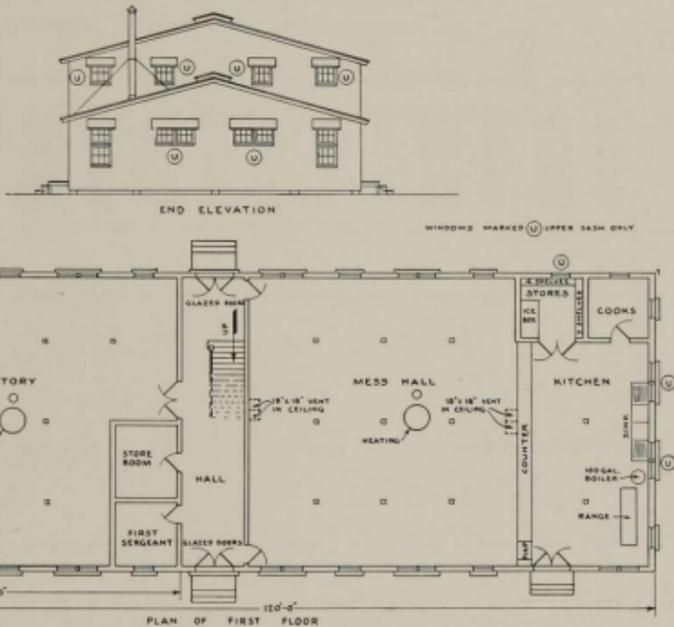


FIG. 6.—Same as Figure 5, showing lower floor

Provision has already been made for ridge ventilation over the kitchens and cooks' rooms, and it has been the expectation of this office from the first that all openings would be screened. It is not considered necessary to cut openings in the walls beneath the present windows, and such action will not be taken until the buildings have been tried out, as this is something that can be done without difficulty at any time.

In a further report on the Fort Myer temporary buildings, made to the Chief of Staff by the Surgeon General on June 7, 1917, anxiety was expressed with regard to the crowding that had occurred in these barracks, and his belief that these plans should be adopted only tentatively until further appropriations could be obtained for more extended building operations.

In the meantime, as stated above, the Quartermaster Corps had drafted a new set of plans for temporary buildings in mobilization camps²¹ and this set included the two-story barracks referred to above. In the designs for the one-story type, which bear the date of May, 1917, only one of the recommenda-

tions made in the Surgeon General's indorsement of May 21, 1917, was acted upon, viz, the establishment of full ridge ventilation (see fig. 4). The two-story barracks were built of wood and ceiled with patent composition board. They were not painted outside or inside except in a few camps. Ridge ventilation was provided for the upper floor, and there were three ventilating shafts for the lower floor extending up to the ridge opening. The windows were about double the size of those in the one-story structures. The buildings were 43 feet wide and varied in length to accommodate organizations of different sizes, conforming in general type to the plans shown in Figures 5, 6, 7, and 8. They were designed in sizes for accommodating 105, 123, 167, 190, and 200 men, respectively. The lower floor contained a large dormitory, an office, a storeroom, the mess hall, and the kitchen, the latter being in an ell. The upper floor was used exclusively as a dormitory, which in some types was

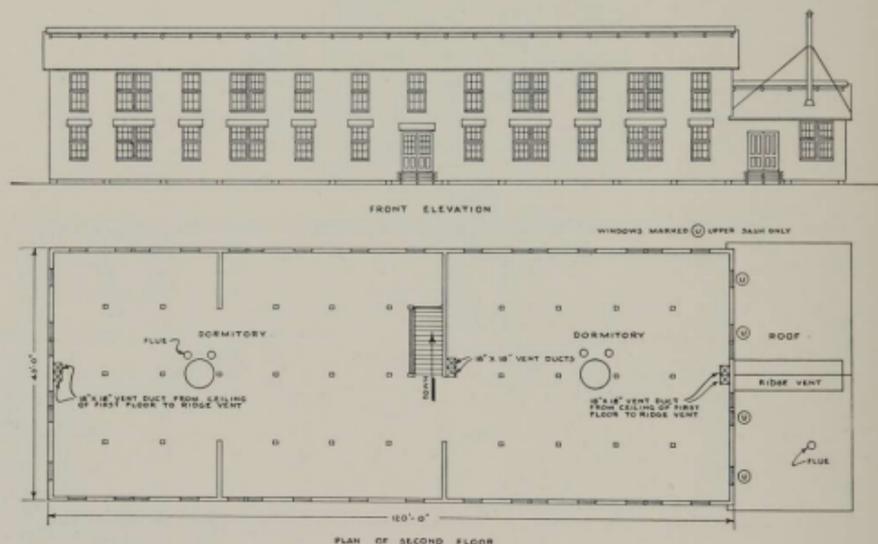


FIG. 7.—Two-story barrack with full ridge ventilation, originally intended for 200 men, allowing about 36 square feet of floor space and 362 cubic feet of air space per capita—43 by 120 feet; for a company of Infantry

divided in two parts by a transverse partition.²² All the dormitory rooms were large, sheltering from 40 to 70 men each. It was contemplated that double-deck bunks be used, and the air space allowed per man ranged from 360 to 374 cubic feet. The initial construction at all the National Army cantonments began with this type of barrack which, in his indorsement of June 7, 1917, the Surgeon General tentatively approved, until such time as further appropriations could be secured. However, in view of the evident fact that serious overcrowding would result, with consequent liability to the spread of disease, the Secretary of War, at the suggestion of the Surgeon General, appointed a medical board^a to examine the housing plans for cantonments and to submit recommendations concerning them.²³ This board, on June 14, 1917, reported:

^a Surg. Gen. William C. Gorgas, U. S. Army; Dr. William H. Welch, of Baltimore; Dr. Franklin Martin, of Chicago, and Dr. Victor C. Vaughan, of Ann Arbor.

Two grave sanitary defects at once became evident on the examination of the plans. These are, first, overcrowding, i. e., the men in the dormitories are too close together; and, second, there are too many men in each dormitory. The amount of cubic space allowed to each man averages about 338 cubic feet.^b This is altogether too small.

Surgeon General Gorgas found, both on the Canal Zone and when called to South Africa, that septic pneumonia was practically uncontrollable when men were too closely crowded. The same, no doubt, is true of other respiratory diseases to a greater or less extent. The most serious of these are cerebrospinal meningitis, pneumonia, tuberculosis,

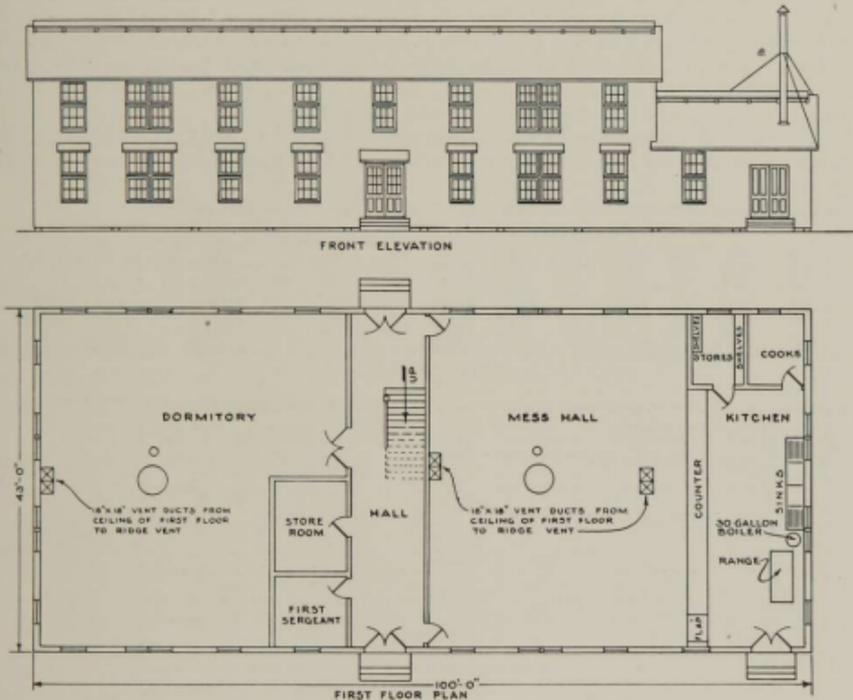


FIG. 8.—Two-story barrack for 123 men, providing about 37 square feet of floor space and about 375 cubic feet of air space per man

measles, mumps, scarlet fever, and whooping cough. All of these are transmitted by direct contact, and the degree of transmission is inversely in proportion to the distance between individuals.

The amount of cubic air space per man is lower than that which would be permitted in any prison in the United States. It is also lower than the standards established by law in common lodging houses for the housing of the most worthless and degraded element of our cities. It is below the standards legally demanded in practically all of the tenement-house laws of the country, standards which, in some instances, have been in force and effect for 50 years, and in others for 20 years. The amount of cubic space is distinctly below the minimum allowed by the English in housing their soldiers in France, where the minimum amount of cubic air space per man is 500 cubic feet.

The number of men in each room in the dormitories is too great. When one of the infections mentioned above breaks out, it is more than likely that before the disease is clini-

^b It is assumed that this per capita figure is based upon the air space available after deducting that occupied by lockers, stoves, and perhaps other furniture. The actual internal capacity of the barracks without such deductions gave per capita allowances ranging from 360 to 375 cubic feet, as shown in Figures 6, 7, 8, and 9, which represent the earliest type of two-story construction of record.

cally recognized all those sleeping in the same room, or at least all of those who are susceptible, will have become infected. It will be necessary, therefore, when a case of cerebrospinal meningitis appears in the occupant of any room to examine all of his roommates. This could be easily done if the number in a room is limited to 30. It would be difficult with a much larger number. In the English Army, as we are informed by Colonel Goodwin, only 30 men are allowed in a shack or a dormitory. The number certainly should not exceed 50, and the smaller number is much preferable. The board feels that it is imperative that more space should be provided and that the number occupying a room in a dormitory should be markedly decreased. The cubic feet per man should not be less than 500, and preferably 600.

The double-deck bunks are a relic of the type of construction tolerated 20 or 30 years ago in our cheap lodging houses, but outlawed by sanitary regulations for many years. It is an unpleasant arrangement for the occupants of both bunks and it interferes more or less with ventilation. If the bunks were placed parallel to the side walls, space between bunks would be increased and better ventilation would be secured.

We regard the bathing facilities as inadequate and would suggest that rooms or halls be fitted with water pipes with numerous stopcocks so that a whole company, or, if need be, a

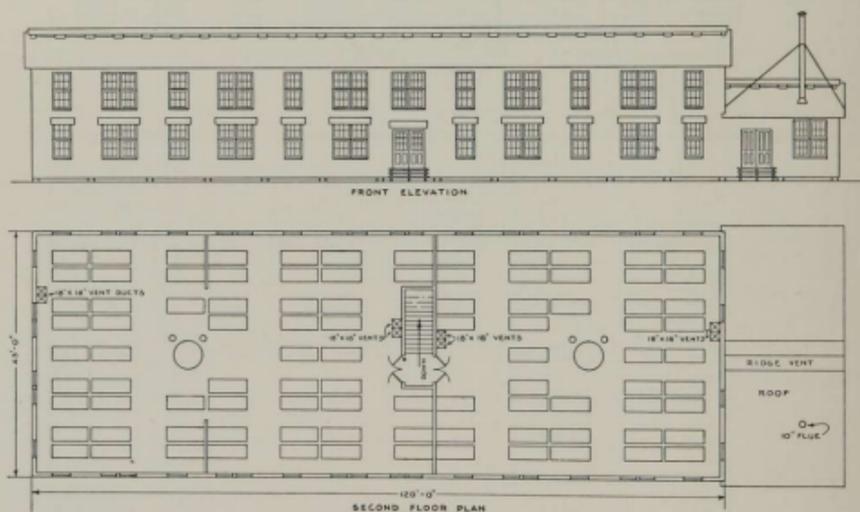


FIG. 9.—Two-story barrack designed for 200 men, as shown in Figure 7, later designated to hold 137 men, allowing about 53 square feet of floor space and 528 cubic feet of air space per capita

whole regiment could be marched through the bath at one time. Daily bathing should be a part of the military training and exercise. An arrangement of this kind will increase the efficiency of the bathing facilities, and at the same time will greatly diminish the cost.

Along with the bathhouse there should be facilities for sterilizing the clothing. In European armies to-day, companies and regiments are passed through the bath at once. Before entering the bath their clothing is removed and placed in a sterilizer, and by the time they get through the bath the sterilized clothing is ready to be used again. This is an important matter, not only for purposes of cleanliness, but in order to destroy vermin and to lessen the chances of infection.

It is well to bear in mind the desirability of making all buildings rat proof.

Lockers for clothing are not to be recommended. Individuals will place articles of food in these lockers, cockroaches and other insects will infest them, damp clothing will be hung in them, they must be opened at every inspection, and this will demand unnecessary time. The extra clothing may be placed on hooks attached to the cots or beds, where they will always be exposed to moving air. The present arrangement for the lockers interferes with the free movement of air through the dormitory, and we are quite positive that they should be eliminated.

If feasible, and we think it is, sections of the walls on each side of every dormitory should be placed on hinges so that they can be raised, thus converting each dormitory practically into an outdoor sleeping porch. There is no section of the United States, even in the most severe winter, where men can not sleep comfortably, when provided with enough blankets, in such dormitories. Such an arrangement will greatly reduce the chance of infection. Moreover, with such an arrangement these cantonments might, after the war, be used as great tubercular camps, and would not become useless when no longer needed by our soldiers. This we consider a matter of no little importance.

The committee makes the following recommendations: 1. That the cubic air space per man be increased to 500 cubic feet. 2. That the unit to be housed in each barrack be reduced to 30. We believe that no sanitary advice is sound which does not provide for at least 500 cubic feet of air space per man and not more than 30 men in a barrack. 3. That the double-deck bunks be eliminated. 4. That the lockers be eliminated. 5. That the outer walls be so constructed that sections may be raised, so as to practically convert the dormitories into outdoor sleeping porches. 6. That the bathing facilities be modified as the board has indicated in the body of this report. 7. That in cantonments for which contracts have already been let small barracks be built adjacent to the ones already provided for in the contract so as to lessen the crowding in the barracks as contracted for. 8. That in locating barracks, the advantage of prevailing winds should be taken into consideration for the purpose of utilizing them in securing ventilation. 9. That Congress be asked to provide for the additional cost of these cantonments rendered necessary by the suggested improvements in hygienic conditions.

On June 14, 1917, the Secretary of War directed the Quartermaster General to carry into effect, in so far as work not already done would permit, the recommendations of the medical board.²⁴

The following memorandum dated July 16, 1917, from the Surgeon General to the officer in charge of cantonment construction was supplementary to the report of the board given above:²⁵

In making this recommendation for changes in the barracks plans, the board desires not to delay the work, and we have kept in view the fact that it was necessary for you to have these cantonments finished by September 1.

We were informed that to carry out our suggestions would cost a very much larger sum than your department had at its disposal, and we made the recommendations knowing that you would have to ask Congress for more money. We expected, therefore, that you would proceed on the present lines, putting up the buildings just as planned, but that you would at once put in estimates for the money needed to carry out our suggestions, and as soon as this money was obtained would cease to put up buildings of a type we object to, and proceed to put up buildings to contain 30 men or less, of sufficient number to give the occupants at least 500 feet of cubic space.

As Surgeon General of the Army, I am of the opinion that the plan outlined would meet the sanitary requirements. I, of course, can not speak for the board, but I am inclined to think that the board would concur in my opinion if they took into consideration the objections to our total plan that Colonel Littell presents to me.

On the same day, the officer in charge of cantonment construction replied as follows, to the last-quoted memorandum of the Surgeon General:²⁶

1. Estimates have been submitted to Congress covering the cost of the increased size of the barracks buildings to meet the wishes of the Surgeon General's Department. Pending the passage of these appropriations, it is desired to get your approval of the changes proposed, so that when the money is available, the changes can be made as expeditiously as possible.

2. After consultation with several representatives of the Surgeon General's Department, it has been decided to suggest the following changes in the design of the cantonments to accomplish the results desired by the Surgeon General's Department, namely, of providing at least 500 cubic feet of air space per man in the barracks and to use single-deck cots.

(a) To modify the interior arrangement of the two-story barracks building as shown in the attached blue prints A and A 2, which contemplates caring for 41 men on the first floor and 96 men on the second floor.

(b) To construct a separate two-story building to be located between the existing two-story buildings to house 28 men on the first floor and 32 men on the second floor. This building to be as shown on sheet AA.

3. All of these rooms will then contain more than 500 cubic feet of space per man and will permit the use of single-deck cots.

4. The funds as estimated will cover the expense of these changes, and it is the opinion of this office that the changes as outlined can be made with the minimum of inconvenience to the men, in case the funds should not become available until after the cantonments have been constructed and are occupied.

With a view to avoiding further alterations in plans, while complying with the wishes of the Medical Department, the number of men to be accommodated in the large type of barracks originally intended for 200 (see fig. 7) was reduced to 137, 41 on the first and 96 on the second floor. The bunk arrangement necessary to comply with this revision in capacity is shown in Figures 9

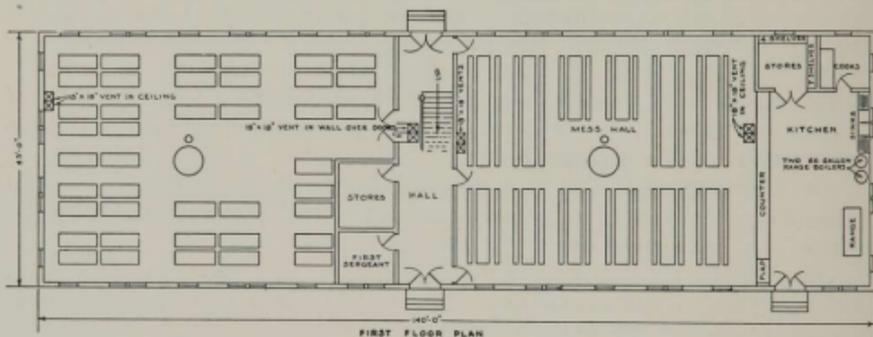


FIG. 10.—Same as Figure 9, showing first-floor arrangement

and 10. This change gave 53 square feet of floor space and 528 cubic feet of air space per capita. In order to provide shelter for the remaining men in each organization, plans were drawn for a two-story barrack accommodating 60 men, 28 on the first and 32 on the second floor, with no communication between the two (fig. 11).²⁷ They provided 55 square feet of floor space and 530 cubic feet of air space per capita. Wherever possible these smaller buildings were constructed near to or between the larger 137-men buildings.²⁶

In August, 1917, companies of Infantry and Engineers were increased to 250 men, and Light and Heavy Artillery to 199 and 206, respectively, in accordance with the reorganization of the Army.²⁸ To meet this increase, additional 60-men barracks were constructed when possible, making three barracks in all for a company of Infantry, one holding 137 men and two holding 60 men each. In other instances partitions were built across some of the larger barracks so dividing them that one whole barrack and a part of another could be assigned to an organization. In some camps the capacity of the upper story of a large barrack was increased by an extension built out over the kitchen ell.²⁹

In the temporary stations (except aviation fields) which were authorized after July 15, 1917, a two-story building accommodating 66 men was used, and

such a type later became the standard for cantonment barracks.³⁰ This was practically the same structure as the one described in the preceding paragraph, but was intended for 66 beds instead of 60, giving 51 square feet of floor space and 480 cubic feet of air space per man. The plan is shown in Figures 12 and

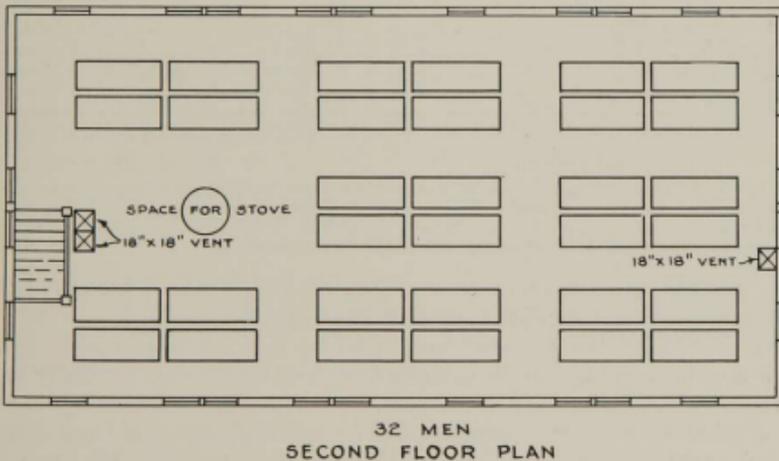
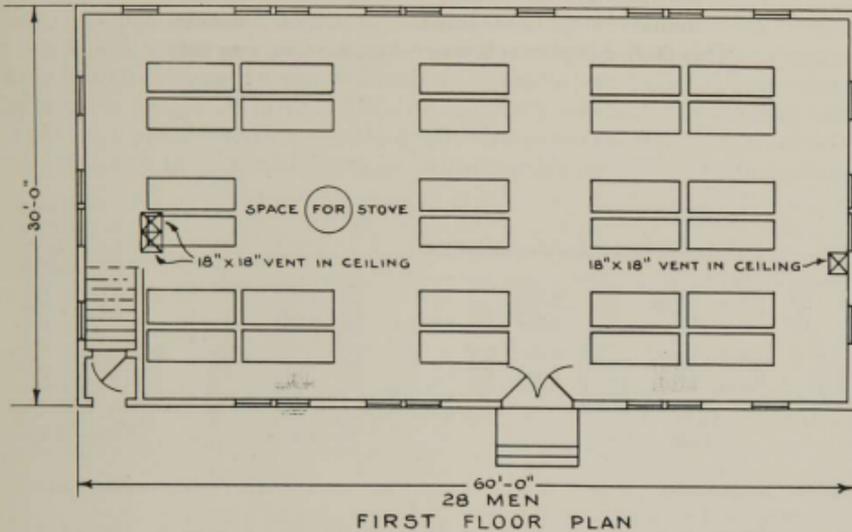


FIG. 11.—Two-story barrack for 60 men, designed to accommodate overflow from large barrack (fig. 7). Provides 55 square feet of floor space and 530 cubic feet of air space per man. Essentially the same as Figure 12, which was designated to shelter 66 men

13, the latter having shaft instead of ridge ventilation. There was no direct communication between upper and lower stories. It took four such buildings to accommodate a company of Infantry or Engineers, and three for a battery of Artillery. There was a detached lavatory and a combined kitchen and

mess hall building for each company or similar organization.³¹ The first cantonment composed of this type building was Camp Joseph E. Johnston, Jacksonville, Fla., and the second was Camp Meigs, Washington, D. C., both Quartermaster Department stations.³² These barracks also were used elsewhere, notably at the ports of embarkation and at Camp Mills.³³ New construction at National Army cantonments for depot brigades and for other purposes conformed to this plan. This 66-bed barrack was regarded as a great improvement in every way over the original barracks; it met fairly well most of the requirements laid down by the medical board in its report of June 14, 1917, viz, relatively small dormitories (32 to 34 men), approximately 500 cubic feet of air space per capita, ridge ventilation, single bunks, good bathing facilities, and the absence of lockers. Movable wall sections, baths of the type recommended, and sterilizers for clothing were not provided, but the absence of the latter was compensated for in part by fairly large sterilizers located at base hospitals and by excellent steam laundries which were generally installed. Furthermore, the building of a sterilizer really adequate for clothing known as a delousing plant was just about to be approved for each large camp when the signing of the armistice stopped the work as a whole.³⁴ The greatest sanitary weakness in this 66-bed barrack was the failure to combine the heating and ventilating systems.

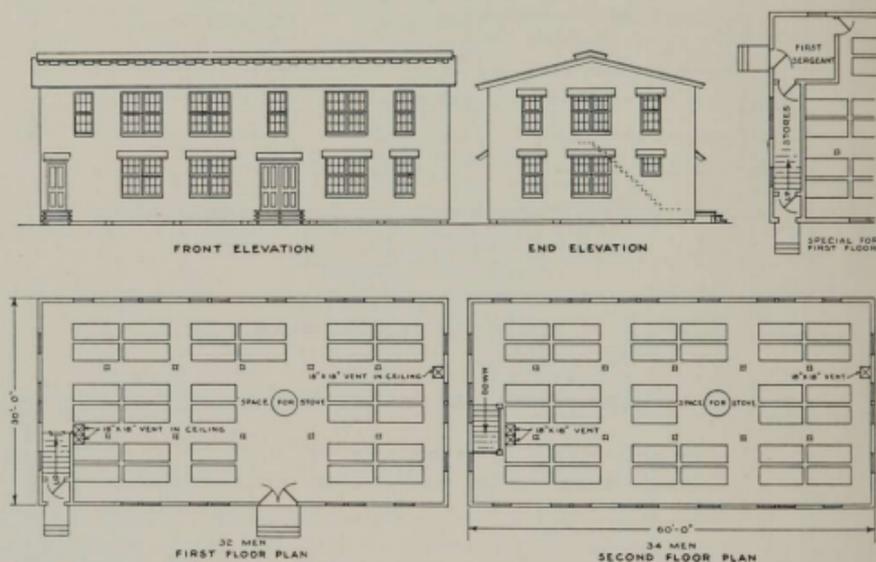


FIG. 12.—Standard two-story barrack, designed to accommodate 66 men, providing about 51 square feet of floor space and 482 cubic feet of air space per capita. All cantonment stations, except the 16 National Army cantonments, consisted of barracks of this type or of the type shown in Figure 13. Many of the National Army cantonments were expanded by constructing barracks of this design. There was no direct connection between upper and lower floors

ties, and the absence of lockers. Movable wall sections, baths of the type recommended, and sterilizers for clothing were not provided, but the absence of the latter was compensated for in part by fairly large sterilizers located at base hospitals and by excellent steam laundries which were generally installed. Furthermore, the building of a sterilizer really adequate for clothing known as a delousing plant was just about to be approved for each large camp when the signing of the armistice stopped the work as a whole.³⁴ The greatest sanitary weakness in this 66-bed barrack was the failure to combine the heating and ventilating systems.

OVERCROWDING IN BARRACKS

Much valuable time elapsed between the date of approval of the original cantonment plans by the Secretary of War, on or before March 26, 1917, and

their final revision, as indicated in the letter of July 16, 1917, from the officer in charge of cantonment construction to the Surgeon General, quoted on p. 139. During the latter part of this period construction work at the cantonments, at officers' training camps, and elsewhere had been proceeding at the greatest possible speed, the type of construction varying in accordance with the frequent changing of plans, some barracks being of the 1916 type (fig. 3), giving about 283 cubic feet of air space per capita, or this barracks as modified. Early construction at National Army cantonments was, however, mainly of the type shown in Figures 5, 6, 7, 8, and 9, providing 362, 375, 528, and 530 cubic feet of air space per capita, respectively. At the date the first increments of the draft were called (September, 1917) many of the barracks were not completed.³⁵ Presently more men were sent to camps in many instances than the authorized housing capacity of the camps in question. Consequently, overcrowding was apparent almost as soon as troops began to arrive in camps. This caused imme-

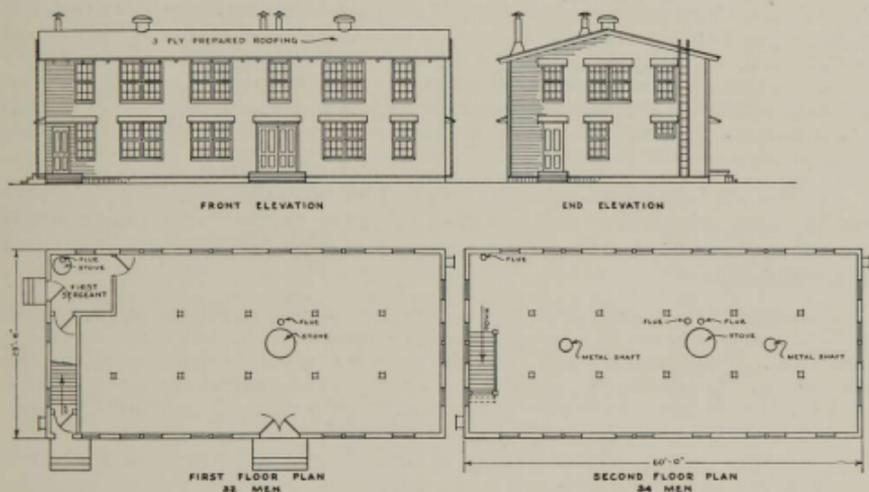


FIG. 13.—Standard two-story barrack, designed to accommodate 66 men, providing about 51 square feet of floor space and 482 cubic feet of air space per capita. Almost identical with Figure 12, except for the ventilation of the second floor by metal shafts and the absence of ventilating shafts in lower story

diately and repeated protests from various camp sanitary inspectors.¹ On November 7, 1917, as a result of reports from camp sanitary inspectors and of other reports received by him, the Surgeon General submitted the following recommendations to The Adjutant General:³⁶

1. Reports received in this office indicate that troops in barracks and tents are being overcrowded to a degree prejudicial to health. In many instances the minimum of 500 cubic feet of air space per man is not being maintained; bunks in the squad rooms are usually placed in pairs side by side so that the heads of each two men come close together.

2. The chief objection to crowding is that it forces occupants into close personal contact and therefore largely increases the opportunity for the spread of diseases of a communicable nature. It is well known that many of these diseases, such as pneumonia, epidemic meningitis, diphtheria, scarlet fever, measles, and influenza are chiefly conveyed from man to man by what is called "droplet infection," brought about when the fluid contents of the mouth of an infected individual are sprayed into the air while in the act of speaking, cough-

ing, or sneezing. Infection of a susceptible individual is especially likely to occur if his head is within 2 or 3 feet of the diseased person. Hence the housing of troops under conditions which require men to sleep with their heads nearer together than 4 or 5 feet is dangerous.

3. Weekly telegraphic reports of communicable diseases received in this office indicate that several of the respiratory diseases are increasing at a rapid rate. Pneumonia for the week ending October 19 was three times as prevalent in National Guard cantonments as in the Regular Army in 1916, and for the week ending October 26, nearly six times as prevalent. The rate for this disease in the National Army was about the same as for the National Guard. The prevalence of measles in the Regular Army for 1916 was represented by an annual admission rate of 20.29 per thousand; in the National Guard cantonments the equivalent rate for the week ending October 12, 1917, was nearly double, and for the week ending October 26 almost quadruple that of the Regular Army in 1916. In the National Army cantonments the rate for the latter week was nearly double the normal rate.

4. Of the measures to be instituted for the prevention of the spread of these diseases, the two all-important considerations are sufficient air space and the greatest possible separation of bunks. As regards air space, the minimum which is consistent with safety has been agreed upon to be 500 cubic feet, with not less than 40 square feet of floor space and preferably 45 feet. A separation of at least 5 feet between the heads of the occupants of bunks should be maintained.

5. I recommend that the attention of those concerned be invited to this vital matter, and that commanding officers of all grades be directed to make every possible effort to maintain at least the above minimum requirements as to air space and separation of bunks in squad rooms under their control.

Acting on this urgent communication, The Adjutant General, on November 14, 1917, dispatched the following telegram to the various department commanders and to the commanding generals of National Guard and National Army divisions:³⁴

Reports received indicate troops in barracks and tents are being overcrowded to a degree prejudicial to health, and in some cases the minimum of 500 cubic feet of air space is not maintained. This condition largely increases opportunity for spread of disease of communicable nature. As regards air space, the minimum consistent with safety has been agreed upon as 500 cubic feet, with at least 40 square feet floor space. A separation of at least 5 feet between heads of occupants of bunks should be maintained. Report by wire if barracks in your command are of sufficient capacity to give each soldier the air space, floor space, and bunk arrangement indicated.

Also, under date of November 16, 1917, The Adjutant General furnished an official copy of the Surgeon General's letter of November 7, 1917, to commanding generals of all National Army cantonments and National Guard camps and to department commanders.³⁵ Among the replies elicited by the telegram of November 14, 1917, from The Adjutant General, the following reports and action can be quoted as of interest:³⁶

[Third indorsement]

OFFICE OF THE DIVISION SURGEON, 86TH DIVISION,
Camp Grant, Ill., November 22, 1917.

To the COMMANDING GENERAL, *Camp Grant, Ill.*

1. The large-sized standard barrack building will give the required 500 cubic feet of air space and 40 square feet of floor space to 150 men, 100 on the upper floor and 50 on the lower floor. By additions to these barracks in some organizations they have been made to furnish them from 210 to 230 men with these allowances. Smaller type barracks have been erected which furnish the required allowances to 60 and 80 men. The following table will give an idea of the present allowances of air space in some of the organizations of the camp

and the allowances that will be provided by their present quarters when the organizations are at full strength. In speaking of a "unit," there is meant 500 cubic feet air space and at least 40 square feet of floor space.

Organization	Units in present quarters	Present strength	Air space when at full strength
			<i>Cubic feet</i>
342d Infantry.....	3,210	2,161	466
343d Infantry.....	4,320	2,107	600
331st Field Artillery.....	1,750	877	605
332d Field Artillery.....	1,560	870	540
333d Field Artillery.....	1,725	1,067	500
331st Machine Gun Battalion.....	624	595	430
333d Machine Gun Battalion.....	624	405	570
Trench Mortar Battery.....	312	168	870
Sanitary Train.....	940	908	530
21st Engineers.....	1,050	1,413	360
Signal Battalion.....	460	393	920
341st Infantry.....	3,150	2,750	438

2. There is apparently no necessity at the present time for any overcrowding except in the 21st Engineers. Personal observation confirms the fact that there is overcrowding in this organization. There is a tendency all over the camp which will need to be combated. This is the proposition of saving space for recreation purposes in the quarters allotted for sleeping by concentrating the bunks and double decking them. The proposition of double decking, of itself, is considered a good one, but when it is used as a means of putting an undue number of men in a room it is to be condemned. Also because of the method in use of constructing these double-decked bunks, in groups of four, the men in adjacent bunks might well be within 3 feet of each other instead of the 4 or 5 feet recommended.

3. With the increase to full strength of the organizations, there will be few of them that can divert any part of their sleeping quarters to other purposes without undue crowding and some organizations will need additional barracks. On the other hand, some organizations will have more room than necessary, and an adjustment, particularly after the departure of the Engineer regiments, should furnish adequate room for all organizations in the camp.

CAMP GRANT,

Rockford, Ill., November 21, 1917.

THE ADJUTANT GENERAL OF THE ARMY,

Washington, D. C.⁴⁰

Reference your telegram of November 14, owing to increased strength of organizations after barracks now occupied had been planned, they have not sufficient capacity to give each soldier the air space, floor space and the bunk arrangement indicated therein. In some companies, by using scrap lumber, double-deck bunks have been constructed which increased floor space. At present there is little overcrowding, but when organizations are filled to maximum it will be difficult to allow as much as 400 cubic feet air space, but the free ventilation of barracks is favorable to that allowance.

BARRY.

Despite the telegram of November 14, 1917, overcrowding existed to a marked degree all through the winter of 1917-18.¹ On December 1, 1917, the Surgeon General recommended additional construction and other measures as follows, this action being taken by indorsement upon the report from Camp Grant quoted above:⁴¹

1. During the past two weeks there has been still further increase in the number of new cases of pneumonia and meningitis in camps of the National Army and National Guard, to the extent of 993 new cases of pneumonia and 128 new cases of meningitis. There have been reported to this office 189 deaths from pneumonia and 21 deaths from meningitis during this period. In several camps pneumonia prevails in epidemic form.

2. It is urgently recommended that in each National Army camp the cubic air space and the square floor space per man be immediately increased by additional construction so as to provide a minimum of 500 cubic feet and 45 square feet, respectively, in each squad room where it does not already reach that allowance on the basis of the ultimate maximum strength of the particular organization.

3. It is recommended that in all barracks the men be required to sleep with the feet of one man opposite the heads of the two adjacent men. This arrangement will permit of at least 5 feet separation between the heads and so decrease the chances of spreading respiratory diseases.

4. The use of any portion of the authorized dormitory space for amusement rooms, barber shops, offices, for any other than sleeping purposes should be prohibited. The placing of bunks in groups of two, the bunks being in contact, should also be prohibited.

5. Experience has shown that the use of double-deck bunks invariably leads to overcrowding because of apparent great increase of floor space when this type of bunk is used. Where double-deck bunks have already been installed, 1,000 cubic feet of air space and 90 square feet of floor space per bunk should be insisted upon. The placing of double-deck bunks in groups of two and four should be prohibited.

In response to this indorsement, The Adjutant General, on December 8, 1917, stated that all department and National Army division commanders had been instructed by telegraph to carry out such matters as were recommended in paragraphs 3, 4, and 5 of the Surgeon General's indorsement and to allow each man a minimum of 500 cubic feet air space and 45 square feet floor space in squad rooms, and that there was sufficient construction already supplied to allow the space required if properly distributed.⁴²

On February 20, 1918, the Surgeon General recommended, concerning the designation on squad-room doors of the authorized man capacity of the squad rooms,⁴⁴ that there be stenciled on the doors of all barrack dormitories the authorized man capacity of said dormitory, this man capacity to be based upon an authorized allowance per soldier of 50 square feet of floor space and at least 500 cubic feet of air space.

Such labeling served a double purpose. It tended to prevent the frequent practice of placing more men in a dormitory than it was adapted for. It also greatly facilitated sanitary inspections, enabling the inspector to determine if overcrowding existed without the necessity of measuring the room and computing its contents.

This recommendation was approved by The Adjutant General, and on March 5, 1918, was sent by him to the commanding generals of all National Army divisions and to the commanding generals of all departments, its connection with his telegram of December 8, 1917, regarding floor and air space in barracks being specified.⁴⁵

The following communication from the Surgeon General to The Adjutant General, May 4, 1918, summarizes the recommendations made by the Surgeon General from time to time and indicates concisely his desire to increase the allowance of floor space, this action being based upon his strengthening conviction that separation of individuals—floor space—was of more fundamental importance than cubic air space:⁴⁶

* * * * *

2. Several recommendations have been made from this office to The Adjutant General of the Army with reference to floor space and air space. On November 7, 1917, it was recommended that at least 500 cubic feet of air space and not less than 40 square feet of floor space, and preferably 45 feet, be provided for men in barracks, and that a separation of at

least 5 feet between the heads of occupants of bunks be maintained. Telegrams prescribing such action were sent out by your office under date of November 14, 1917.

3. On December 1, as a result of the increase of respiratory diseases, it was recommended that the minimum of 500 cubic feet of air space and 45 square feet of floor space be maintained in each squad room; that the men be required to sleep in such a way that the feet of one man were opposite the heads of the two adjacent men; that bunks be not placed in groups of two, and that no dormitory space be used for purposes other than that for which it was intended. The three latter recommendations were approved by your office.

4. On February 20, 1918, it was recommended that all dormitories be marked on the doors, showing their authorized capacity on a basis of one man for each 50 square feet of floor space and 500 cubic feet of air space. It is understood that this recommendation was approved, although this office has no copy of the approval on file. Observation of inspectors has shown that dormitories are being marked.

That overcrowding at cantonments continued to exist in greater or less degree until a short time before the signing of the armistice, and even thereafter, in some instances, is evidenced by the reports of the special sanitary inspectors from the Office of the Surgeon General.¹

HOUSING AT FLYING FIELDS

The barracks for aviation stations in this country were designed by civilian architects, under the supervision of the construction division of the Signal Corps.⁴⁷ The first type built was a one-story frame structure, lined with

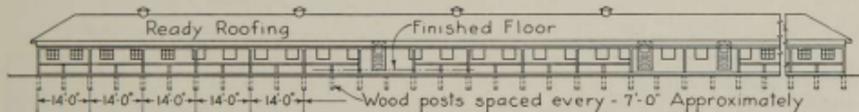


Fig. 14.—Original aviation barracks. Front view, showing 10-foot porch

patent composition board and painted inside and out. It was 356 feet long and 20 feet wide, with a 10-foot porch along the entire front. A ceiling extended across horizontally about halfway up on the slope of the roof, giving a mean height for the dormitory space of approximately $9\frac{1}{2}$ feet. An ell at the back accommodated excellent lavatories. This building had galvanized-steel ventilators and was intended to accommodate 140 men in the main dormitory, giving approximately 42 square feet of floor space and 404 cubic feet of air space per capita.⁴⁸ Single-deck bunks were supposed to be used, *placed in pairs*, the two bunks touching each other, with a space of about 2 feet between each pair (figs. 14 and 15). In many instances double-deck bunks were employed and more than 140 men were put in the dormitories.¹

In August, 1917, following the recommendations of the Surgeon General,⁴⁹ these buildings were altered by moving forward the front wall, including the porch area, and dividing the entire interior into six small dormitory rooms by means of transverse partitions.⁵⁰ The plan then provided for 148 beds in these six dormitories. This gave an average of 25 men to a room, with about 59 square feet of floor space and 539 cubic feet of air space per capita. The contemplated arrangement of cots is shown in Figure 16. There were no further changes in this type of aviation barracks during the war, but another type designed for 150 men was built at some stations; it contained a single large dormitory 199 by 42 feet and provided about 56 square feet of floor space per man.

SHELTER IN TENT CAMPS

National Guard troops were housed in pyramidal tents almost exclusively, both during their mobilization in the various States and after their arrival in their training camps.⁵¹ In the latter the tents ultimately were framed and floored.⁵² After the departure of these troops for Europe, their places were taken by various National Army and Regular Army divisions, which also were housed in tents. As noted in the preceding chapter, the tent camps, with the exception of a few temporary summer camps, were located in the Southern States. Owing to the high original cost of canvas and its relatively quick deterioration when exposed to the weather, this method of housing troops, if extended over a considerable period, is generally more expensive than frame construction. Tentage was used in this instance because sufficient time was not available for building cantonments for the National Guard; furthermore, it was expected that they would go overseas sooner than they

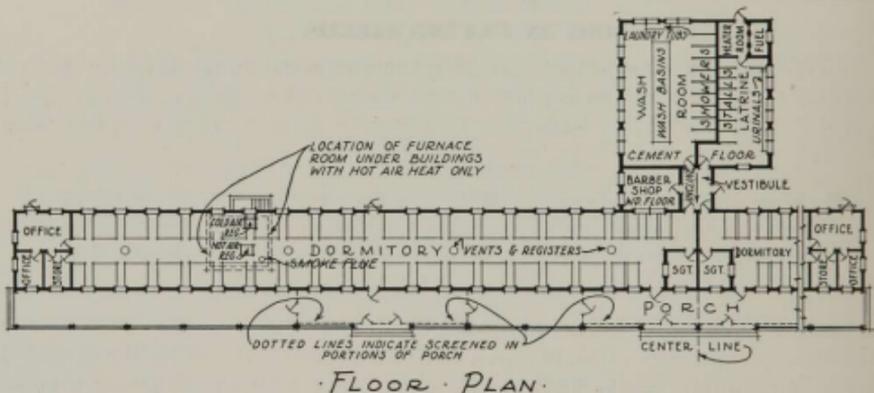


FIG. 15.—Floor plan, original aviation barracks. One story, 20 by 168 feet, with 10-foot porch in front. Planned for 140 men in two main dormitories, allowing 42 square feet of floor space and 404 cubic feet of air space per capita

actually did. For the enlisted men the large pyramidal tents used had formerly been considered of sufficient size to accommodate 8 men, and even 12 in emergency for short periods. They could be well ventilated by rolling up the sides and throwing back the cowl at the peak of the tent.

The pyramidal tent when framed and floored was about 16 feet square, its walls were about $6\frac{1}{2}$ feet high and its peak was $15\frac{1}{2}$ feet above the floor.⁵³ It provided 256 square feet of floor space and approximately 2,775 cubic feet of air space; with 8 occupants it allowed 32 square feet and 348 cubic feet per capita (see fig. 11). With 12 occupants the air space was reduced to 231 feet per capita. If the tent was not framed, the wall was only about 3 feet high and consequently the cubic air space was much less than that given.

In the beginning there was a shortage of canvas in the United States, and National Guard troops were required to bring to their training camps the tentage they had been using at State mobilization points.⁵⁴ This was then supplemented by all other tents available. The amount of tentage being limited, it so happened that tents were at once crowded to their emergency

capacity of 12 men, and in some instances even above this figure. This matter was early brought to the attention of the War Department by the commanding general, Southeastern Department, in the following correspondence:⁵⁵

1. The order to sleep 12 men to one pyramidal tent is, in the opinion of this office, one which will work a great hardship and possibly loss of life among the enlisted personnel. Without floors it would be almost a matter of impossibility to keep sanitary conditions such as to keep a healthful command. This would apply especially in localities such as Camp Sevier where the ground is hilly. A tent without a floor, occupied by 12 men, on the side of these hills, would be so uncomfortable that the men would hardly get the necessary sleep.

2. It is urged that this matter be brought to the attention of the Surgeon General's Department in the interest of the men.

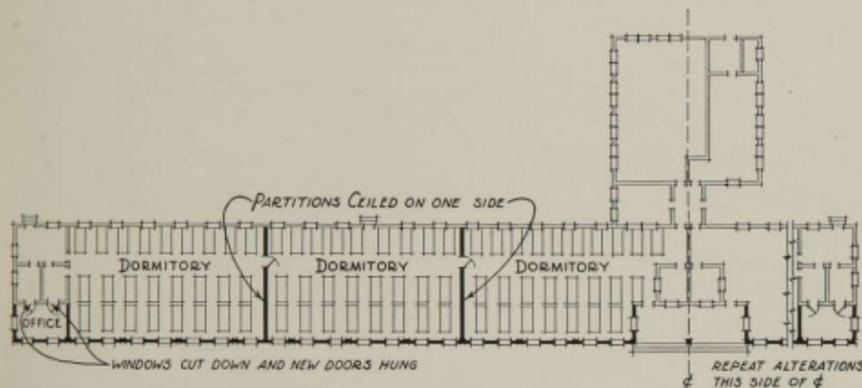


FIG. 16.—Floor plan modified aviation barrack, as altered August, 1917, to include former porch, and divided into dormitories holding 25 men each; allowing 59 square feet of floor space and 539 cubic feet of air space per capita

[First indorsement]

HEADQUARTERS SOUTHEASTERN DEPARTMENT,
Charleston, S. C., August 18, 1917.

Respectfully referred to The Adjutant General, Washington, D. C.

1. I have already invited attention to the necessity of flooring tents. The proposition to put 12 men in one tent without floors is one which should not be considered for a moment. It would be economy attained at the expense of the health, efficiency, and lives of the men.

2. I recommend tents be floored and not more than 8 men put in a tent. It will be difficult to take care of even this number when the weather becomes such that stoves are required.

(Signed) LEONARD WOOD,
Major General, U. S. Army.

Received, A. G. O., August 21, 1917.

On August 27, 1917, the Surgeon General invited the attention of the War Department to the serious danger attending overcrowding in tents:⁵⁵

1. The subject matter of these communications is regarded by this office as of vital importance.

2. The proposed overcrowding in cantonments of the National Guard to the extent of placing 12 men in one pyramidal tent will result in two highly insanitary conditions—insufficient air space per man and greatly increased opportunity for contact infection. Under these conditions it may confidently be predicted that pneumonia, now known to be a contagious disease, will appear, and there is reason to expect a more troublesome experience with it than that encountered during the recent epidemic in the Southern Department, to which Colonel Stark refers. The troops there were in tents, floored and framed, with never

more than 10 men in one tent. During the outbreak over 400 cases of pneumonia developed among about 40,000 troops, with a death rate of 1 in every 5 cases. If the War Department adheres to its present decision to place 12 men in each tent without flooring, it should be prepared to expect an increased sick rate and the probability of extensive epidemics of pneumonia and meningitis, with many deaths.

3. This office is of the opinion that it would be preferable to place part of the men in shelter tents rather than subject them to the dangers incident to such overcrowding in wall tents.

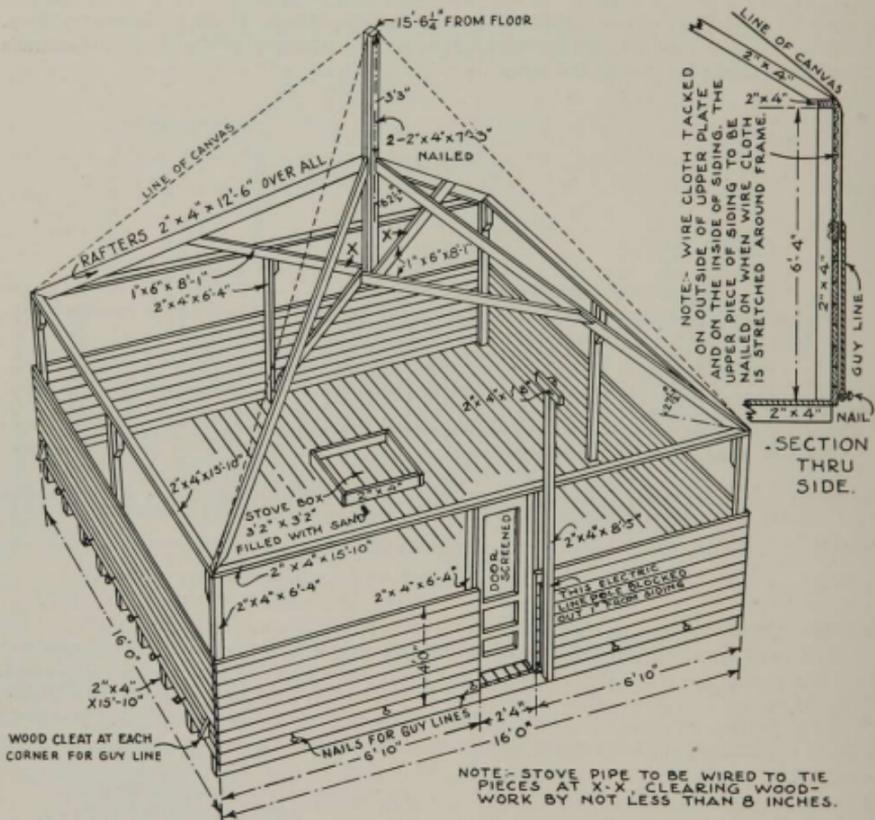


FIG. 17.—Standard pyramidal-tent frame. Details for framing and flooring a pyramidal tent. With 8 occupants it allows 32 square feet of floor space and 348 cubic feet of air space per capita

Subparagraph *h*, G. O. 137, War Department, October 30, 1917, is as follows:

(*h*) Heavy tentage for the National Guard, unless otherwise ordered, when State organizations are to be mobilized at State mobilization camps, will be shipped directly to training camps, to be there apportioned out according to the needs of all organizations by division or camp commanders, and on the basis of one large pyramidal tent to 12 men, until the total supply of tentage available is increased, when distribution will be made at the rate of one tent to 9 men.

No allotment of funds originally was made by the War Department to frame and floor tents in the National Guard divisional camps. A protest

from the commanding general, Southeastern Department, August, 1917, follows:⁵⁶

1. It is recommended that the decision not to provide tent floors for the National Guard divisional camps be reconsidered and that authority for the purchase of the necessary lumber be granted to constructing quartermasters.

2. The labor of constructing tent floors can be performed in part by troops of the advance detachments, and completed when the organizations arrive. The total cost per tent should not exceed \$4 to \$5, or approximately \$0.50 per man, and the saving to equipment and clothing, and the certainty of a neat and orderly arrangement in tents would, it is believed, amply justify the expense, even without taking into consideration the comfort and contentment and physical well-being of the troops.

3. I wish to invite attention, also, to the evident fact that the saving made on material for tent floors will be more than counterbalanced by the increase in sick rate, with a corresponding reduction in efficiency. As the deficiency in canvas will cause necessary overcrowding, it is thought the part of wisdom to take very precaution to minimize the danger of communicable diseases, and tent floors, being susceptible to mechanical cleaning, will go far toward the reduction of such diseases as can be acquired from men in close contact who can not be so disciplined that they will not expectorate on the floor, as they invariably do in unfloored tents.

4. In addition to the above reasons, the possession of a tent floor in a camp invariably adds to pride in appearance, and it is an indisputable fact that a soldier may not keep his clothing and equipment in even a reasonably correct condition if he is forced to be housed on bare soil.

On September 17, 1917, The Adjutant General directed the officer in charge of cantonment construction to construct tent floors and side walls for all National Guard camps, except the camps then occupied by the 26th and 42d Divisions, which were soon to be vacated.⁵²

On September 18, 1917, The Adjutant General directed the Quartermaster General to supply tentage, as soon as it became available from storage, new tentage received from contractors, or from troops leaving for overseas service, on the basis of 8 men per tent.⁵⁷

Coincident with the arrival of the troops at the camps came the early onset of one of the severest winters known in this country. A widespread epidemic of measles-pneumonia, particularly severe at Camps Wheeler, Bowie, and Beauregard occurred.⁵⁸

A letter of the Surgeon General of November 7, 1917, which has already been quoted in full in connection with overcrowding in barracks, also referred to overcrowding in tents.⁵⁶

During the latter part of November and first half of December, 1917, the Surgeon General, accompanied by several experienced sanitarians from his office,^c made an inspection of many National Guard camps, including the three mentioned above.⁵⁹ The following letters are extracts from reports made by the Surgeon General to the Chief of Staff.^{60 61}

NOVEMBER 26, 1917.

From: Surgeon General, United States Army,

To: The Chief of Staff (through The Adjutant General of the Army).

Subject: Report of inspection of Camp Wheeler, Macon, Ga.

1. In my recent inspection of Camp Wheeler, at Macon, Ga., I found conditions as had been indicated by reports. There had been a sharp epidemic of measles, some 3,000 cases, and, as always occurs with measles, a certain number of cases of pneumonia. At the time of my visit, there were some 300 cases of pneumonia in the hospital. While the hospital was crowded, the right of way was given the pneumonia cases and they were being well cared for.

* * * * *

^c The party included Surg. Gen. William C. Gorgas, Col. Deane C. Howard, Maj. Victor C. Vaughan, and Dr. William H. Welch.

6. Whatever the original cause of the epidemic and the present conditions, all these evils are accentuated by the crowded condition of the camp. The tendency to pneumonia has no doubt been increased by the fact that the men have generally been exposed to the cold weather of the past month with no other protection than their summer clothing. Clothing is now rapidly coming into camp, and about two-thirds of the men are supplied with woolen garments.

* * * * *

7. I recommend that it be insisted upon that all men in the camp have 50 feet of floor space each, and to accomplish this such additional shelter be supplied as may be necessary; that no fresh men be brought into the camp until the epidemic has subsided; that an observation camp be established and that all new men be kept under observation until the main camp is free from infection.

W. C. GORGAS,
Surgeon General, U. S. Army.

CAMP BOWIE,
Fort Worth, Tex., December 3, 1917.

From: The Surgeon General of the Army.
To: The Chief of Staff, War Department, Washington.
Subject: Conditions 36th Division, Camp Bowie, Tex.

1. We have had in this camp during the past month 41 deaths from pneumonia, with 409 cases admitted; about 2,900 cases of measles in the same length of time. The causes of this condition are much the same as in the other camps reported upon. The great number of cases of measles is due to the fact that the men come from the sparsely settled States of Texas and Oklahoma and have not had measles in childhood, but the basic cause is due to the overcrowding of the camp. We have at present 9 men to a tent. I recommend that the division commander be directed to furnish sufficient accommodations so that each man will be allowed 50 feet of floor space. This would give not more than 5 men to a tent.

* * * * *

W. C. GORGAS,
Major General, U. S. A.

The letters sent by General Gorgas from the other camps depicted practically the same situation. Following receipt of these reports the War Department, on December 5, 1917, issued orders to the commanding generals of Camps Bowie, Beauregard, and Wheeler to reduce the number of men per tent to 5.⁶² In the remaining National Guard camps the authorized quota remained at 8 men. This fact the Surgeon General brought to the attention of the Chief of Staff, in the following memoranda:^{63, 64}

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, February 14, 1918.

Memorandum for the Chief of Staff:

Complying with your request that a memorandum be submitted covering any general sanitary improvements now needed in the various camps, the following is submitted:

1. Overcrowding is not yet entirely relieved in many camps. Our reports indicate that the men are quartered 8 to a tent in some National Guard and Regular Army divisions. Additional tentage should be furnished as soon as available to enable men to be quartered 5 to a tent.

Overcrowding is reported at remount depots, National Army cantonments. Certain new construction has been authorized to relieve this condition, but more is required to relieve actual and prospective overcrowding in some camps.

* * * * *

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, March 28, 1918.

Memorandum for Chief of Staff:

This office has repeatedly recommended a minimum of 50 square feet of floor space per man in camps and cantonments as necessary to maintain health. The necessity of this allowance is as great when health conditions are good as after epidemics have broken out, and the avoidance of overcrowding at the start will prevent the occurrence of many epidemics.

The assumed better ventilation in summer is no valid reason for overcrowding men during warm weather. All respiratory diseases are transmitted by "contact" or "droplet infection," and the degree of separation of men is the important factor in preventing the spread of these diseases. The amount of cubic air space per man or the assumed freer ventilation in summer are of secondary importance.

This office having stated the minimum requirements as to floor space to maintain the health of troops, it can not assume the responsibility for overcrowding if the War Department orders 8 men to be placed in a tent, which would give only 32 square feet per man. Lives have been lost on account of overcrowding in the past and, in the opinion of this office, questions of economy should not outweigh sanitary requirements in connection with the housing of troops.

If military necessity requires overcrowding to the extent contemplated in attached memorandum, and the recommendations of this office are not to be followed, the responsibility therefore should be assumed by higher authority. This office can not acquiesce in a policy of placing 8 men to a tent, as it is considered that such overcrowding would be prejudicial to health.

Finally, on June 25, 1918, general instructions were given to all camp commanders as follows:⁶⁵

Memorandum for The Adjutant General of the Army.

Subject: Tentage accommodations.

The Secretary of War directs that the following information be communicated to Commanding Generals of Divisions in the United States, Department Commanders, and the Quartermaster General:

In housing men in tents, the following rules will be observed: For permanent occupancy in the summer season, if there is no sickness in camp, 6 men should be placed in each pyramidal tent. For temporary occupancy, if there is no sickness in camp, 8 men to a tent. In the winter, or if undue sickness develops in the summer, 5 men to a tent. These figures will be used as the basis for requisitions for tentage.

Thus many months elapsed before the overcrowded conditions of the tent camps were finally corrected by War Department order.

VENTILATION OF BARRACKS

More changes were found necessary in the method of ventilating cantonment barracks than in the type of construction. Five revisions were made between March 26, 1917, when the original plans were dispatched to department quartermaster, and August 28, 1918, on which date standard steel ventilators were adopted.⁶⁶ As already noted, the first set of plans designed for cantonment construction provided no means of ventilation except by windows (see fig. 3). This, as also previously stated, was the type of building used along the Mexican border from 1914 to 1917.¹⁴ When, in May, 1917, temporary buildings of this type were erected at Fort Myer, Va., the absence of ventilation was immediately reported by the surgeon of the post to the Surgeon General's Office. This action resulted in an inspection of these buildings by representatives from

the Surgeon General's Office and recommendation by the Surgeon General that full ridge ventilation be instituted in all temporary buildings (communication of May 21, 1917) cited on page 134.²⁰ This recommendation was approved for future construction, and some buildings already built were provided with ventilators; many were not. Unfortunately, ridge ventilation was suited for one-story buildings only. When the erection of two-story barracks at the large cantonments was decided upon, plans were made for installing ventilating shafts for the lower stories. That this was not always done at the outset is shown by the following extract of a sanitary inspection of Camp Devens, Mass., made on July 21, 1917.⁶⁶

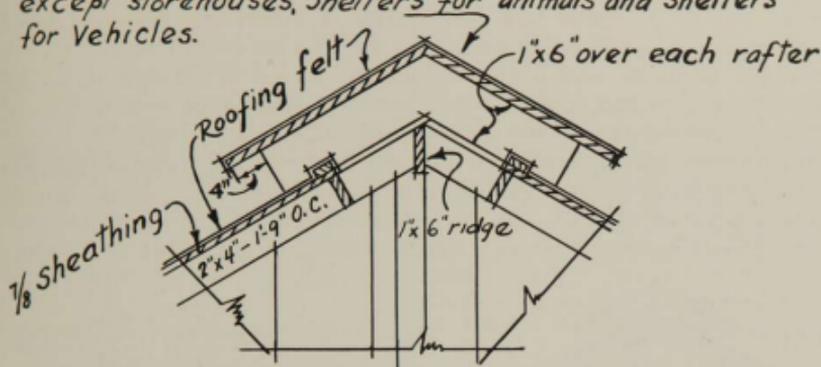
The barracks which have been constructed give a per capita floor space of 41.6 square feet. There is no ventilation in the squad room on the ground floor except by windows. They are made to slide from side to side, and as soon as they get wet the wood will swell and it will be impossible to open them. They should be attached by hinges on the bottom side or open on horizontal or vertical pivots.

Although the above report called attention to lack of proper ventilation on the first floor of two-story buildings, it contained no recommendation for remedy of this defect, except means for keeping the windows open. Ultimately shafts were provided for all such barracks.⁵⁰

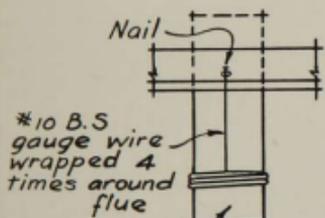
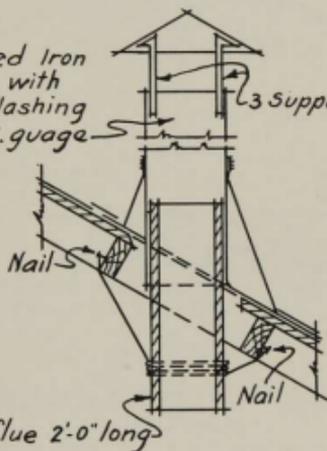
The original type of ridge ventilation possessed the disadvantage of offering insufficient protection against cold, rain, snow, or wind, and, as might have been expected, was the source of numerous and immediate complaints from occupants of this type of barracks. To overcome this objection, the first change in ventilators was made; that of placing baffle boards on all roof ventilators (fig. 19).⁵⁰ This alteration afforded inadequate protection, and complaints were still received. Hence, in October, 1917, shutters were added, which made it possible to close the ventilators from the inside by means of a pulley and rope (fig. 20).⁵⁰ The design provided a double shutter, one for either side of the ventilator, each controlled by a separate rope. This plan frequently resulted in both shutters being closed tight during inclement weather, with absence of all ventilation except by windows. In December, 1917, further improvement was attempted by using a single shutter, arranged to close both sides of the ventilator from the inside by a single rope and pulley (fig. 21).⁵⁰ This type offered the same objection as the preceding one. If during cold weather the shutters did not close tightly the ventilator was stuffed with such things as rags, paper, underwear, in fact with anything which would keep out the cold air and permit adequately heating the room. In August, 1918, after a long series of conferences between representatives from the Surgeon General's Office and from the construction division, the standard ventilators were adopted (see fig. 16).^{50 51} This device was still in use at the end of the war and was considered to be a great improvement over former types.¹

Aviation barracks were provided with a limited number of cowled metal ventilating shafts passing through the roof at or near the ridge and ending just inside the roof.⁵⁰ Owing to the fact that these barracks had a ceiling, an attic existed into which these ventilating shafts entered. The ceiling itself was pierced with a few small square openings covered with netting or with registers having movable louvers such as are used in floor or wall registers

Ridge vents to be constructed on all buildings except storehouses, shelters for animals and shelters for vehicles.



9" Galvanized Iron smoke pipe with hood and flashing all 26 U.S.S. gauge



7" Fire clay round flue 2'-0" long

DETAIL OF FLUE SMOKE PIPE & FLASHING

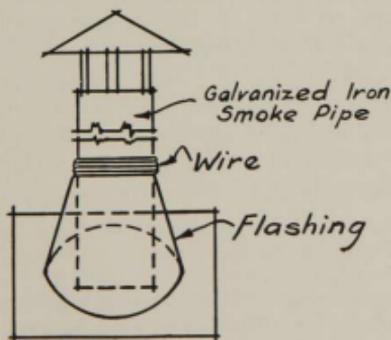


FIG. 18.—Primary type of ridge ventilation added in 1917, following recommendation by the Surgeon General

in buildings heated by hot-air furnaces. No direct shaft connections between the openings in the ceiling and those in the roof existed, and the number of apertures in both locations was inadequate. Furthermore, the ventilating openings in the ceiling rapidly became occluded with dust and cobwebs. A few aviation barracks were heated by hot air forced in through shafts by electric fans, and in one instance noted the inlet shafts were near the top of the rooms instead of at the bottom where they should have been.¹

The question of ventilation through windows and other openings in the walls of barracks received considerable attention from the outset. In his fifth indorsement of May 21, 1917, the Surgeon General recommended openings below the windows to increase the ventilation in the one-story barracks

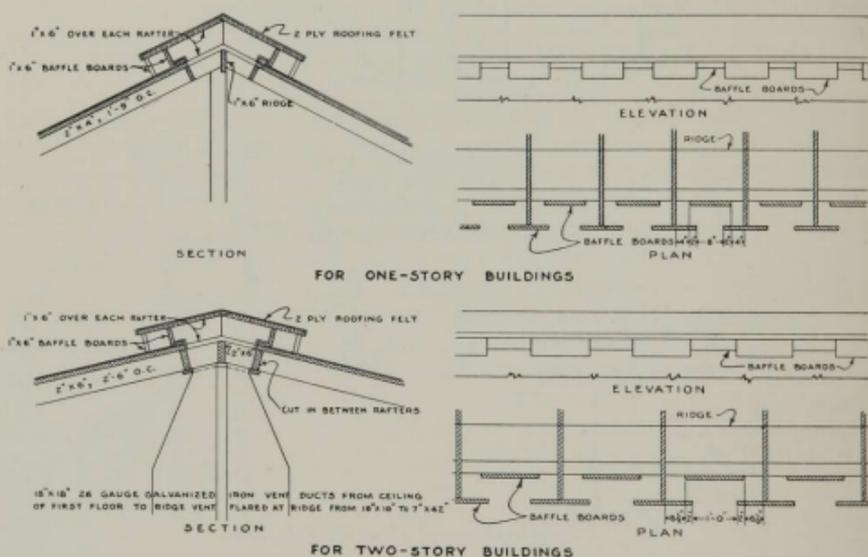


FIG. 19.—First change in ventilators; the addition of baffle boards, July, 1917

built at Fort Myer, which were provided with windows about 34 by 37 inches in size and located high up in the walls.²⁰ The medical board which reported upon barrack plans on June 14, 1917, recommended, if feasible, that sections of the wall on each side of every dormitory be placed on hinges so that they could be raised. (See p. 137.)²³ In the plans for the two-story cantonment barracks, full-length windows were provided, the upper and lower sashes being separate and each sliding horizontally. Objection to this type of window came from several sources. The following letter was sent by the Surgeon General, on August 9, 1917, to The Adjutant General:⁶⁷

At a recent inspection of the cantonment at Camp Devens, Ayer, Mass., by a special inspector from this office, it was noted that the windows of the Artillery barracks were arranged to slide in grooves. On account of the limited cubic air space allotted in those buildings, ventilation by means of these windows is extremely essential, and the maximum amount must be provided for. With the present construction, it would be difficult or impossible to open these windows as soon as the wood begins to swell after being wet. It is there-

fore recommended that the windows be hinged at the bottom, so as to swing into the buildings at an angle of about 45° . This will give the maximum amount of ventilation, with as little danger from draft as possible.

The cantonment surgeon, Camp Devens, Ayer, Mass., on August 10, 1917, expressed his views on the sliding window as follows:⁶⁵

The present type of sliding-window construction, which is being installed at this cantonment, can be improved by changing to a hinged window which will drop in. As now installed, a number of the windows stick tightly in the grooves of sashes and are opened with considerable difficulty. The windows in some of the buildings are permanently fixed and can not be opened because of interference of studding. Ventilation will not be as efficient with the sliding windows as with the drop window. The present (sliding) type of window sash will be a perpetual annoyance because of swelling and impossibility of operation. Print of present and proposed type inclosed.

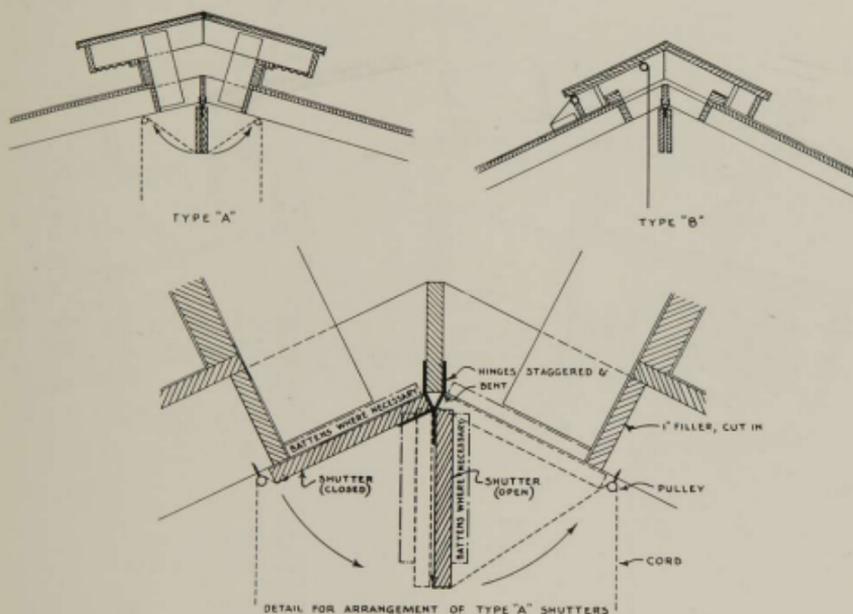


FIG. 20.—Second change in ventilators, October, 1917; two shutters, closed from the inside

In response to the criticism of the Surgeon General, the officer in charge of the cantonment division, on August 13, 1917, stated that windows in barrack buildings were made to slide in order that the entire opening could be cleared for the admission of air; that this type of window was used with full knowledge of the Surgeon General, and that the construction was too far advanced to make a change like this either feasible or reasonable. He recommended that no change be made.⁶⁷

Few, if any complaints in respect to windows sticking were received after the buildings were occupied. Certainly if sticking occurred it was easily remediable locally. As a matter of fact, the horizontally sliding sashes permitted excellent ventilation in warm weather, but apparently no attention was given in the construction plans to the question of providing air inlets in cold weather, so arranged as to admit air but at the same time prevent objectionable drafts on the closely

packed sleepers. Perhaps it was felt that the roughly constructed barracks would admit enough air through cracks and crannies. With the onset of respiratory epidemics in both the first and second winters of the war, the Surgeon General, as well as local sanitary authorities, laid great stress on the necessity of keeping windows open at night. Rigid rules regarding this matter were laid down in the camps and enforced more or less strictly through the agency of nightly inspections by line and medical officers.⁵⁰ With but limited heating facilities, frequently inadequate bedding, and dormitories completely filled with sleepers, it was impossible during severe weather to open windows to any appreciable degree without producing unpleasant and often dangerous drafts on

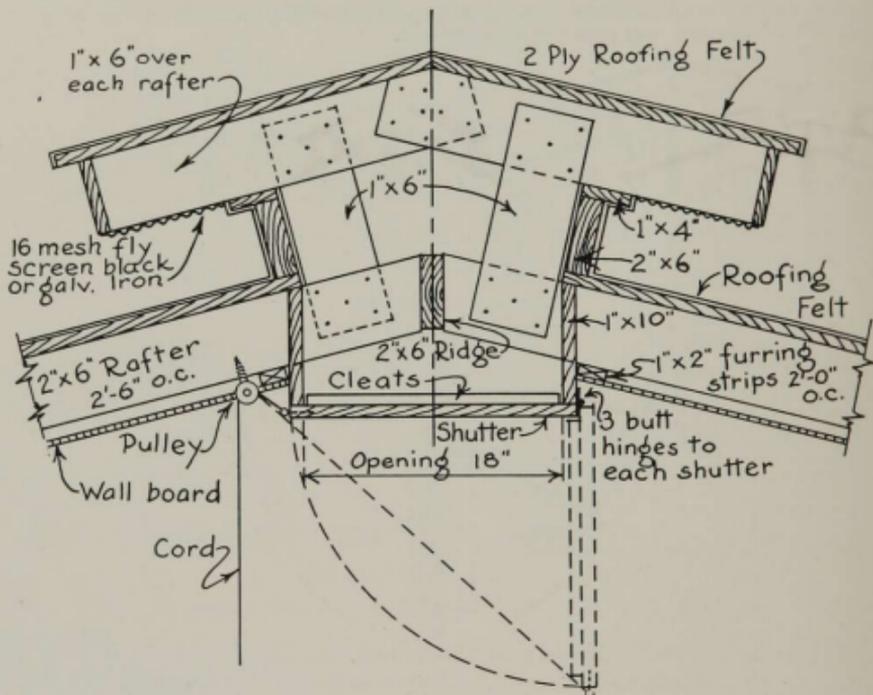
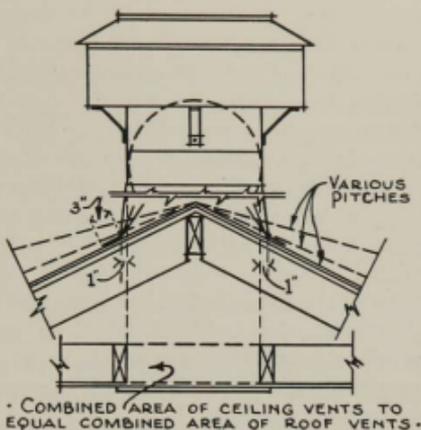
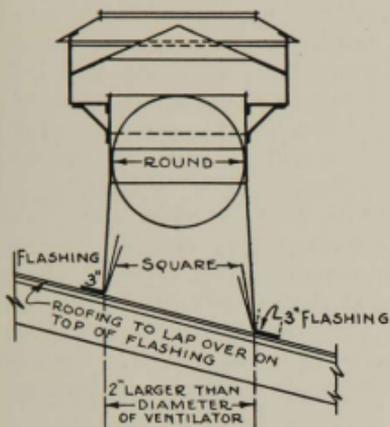
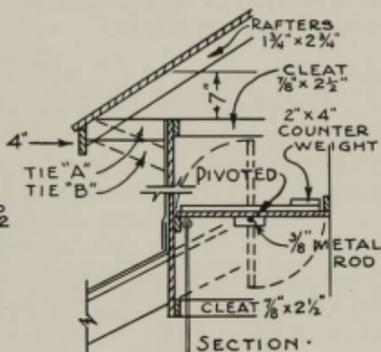
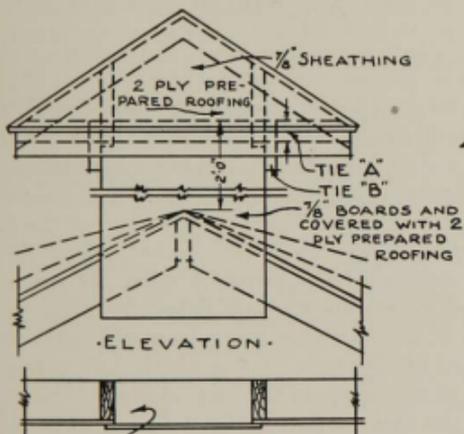


FIG. 21.—Showing third change in ventilators; ridge vent with one shutter closed from the inside. December 17, 1917

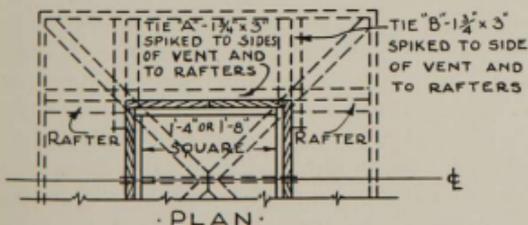
some individuals. This rendered the enforcement of the ventilation rules very difficult, though it led to improvising various devices for preventing direct drafts while admitting air. Arrangements for deflecting the cold air upward were not easily constructed with the type of sliding window employed, but were used in some camps.⁵⁰ In other camps screens covered with cheesecloth were provided to close the window space and permit a filtering in of air. Some commands which used the "cubicle system" arranged a shelter tent half in such a way that it formed a screen on one side and at the head end of each bed, thereby materially protecting the occupant from drafts. These makeshifts never proved wholly satisfactory, and this suggests that in any future cantonment construction plans should be made for admitting warmed air by some simple but adequate device connected with the heating appliances.



TYPICAL STEEL VENTILATOR



• COMBINED AREA OF CEILING VENTS TO EQUAL COMBINED AREA OF ROOF VENTS.



ALTERNATE WOOD VENTILATOR

FIG. 22.—Galvanized-steel ventilator adopted as a standard, August 28, 1918

HEATING OF CANTONMENTS AND CAMPS

The system of heating the temporary barracks during the World War was very crude. It was developed independently of the ventilation and with little attention to sanitary considerations; moreover, it was extremely wasteful of fuel. Most of the cantonments, including some far northern ones such as Camp Dodge, Iowa, were warmed by a kind of furnace placed in the center of each dormitory and surrounded by a galvanized-iron jacket about 6 inches distant from the main firebox.⁶⁹ No provisions were made to utilize the furnace as a means of drawing in and immediately warming a supply of fresh air.

Several northern cantonments, however, were heated by steam, a boiler plant being installed usually for each regimental area, with the steam transmitted through overhead pipes.⁷⁰ The radiators were arranged along the walls of the dormitories, but here also no effort was made scientifically to combine ventilation and heating. Neither in this method of heating nor in the one previously described was any attempt made to humidify the air. The aviation barracks usually were heated by steam, but in some cases hot-air furnaces and stoves were employed.⁷¹

Tents were heated by small stoves, which were probably as satisfactory as any method that was available, though no ventilators opening beneath the stove were installed. In many instances there was delay in providing sufficient stoves in the fall of 1917.¹

BEDS AND BEDDING

It was originally contemplated by the Quartermaster Department that soldiers in cantonments should be provided with double-deck bunks.²¹ This plan was vigorously combated by the Surgeon General's Office and also by the medical board whose report has already been quoted on page 138. Their view, based on past experience, was that double-deck bunks, by reason of the comparatively little floor space occupied, always resulted in overcrowding during times of stress, with consequent dangerous diminution in cubic air space per capita. Double-deck bunks many years ago were abolished in the barracks of the Regular Army, but were still found occasionally in guard houses; not, however, without frequent protests on the part of the Medical Department. As a result of the representations of the Surgeon General, already quoted, the allowances of air and floor space per man in the National Army cantonments were increased and the plan of using double-deck bunks was given up.⁵⁶ In place, single iron bedsteads, painted black and provided with an excellent metal spring, were furnished most camps. So strong, however, was the desire, on the part of some local commanders, to employ double-deck bunks that in many instances frames were constructed from scrap lumber and used to support two iron beds, one above the other. In a good many aviation barracks, too, neat double-deck bunks were in use, the uprights being constructed of angle iron.¹ These bunks were very attractive in appearance and gave an impression of spaciousness in the barracks, with wide separation of the sleepers. They also greatly facilitated cleaning of the floors. In some camps and cantonments folding "Gold Medal" canvas cots were used to a certain extent for a limited time.⁵⁰

Even with the 40 to 50 square feet of floor space provided per man, the use of ordinary beds produced considerable crowding, and usually there was a tendency to group beds closely together along the sides of a dormitory and leave a large vacant space in the center.⁵⁰ This tendency and the still more dangerous practice of arranging beds in groups of two or four in actual contact, had to be constantly combated by sanitary inspectors.⁵⁰ At times when sputum-borne diseases were prevalent, particularly during the epidemics of measles and influenza, the cubicle system was employed at many camps, a screen made of a sheet, a strip of muslin, or a shelter tent half being placed at night between two adjacent sleepers with a view to limiting droplet infection in coughing or sneezing.⁷² These procedures were not definitely prescribed by the War Department; but the idea was suggested by the Surgeon General, and its development left to local initiative.⁷³

Suggestions for the use of double-deck bunks were renewed from time to time; the arguments in support of the practice were very plausible. The following communications from the Surgeon General to The Adjutant General show a change in the attitude of the Surgeon General's Office in the matter. The first bears the date of January 3, 1918; the second, January 19, 1918:^{74,75}

1. This office recognizes the advantages from an administrative standpoint of double-deck bunks in barracks. The great danger lies in the tendency to overcrowding when double-deck bunks are in use. Overcrowding is the most serious sanitary evil with which this department has to contend. It is the basic cause of the epidemic prevalence of the diseases of the respiratory tract in most instances.

2. For the reasons stated, this office has consistently opposed the use of double-deck bunks in barracks and again recommends that the suggested change be disapproved.

* * * * *

2. Upon reconsideration, this office withdraws its opposition to the use of double-deck bunks in barracks if the following provisions are strictly observed:

Double-deck bunks to be arranged singly (not in groups of two or four); an allowance of 50 square feet floor space and 500 cubic feet air space to be allowed for each man. This will mean 100 square feet of floor space for each double-deck bunk.

Under no circumstances should the apparent increase in the available floor space which seems to result from the use of double-deck bunks be made a cause for placing in any sleeping room so many of the bunks as to reduce the allowance of floor space and cubic contents per man below the figures given above.

This change in attitude on the part of the Surgeon General's Office was due to an increasing recognition of the probable importance of contact as a means of spreading respiratory disease. Wide separation of sleepers appeared to be an important factor in preventing such spread. The use of double-deck bunks was considered to offer facilities for wider separation of individuals, provided all the conditions laid down in the fifth indorsement were complied with.

The bedding used by enlisted men during the war consisted of a white cotton bed sack filled with straw, olive-drab blankets,⁷⁶ and comforters.⁷⁷ No sheets, pillow slips, pillows, pajamas, or other sleeping garments were used. In the winter of 1917-18 the supply of blankets and woollen underwear was inadequate in many camps, and great numbers of comforters were issued to supplement the bed covering.⁷⁷ These comforters, with light-colored cotton

covers, became very much soiled, and while probably no more insanitary than blankets, nevertheless were far more objectionable in appearance and were difficult to launder.¹ The practice of frequently airing and sunning the bedding was urged by the Surgeon General and for the most part was thoroughly enforced in camps.¹ During the influenza epidemic beds and bedding were taken out of barracks for several hours daily, weather permitting.

CARE OF BARRACKS FLOORS

The floors of cantonment barracks were constructed of dressed lumber, but usually this was of inferior grade.⁵⁰ The continual passage of large numbers of men, their shoes frequently encrusted with mud, rendered cleaning such floors extremely difficult. If cleaned by mopping they became water-soaked and dried very slowly. Dry cleansing led to the raising of clouds of dust, and this practice was considered particularly undesirable at times when respiratory diseases were prevalent. Bad conditions were aggravated as the floors began to wear rough. It was brought to the attention of the Surgeon General by one of his sanitary inspectors that at Camp Travis excellent results had been obtained by the application to such floors of a mixture of crude oil and kerosene, which rendered cleaning easier, limited the amount of water absorbed when mopping, and prevented the raising of dust when sweeping.¹ Using this report as a basis for his action, the Surgeon General on January 8, 1918, recommended that the oil preparation be used generally as a sanitary precaution, and the recommendation received the approval of the War Department.⁷⁸ The Surgeon General's letter is as follows:

1. It is recommended that the following method of caring for floors of temporary buildings in all National Army cantonments, National Guard camps, aviation fields, ports of embarkation, and similar stations be prescribed and that the Quartermaster Department be directed to furnish the necessary materials.

Equal parts of crude oil and kerosene are mixed and applied to the floors with a mop or soft brush. If kerosene can not be obtained, about a quart of crude oil is poured into a bucket of hot water and thoroughly stirred.

This mixture applied to the floors will give practically the same result as the first mixture. The frequency with which it will be necessary to apply this treatment will depend upon the weather conditions, ranging from once in 10 days to once every 3 weeks.

2. This method of caring for floors has been used with very high degree of success at Camp Travis, San Antonio, Tex., and is similar to the method commonly used on softwood floors at military stations in the Philippines and in Panama.

3. The method will greatly reduce the amount of dust in barracks. This result is of much sanitary importance, in view of the great prevalence of fatal respiratory diseases the incidence of which is favored by dust.

On January 22, 1918, the Secretary of War directed the Quartermaster General to have the floors in all temporary buildings in all National Army cantonments, National Guard camps, aviation fields, ports of embarkation, and similar stations treated with oil as recommended by the Surgeon General.⁷⁹ The use of such a mixture on the floors of hospital wards proved objectionable through the rapid soiling of the ward linen;¹ consequently, at the instance of the Surgeon General, The Adjutant General, on February 22, 1918, modified the instructions of January 22, so as to exempt the wards and rooms occupied by the sick in base hospitals from the application of the crude-oil mixture to

floors.⁸⁰ This is not to be taken to mean that it was believed unnecessary to oil ward floors. On the contrary, the hospital division of the Surgeon General's Office was at the time carrying out observations to determine upon a floor dressing best adapted to the needs of temporary hospitals which would be more suitable than crude oil and kerosene. Floor wax, thinned by means of hot turpentine, was tried first.⁸¹ Since this preparation proved too expensive, it was decided on June 6, 1918, to make use of a light paraffin oil, very sparingly applied at infrequent intervals.⁸²

Sanitary inspectors paid particular attention to the thoroughness with which oiling was carried out.¹ It was found at some camps that the orders on the subject were not complied with, the most common claims being that the instructions never had been received, that the procedure was not satisfactory, that oil was not obtainable, or that the fire risk was increased. Such cases having been brought to the attention of the Surgeon General, the facts were presented to The Adjutant General on several occasions with a view to obtaining compliance with the existing instructions.

In general, the use of crude oil and kerosene accomplished the purpose for which it was intended and proved fairly satisfactory. In some camps complaint was made that the mixture produced a gummy, black, unsightly condition of the floors and was harmful to clothing and equipment. Probably this condition came about through the use of heavy grades of crude oil, which might better have received dilution with more than an equal amount of kerosene.⁸² Where carefully applied in proper dilution, especially if the baseboards were neatly darkened with the same mixture, the appearance of the floors was attractive and, what was much more important from the sanitary standpoint, the raising of dust was largely prevented. Yet the use of a specially prepared floor oil would have obviated many of the original complaints, and ultimately such an oil was adopted by the Quartermaster Department, and its employment, together with certain modifications in the earlier oiling instructions, was recommended by the Surgeon General December 16, 1919. In the interests of completeness this bulletin is quoted, though it was not published within the period covered by this history.⁸³

* * * * *

1. The floors of dormitories, offices, corridors, mess halls, and other rooms where such practice may appear desirable, in permanent and temporary barracks and office buildings, will be treated with a suitable floor oil or other preparation at intervals sufficiently frequent to keep them in such condition as to limit the raising of dust during cleansing processes or as a result of the movements of occupants. It is of great importance that the presence of dust be reduced to a minimum, especially during the prevalence of respiratory diseases.

2. One of the best preparations for use on the floors of permanent or temporary barrack buildings for the purpose above indicated is floor oil, War Department Specification No. 3526-F, which should be applied with mop or soft brush. The frequency with which the oil should be applied will depend upon weather conditions, ranging from once in 10 days to once in 3 weeks. In the absence of the floor oil mentioned above a mixture of kerosene and crude oil may be used, the proportions of the two substances varying according to the density of the crude oil.

3. The floors of wards, corridors, offices, mess halls, and other rooms where such practice may appear desirable, in temporary hospitals, will be treated with oil in like manner. The floors in permanent hospitals will be treated with the wax preparation and brightener provided for the purpose.

4. The use of oil on the floors by no means diminishes the necessity for scrubbing the floors at suitable intervals.

5. The necessary oil or other preparation required to carry out the purposes above indicated may be procured in accordance with the procedure set forth in Quartermaster Notice 115.

* * * * *

Owing to the complaints occasionally received regarding the oiling of floors, the Surgeon General, as early as February, 1918, sent out a memorandum to the surgeons of all the important stations requesting a statement as to whether oiling was generally practiced and proved satisfactory.⁸⁴ In nearly all instances the instructions were reported as being complied with, and the great majority of surgeons favored the practice.

BATHING AND TOILET FACILITIES

The bathing facilities provided for camps, cantonments, and aviation fields were in general excellent and offered practically no ground for criticism.⁸⁴ In the cantonments a small building for use of each company was constructed adjacent to the barracks occupied by the organization, and was equipped with toilets, urinals, shower baths, galvanized-iron wash trough with shelf for individual basins, and hot-water heater.⁸⁵ The buildings were usually warmed by stoves. The floors were concrete, with proper sewer connections for disposing of bath water. The shower heads were of good design and were located in common at one end of the building, no individual compartments being provided. As a rule the supply of hot water was ample, this depending chiefly on local care of the heating apparatus. The only criticism that might be made was the necessity of going outdoors to enter the building. In the barracks of aviation fields the lavatories were somewhat better equipped than those described above and were in direct communication with the dormitories.⁸⁶ The National Guard tent camps were provided with rough bath shacks, usually located to the rear of the line of tents occupied by a company. Shower baths, with hot-water heaters, were provided. Floors were usually of wood, with provisions for collecting the waste water, which was conducted away by ditches until near the conclusion of the war when sewer systems were installed in most of these camps.⁸⁷

Toilet fixtures in National Army cantonments and in aviation fields were of vitrified material conforming to the type and grade found in the ordinary home. They were provided with an adequate flush, and discharged into a sewer. Urinals in cantonment lavatories were of a crude trough type, made of galvanized iron with right-angled corners. They were provided with faucets for flushing and furthermore, the waste water from the wash trough passed through the urinal to aid in cleansing it.⁸⁸ These urinal troughs were almost without exception kept in good condition and rarely offered ground for criticism. There can be no doubt, however, that a trough of semicylindrical cross section, or rounded corners, could have been more readily cleaned. The urinal troughs provided at aviation barracks were somewhat better than those described above.

⁸⁴ This statement would seem to disprove the recommendation of the medical board of June 14, 1917, quoted *supra*. However, what the board had in mind was the necessity for body and clothing disinfection throughout our camps and cantonments.

Originally, the National Guard camps' excreta was disposed of in pit latrines.⁵¹ Rough frame latrine shacks were constructed at the rear of each line of company tents, this being at the opposite side of the camp from the company kitchen. Screening of latrine shacks and the providing of flytraps and fly paper were repeatedly insisted on by the Surgeon General⁵⁰ and were as a rule ultimately accomplished.¹ Pits were covered with tight wooden seats, in general conforming to the Havard type of latrine box, and having self-closing covers for the holes. A galvanized-iron urinal trough, discharging into the pit, was usually installed; it was the practice to smear it with crude oil for the purpose of preventing odor and repelling flies.¹ The care of seats and pits required infinite attention to detail in a large camp, but the principles were well understood and the work with few exceptions was satisfactorily done; the method was prescribed in Special Regulations No. 28, W. D., 1917, as follows:

Disposal of excreta.—In permanent camps, where a water-carriage system is not installed, the Havard or other fly-tight box and pit latrine will be used. Each day the pit will either be burned out or sprayed with a lampblack or boneblack mixture. If burned out, 1 gallon of crude oil and 15 pounds of hay or straw should be used. A satisfactory mixture for spraying consists of one-half pound of lampblack to a gallon of kerosene, or 1 pound of boneblack to 3 gallons of crude oil. Spraying should be done preferably with a spray pump. Both the interior of the box and of the pit should be kept thoroughly coated with the mixture. Detail drawing of the Havard box may be found in the Manual for the Quartermaster Corps. The box must be kept fly-tight. This implies closure of all cracks and care of hinges and back construction, so that the lids drop automatically. The latrine seats will be scrubbed with soap and water daily, and washed off at least twice weekly with a 1 to 100 solution of creolin or other disinfectant. When filled to within 2 feet of the top, pits will be filled with earth to within 6 inches of the surface and covered with a layer of sacking soaked in crude oil, to extend 3 feet beyond the edges of the pit; the pit will then be filled in with earth and the location marked. Urinal cans will be emptied and burned out. * * *

The use of latrine pits was not generally satisfactory and at certain camps, where the soil was nonabsorptive and so necessitated pumping out of the contents with odorless excavators, was very unsatisfactory.¹ In certain localities the digging of pits was very difficult, sometimes necessitating blasting. Sewer systems for National Guard camps were ultimately authorized.⁵⁷ While there was little disease of an intestinal nature during the war, and while such as did occur could not be traced to the use of pit latrines, nevertheless, experience indicated that it is poor policy and false economy to use a pit system of disposal in a large camp. This was the more true with the great base hospitals of many hundred beds which were constructed at the National Guard camps which were originally designed without sewer systems. As a matter of fact, this defect was much more promptly remedied at the hospitals than it was in the remainder of the tent camp areas.⁵⁷

MESSING CONDITIONS

As has been explained, the original large-type cantonment barracks had a portion of the lower floor devoted to the kitchen and mess room.²² In connection with later buildings, accommodating 66 men, a detached structure, containing kitchen and mess hall, was provided for each company.⁵⁵ The latter

practice was followed in aviation fields. Tent camps had a screened mess shack, containing kitchen and dining room, for each company. In general, it may be said that in all types of camp kitchens were unsatisfactory from a sanitary standpoint. Their floors in cantonments and aviation camps were of second-grade lumber and in the tent camps were of earth. Their walls were unpainted and difficult to keep clean. The kitchen space was usually too small, the store-rooms inadequate, and a cook's room which opened from the kitchen permitted flies to pass directly from bedding to food.¹ For a long time in sewered camps the grease traps were inadequate, with much resulting harm to sewage disposal plants. In unsewered camps the kitchen slops were evaporated in various types of incinerators located close to the kitchen.¹ The scullery arrangements were inadequate for kitchen utensils, and no special provisions were made for washing the mess kits of the company. This was done in tubs or cans by the individual method, usually out of doors.¹ The washing was nearly always unsatisfactory in one or more respects, particularly as regards use of hot water, sufficiency of soap, and adequacy of rinsing. Many believed that in this method of individual mess-kit washing we had discovered the most important means of spreading respiratory diseases. Much careful investigation of this subject has led to diverse opinions, but there can be no question that adequate facilities and careful washing are desirable for decency's sake, even if not essential for preventing the spread of sputum-borne diseases. On recommendation of the Surgeon General, rigid instructions were issued by the War Department regarding the proper manner of dish washing, both by the individual method and also when mess kits had been pooled for general use. These instructions are as follows:

Circular No. 21.

WAR DEPARTMENT,
Washington, October 21, 1918.

WASHING OF DISHES AND MESS EQUIPMENT

1. Reports of sanitary inspectors indicate that in many camps the washing of dishes and mess equipment is performed in such a manner as to favor the passage of disease germs from man to man.
2. When dishes and mess equipment are washed, they must be thoroughly rinsed in boiling water. It is essential that the water be actually boiling. It can be maintained in that condition only by providing heat under the receptacle during the whole time that the rinsing process is going on. In cases where dishes other than mess equipment are used, or where the mess equipment of a company is pooled for general use, it is essential that the whole supply of dishes be actually boiled in a garbage can after each meal.
3. This matter is of extreme importance at times when respiratory diseases of a serious nature are prevalent.

(720, A. G. O.)

By order of the Secretary of War.

PEYTON C. MARCH,
General, Chief of Staff.

Official:

P. C. HARRIS, *The Adjutant General.*

Circular No. 48.

WAR DEPARTMENT,
Washington, November 1, 1918.

WASHING OF MESS EQUIPMENT

In connection with Circular No. 21, War Department, October 21, 1918, the following supplementary instructions are published:

1. Further reports and investigation indicate that when soldiers personally wash their mess equipment there is much danger of transmitting disease germs through the agency of a common dishcloth, which is handled successively by many men whose hands often are soiled with infected discharges from their mouths and noses. The method of washing mess equipment prescribed in Circular 21, War Department, 1918, will dispense with the necessity for using a dishcloth, and the use of dishcloths will be discontinued whenever individual washing is practiced. If the mess equipment is thoroughly shaken immediately after withdrawal from the boiling rinse water, the small amount of remaining moisture will quickly be evaporated by the heat retained in the article. Air drying will usually be possible when dishes and mess equipment are boiled in bulk in the manner prescribed in Circular 21, and the use of dishcloths in these circumstances will be discontinued as far as practicable.

2. Unless due care is used during the process of washing mess kits individually, the hands of the soldier may readily become soiled with wash water contaminated by contact with the hands or the mess kits of previous users. To obviate this danger, suitable long-handled swabs will be provided at the washing places and the men will be instructed to use these instead of the fingers for removing adherent pieces of food. These swabs will not be used during the final rinsing in boiling water.

3. In this circular and in Circular 21 all reference to dishes and mess equipment will include knives, forks, and spoons.

4. After washing, all mess equipment and dishes should be protected from flies.

5. The pooling of mess equipment and its washing in bulk is considered preferable to individual washing wherever practicable.

(720, A. G. O.)

By order of the Secretary of War:

PEYTON C. MARCH,
General, Chief of Staff.

Official:

P. C. HARRIS, *The Adjutant General.*

The prescribed scheme is admittedly difficult to carry out. Constant effort by inspectors from the Surgeon General's Office and by local medical authorities failed to obtain satisfactory results. It is the belief of the writer that adequate washing of tableware or mess kits with existing facilities is impossible of enforcement, and that the only prospect of material improvement lies in the direction of providing such additional facilities as will render the safe and proper washing of such articles a matter of ease and convenience.

Mess rooms were generally satisfactory, but the tables provided at the time of constructing the barracks were for the most part faulty from the standpoint of maintaining cleanliness.⁵⁰ These tables were about 2½ feet wide, with the unseasoned top boards firmly nailed in place; usually the lumber was tongued and grooved. No tablecloth or other covering was provided, or indeed allowed. The cracks between the boards readily became filled with organic matter which it was practically impossible to remove. Prior to the beginning of the World War the Medical Department recognized three types of deal table as sanitary. The first was carefully constructed of seasoned material which did not shrink, and therefore had no cracks between the boards; the second had inch-wide spaces between each two adjacent boards; in the third

design every other board was loose and could be entirely removed. Either of the two latter types permitted ready cleansing of the edges of the boards. In a few camps the majority of the tables were originally constructed according to the second or third plan by reason of the urgent demands of the camp surgeon,¹ and at most stations the tops were gradually changed as a consequence of repeated efforts on the part of the sanitary authorities, but in some instances the alteration had not been effected at the date of the beginning of the armistice.¹

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- (9) Reports of the Board of Review of Construction to the Secretary of War, 1920, 99. On file, Office of the Principal Clerk, Construction Service, Quartermaster General's Office.
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- (15) First indorsement from Quartermaster General, March 24, 1917, to The Adjutant General. Subject: Temporary buildings mobilization camps in connection with Officers' Training Camps. On file, Record Room, S. G. O., Correspondence File, 2538833 (Old Files). Also: Report of the Chief of the Construction Division, 1918, 18.
- (16) Sanitary reports Fort Myer, May, 1917. On file, Record Room, S. G. O., Correspondence File, 721.5 Fort Myer (P).
- (17) Letter from the Quartermaster General to The Adjutant General of the Army, March 22, 1917. Subject: Mobilization Plans. On file, Construction Division, Quartermaster General's Office 652—Construction and Repair (General). First indorsement, War Department, A. G. O., March 26, 1917, to the Quartermaster General. On file, Record Room, A. G. O., 2557618 (Old Files).

- (18) First indorsement from Quartermaster to The Adjutant General, March 21, 1917, submitting plans for construction of temporary cantonment buildings, and 1st indorsement to letter from The Adjutant General to Quartermaster General, March 21, 1917, noting approval of Secretary of War to plans. On file, Record Room, A. G. O., 2555459 (Old Files).
- (19) First indorsement, W. D., A. G. O., April 9, 1917, to Quartermaster General on letter from Quartermaster General, April 6, 1917, to The Adjutant General. Subject: Temporary shelter for mobilization camps. On file, Record Room, A. G. O., Correspondence Files, 2567725.
- (20) Memorandum from the Surgeon General, dated May 3, 1917, for the Chief of Staff with indorsements (2d, 3d, 4th, 5th, abstract of June 5, Quartermaster to The Adjutant General, and 8th). On file, Record Room, S. G. O., Correspondence File, 172968 (Old Files).
- (21) Memorandum from the Quartermaster General to the Surgeon General, May 16, 1917. On file, Record Room, S. G. O., Correspondence File, 175339 (Old Files).
- (22) Sheets No. 14A, Quartermaster General's Office, June, 1917, and Sheets Nos. 13A, 12A, and 12B, Quartermaster General's Office, July, 1917. On file, Plans Division, Construction Service, Office of the Quartermaster General.
- (23) Report of the Board appointed by the Secretary of War to examine the housing plans for large cantonments, June 14, 1917. On file, Record Room, S. G. O., Correspondence File 621. (General.)
- (24) Memorandum of Acting Chief of Staff, June 14, 1917, for the Quartermaster General, citing approval of Secretary of War. On file, A. G. O., Old Files Division, 2626174.
- (25) Memorandum from the Surgeon General, July 16, 1917, for Col. Isaac W. Littell, C. C. On file, Record Room, S. G. O., Correspondence File 175339 (Old Files).
- (26) Letter from the Officer in Charge of Cantonment Construction, July 16, 1917, to the Surgeon General. Subject: Increased construction in the barracks buildings for the cantonment to provide additional air space. On file, Mail Control Division, Construction Service, Quartermaster General 652-A (General).
- (27) Plans Cantonment Buildings: Figure No. 7, Sheet No. 60, Office of the Quartermaster General, July, 1917. On file, Plans Division, Construction Section, Office of the Quartermaster General.
- (28) Tables of Organization, War Department, January 14, 1918, replacing Tables of Organization, Series A, War Department, August 8, 1917.
- (29) Schedule of changes to be made in cantonment buildings to meet new organization equipments. Revised September 7, 1917. (Signed Col. Isaac W. Littell, Officer in Charge Cantonment Construction.) On file, Mail Control Division, Construction Service, Quartermaster General's Office, 642 (General).
- (30) Report of the Chief of the Construction Division to the Secretary of War, 1918, 18.
- (31) Manual of the Construction Division of the Army, Section C, Engineering Division, 1918.
- (32) Barracks at Camp Joseph E. Johnston and Camp Meigs. See letter from Officer in Charge Cantonment Construction, September 27, 1917, to the Constructing Quartermaster, Quartermaster Training Camp, Jacksonville, Fla. Subject: Blue prints, inclosing Table of Buildings for Quartermaster Camp, Jacksonville, Fla. Also: Memorandum from Lieut. Col. F. B. Wheeton, Q. M. C., September 30, 1918, to Maj. H. J. Burt, Engineer Branch. Subject: Requisition for construction of additional quarters (shows type of barracks). Both on file, Mail Control Division, Construction Service, Quartermaster General's Office, 652. (Camps Joseph E. Johnston and Meigs, respectively.)
- (33) Memorandum from Officer in Charge Cantonment Construction, August 29, 1917, to Construction Quartermaster Embarkation Camp, Tenafly, N. J. Subject: Buildings (gives authority to build barracks). Also: Memorandum from Captain Gunby to Mr. Beal, December 12, 1917. Subject: Newport News. Also: Memorandum for Captain Beal from Captain Nichols, Q. M. C., September 11, 1918. Subject: Camp Mills, Reconstruction of camp using cantonment construction. On file, Mail Control Division, Construction Service, Quartermaster General's Office, 652-A, Camp Merritt, N. J., 652-A, Camp Stuart, and 652 Camp Mills, respectively.

- (34) Report of the Chief of the Construction Division, 1918, 43. For authority, see: Memorandum from Chief of Staff, October 8, 1918, with approval of Acting Secretary of War. On file, Construction Service, Mail Control Division, Quartermaster General's Office. 652 B (General).
- (35) Report of the Provost Marshal General, 1917, 26.
- (36) Letter from the Surgeon General to The Adjutant General, November 7, 1917. Subject: Overcrowding in camps. On file, Record Room, S. G. O., Correspondence File, 720-1 (Health and Prevention of Disease).
- (37) Telegram from The Adjutant General to the Commanding Officer, Camp Devens, Ayer, Mass., November 14, 1917. On file, Record Room, A. G. O., Correspondence File 720 (Miscellaneous Division).
- (38) First indorsement, War Department, A. G. O., November 16, 1917, to the Commanding Generals of all National Guard and National Army Divisions and to all Department Commanders. On file, Record Room, A. G. O., Correspondence File 720 (Miscellaneous Division).
- (39) Third indorsement, Office of the Division Surgeon, 86th Division, Camp Grant, Illinois, November 22, 1917, to the Commanding General, Camp Grant, Illinois. On file, Record Room, S. G. O., Correspondence File, 720-1 (Health and Prevention of Disease).
- (40) Telegram from Commanding General, Camp Grant, Rockford, Ill., to The Adjutant General, November 21, 1917. On file, Record Room, A. G. O., Correspondence File 720 (Miscellaneous Division).
- (41) Sixth indorsement, S. G. O., War Department, December 1, 1917, to The Adjutant General (overcrowding). On file, Record Room, A. G. O., Correspondence File (Miscellaneous Division).
- (42) Eighth indorsement, War Department, A. G. O., December 8, 1917, to the Surgeon General. On file, Record Room, S. G. O., Correspondence File, 720 General (Miscellaneous Division).
- (43) Telegram from The Adjutant General, to the Commanding General, Southeastern Department, Charleston, S. C., December 8, 1917. On file, Record Room, A. G. O., Correspondence File 720 (Miscellaneous Division).
- (44) Letter from the Surgeon General to The Adjutant General, February 20, 1918. Subject: Designation on doors of the authorized man capacity of barracks dormitories. On file, Record Room, A. G. O., Correspondence File, 221 (Miscellaneous Division).
- (45) First indorsement, War Department, A. G. O., March 5, 1918, to the Commanding Generals of all Departments. On file, Record Room, A. G. O., Correspondence File, 221 (Miscellaneous Division).
- (46) Second indorsement, War Department, S. G. O., May 4, 1918, to The Adjutant General (floor and air space). On file, Record Room, S. G. O., Correspondence File, 724 (Fort Leavenworth) (N).
- (47) Report of Chief Signal Officer of the Army, 1917. On file, Library of Air Service. Also: Proceedings of Aircraft Production Board, Council National Defense, 142, stating Board approved contract between Albert Kohn and Colonel Edgar. On file, Library, Air Service. Also: Approval of Contract by Chief Signal Officer, September 21, 1917. On file, General Files, Air Service, 161A (Agreements).
- (48) Plans for original aviation barracks (Figures 9 and 9a). On file, Mail Control Division, Construction Service, Quartermaster General's Office, 652 General (Construction of quarters for Aviation Corps).
- (49) Report of the Board appointed by the Secretary of War to examine the housing plans for large cantonments, dated June 14, 1917. On file, Record Room, S. G. O., Correspondence File 621 (General).
- (50) Plans on file, Plans Division, Construction Service, Quartermaster General's Office.
- (51) Report of the Chief of the Construction Division, 1918, 14.
- (52) Seventh indorsement, War Department, A. G. O., September 17, 1917, to Col. I. W. Littell. On file, Record Room, A. G. O., Correspondence File, 424.1 Southwestern Department (Miscellaneous Division).

- (53) Manual for the Quartermaster Corps, U. S. Army, 1916, Vol. II, Appendix No. 15-10.
- (54) Letter from the commanding officer, Camp Sevier, August 17, 1917, to the commanding general, Southeastern Department. Subject: Bulletin 98. Headquarters, Southeastern Department, July 28, 1917. On file, Record Room, S. G. O., Correspondence File, 720.1 (Health and Prevention of Diseases).
- (55) First indorsement, S. G. O., August 27, 1917, to The Adjutant General, on letter from Department Surgeon, Southeastern Department, August 22, 1917, to the Surgeon General. Subject: Tent floors. On file, Record Room, S. G. O., Correspondence File, 411.2 (Flooring, etc.).
- (56) Copy of letter from the Department Commander, Southeastern Department, to The Adjutant General. Subject: Tent floors for National Guard Divisional camps. On file, Sanitation Division, S. G. O., "Housing of Troops."
- (57) Letter from The Adjutant General, to the Quartermaster General, September 18, 1917. Subject: Tent floors for National Guard camps. On file, Record Room, A. G. O., Correspondence File 424.1 (Miscellaneous Division).
- (58) Annual report of the Surgeon General of the U. S. Army, 1918, 170-171. Room, S. G. O., Document File.
- (59) Letter of instructions from The Adjutant General, November 26, 1917, to Major General W. C. Gorgas, Surgeon General, supplemented by letter of December 17, 1917, On file, Record Room, S. G. O., 201 (Gorgas, Wm. C.).
- (60) Letter from the Surgeon General to the Chief of Staff, November 26, 1917. Subject: Report of inspection of Camp Wheeler. On file, Record Room, S. G. O., Correspondence File, 721-1 (Camp Wheeler) (D).
- (61) Letter from the Surgeon General, to the Chief of Staff, dated December 3, 1917. Subject: Conditions 36th Division, Camp Bowie. On file, Record Room, S. G. O., Correspondence File, 720-1 (Camp Bowie) (D).
- (62) Telegram from the Surgeon General to Division Surgeons, December 5, 1917. On file, Record Room, S. G. O., Correspondence File 424 (Tentage). (Camps Bowie, Beauregard, and Wheeler) (D).
- (63) Memorandum from the Surgeon General, for the Chief of Staff, dated February 14, 1918. On file, Record Room, S. G. O., Correspondence File 702 (Health and Prevention of Disease).
- (64) Memorandum from the Surgeon General, March 28, 1918, to the Chief of Staff. On file, S. G. O., Sanitation Division (Ventilation).
- (65) Memorandum from the Assistant Chief of Staff, June 25, 1918, to The Adjutant General. Copy on file, Record Room, S. G. O., Correspondence File, 424 (Tentage).
- (66) Special sanitary report made to the Surgeon General by Col. Henry Shaw, M. C., July 21, 1917. Subject: Camp Devens, Mass. On file, Record Room, S. G. O., 721.5 (Camp Devens) (P).
- (67) Letter from the Surgeon General to The Adjutant General, August 9, 1917, and indorsements. Subject: Ventilation of cantonment barracks. On file, Record Room, S. G. O., Correspondence File 175339 (Old Files).
- (68) Letter from the cantonment surgeon, Camp Devens, to the Surgeon General, August 10, 1917. Subject: Window construction. On file, Record Room, S. G. O., Correspondence File, 175339 (Old Files).
- (69) Report of the Chief of the Construction Division, 1918, 25.
- (70) *Ibid.*, 26.
- (71) Memorandum from S. C. Appell, Supply Section, to Major Bevens, September 17, 1918. Subject: Heating apparatus installed in various fields. On file, General Files, Air Service, 674 (General).
- (72) Memorandum from the Surgeon General to camp and division surgeons. Subject: Respiratory diseases. On file, Sanitary Division, S. G. O.
- (73) Circular memorandum, S. G. O., September 6, 1918.
- (74) Second indorsement, War Department, S. G. O., January 3, 1918, to The Adjutant General. Subject: Double-deck bunks in barracks. On file, Record Room, S. G. O., Correspondence File, 724.9 (General).

- (75) Fifth indorsement, War Department, S. G. O., January 19, 1918, to The Adjutant General. Subject: Withdrawal opposition double-deck bunks. On file, Record Room, S. G. O., Correspondence File, 724.9 (General).
- (76) G. O. No. 39, W. D., June 24, 1915.
- (77) Telegram from Quartermaster General, U. S. Army, September 20, 1917, to quartermasters all camps. File No. 427.7-212 (G. M.) Q. M. G., old files.
- (78) Letter from the Surgeon General to The Adjutant General, January 8, 1918. Subject: Treatment of floors with a mixture of crude oil and kerosene in temporary buildings; also First indorsement thereon. On file, Record Room, S. G. O., Correspondence File 600.3 (General.)
- (79) Letter from The Adjutant General to the Quartermaster General, January 22, 1918. Subject: Treatment of floors with a mixture of crude oil in temporary buildings. On file, Record Room, A. G. O., Correspondence File, 600.3 (Miscellaneous Division).
- (80) Treatment of floors. Letter from The Adjutant General to the Quartermaster General, February 22, 1918. Subject: Treating of floors with a mixture of crude oil and kerosene in temporary buildings. On file, Record Room, A. G. O., Correspondence File, 600.3 (Miscellaneous Division).
- (81) Circular letter from the Surgeon General, June 6, 1918.
- (82) First indorsement, Headquarters 82d Division, Office of the Division Surgeon, to the Surgeon General, February 28, 1918. On file, Record Room, S. G. O.; Correspondence File, 600.3 (General).
- (83) W. D. Specifications No. 3526-F, December 11, 1919. On file, Supply Division, Office Q. M. G.
- (84) Memorandum from the Surgeon General to Division Surgeons, etc., February 25, 1918. On file, Sanitation Division (Oiling Floors, etc.) S. G. O.
- (85) Plates 52 and 53, Manual of the Construction Division of the Army, Section C, Engineering Division, 1918. (Consolidated Supply Co., Printers, Washington, D. C.) Copy on file, Hospital Division, S. G. O.
- (86) Figures 9a and 10 (Aviation barracks). Plans on file, Plans Division, Construction Service, Quartermaster General's Office.
- (87) Report of the Chief of the Construction Division, 1919, 30.
- (88) Manual of the Construction Division of the Army, 99-100.
- (89) Memorandum from the Surgeon General to division surgeons, etc., March 5, 1918. Subject: Flytraps, fly paper, and fly swatters for camps, cantonments, and other stations. On file, Record Room, S. G. O., Correspondence File, 726.1 (Mosquitoes and flies).

CHAPTER VI

DETENTION AND QUARANTINE CAMPS

Never had this country, and probably never before had any country, been confronted with the problem of mobilizing such a great number of absolutely untrained men in so short a time as became necessary when war was declared with Germany. Raw recruits were brought together in numbers hitherto undreamed of in America. To provide accommodations, large cantonments and many tent camps were erected at various points throughout the country and the facilities at many existing permanent stations were greatly increased. The types of construction employed have already been described in Chapter V. Men began to arrive at the rendezvous before proper accommodations were completed, and during the entire war the housing provided at most stations was generally insufficient for the number of soldiers present.¹ Construction work did not keep pace with the streams of drafted men; consequently, despite the strongest objections on the part of the Medical Department, overcrowding was frequent,¹ with the result that when once an infection was introduced into a barrack the opportunities for its rapid spread were exceptionally favorable.

The mobilization of large numbers of untrained recruits and their transformation into hardened soldiers probably has always been accompanied by the occurrence of epidemics of communicable diseases, with a corresponding increase in morbidity and mortality rates. The assembling of such bodies of men acts as a dragnet to bring together and concentrate all the infections then prevalent in the territory from which the individuals are drawn.

At the date of the declaration of war with Germany the strength of our Army was approximately 130,000.² This number had increased by the end of 1917 to 1,538,203, and up to the date of the signing of the armistice over 4,000,000 men had been enrolled in the military service.³ This means that during the period in question practically 4,000,000 men had come directly from civil life to the various points of mobilization, an average of over 210,000 each month. By far the greater part of these were enrolled during the last 12 months, because the first months of the war were largely occupied in preparing to receive, house, and equip the troops.

These men came from all walks of life, from the city and from the country, from the ranks of rich and of poor, and from every conceivable kind of sanitary environment. Most of them had a very limited knowledge of personal hygiene and were without any previous experience which would assist them in caring for themselves amid their new surroundings. It must necessarily follow that individuals so mobilized had in many instances been recently exposed to one or more of the exanthemata, and that some were actually in the incubation period of an infection at the time of entraining for their first station. Frequently the disease would become fully developed en route. The drafted men belonged to an age group particularly susceptible to certain acute communi-

cable diseases. Many of those from the rural districts had probably never before been exposed to some of these infections, and consequently had acquired no immunity thereto. As a whole, the field was most fertile for the development of epidemics, provided an incipient case or a carrier was introduced. The change in mode of living was abrupt. The recruits reached camp in a condition of lowered vitality, in part due to the fatigue of their journey, but probably in far greater measure a result of the psychological condition induced by separation from families and friends, uncertainty as to their business affairs, and a realization of the seriousness of the new life upon which they were embarking. After their arrival at Army stations the general features of the new life did not at first tend to improve their physical and mental condition. They became a part of the military machine; their daily life was directed by routine; discipline must be observed; they could not go when and where they pleased, have just what they wanted to eat, or arrange their sleeping quarters to suit their own ideas; the majority were quartered in barracks which, in the cantonments, usually had dormitories containing beds for from 50 to 75 persons, frequently all strangers; others were sheltered in overcrowded tents without frames or floors.¹ During the autumn of 1917 men were sometimes received at camps in which the barracks had not been finished and in which heating systems were not yet completely installed; there were in certain instances insufficient supplies of heavy clothing and blankets; the fall of 1917, as well as the ensuing winter, was exceptionally cold and there occurred, perhaps, some actual suffering among the new recruits on this score.¹ Many of these newly made soldiers had been following sedentary or indoor occupations and were not used to hard manual labor or to exposure in severe climates. Nevertheless, they were put through an intensive course of military drill, together with such fatigue work as was necessary. It is no wonder, then, that the condition of low vitality in which they arrived at the camp continued for a while. The majority were depressed and homesick, their general physical condition was below par, and they became easy prey to infections. It is at this time, viz., during the first two or three weeks of camp life, that many infectious diseases are most prone to develop. The man who had been exposed before he left home might develop symptoms of disease at any time, or the individual who on entraining was in the first stage of one of the exanthemata might infect others in his car, who in turn were ready in a few days to spread the contagion. All these conditions told, and during the fall of 1917 and winter of 1917-18 there occurred at nearly every camp serious epidemics of the communicable diseases, especially measles, mumps, scarlet fever, meningitis, and pneumonia.¹

During the early part of the war, on the arrival of a detachment of recruits at a camp the men were assigned directly to existing organizations, which they promptly joined. In this way individuals from many different communities might be placed together in the closest contact, and if some had been exposed to infectious disease prior to arrival at camp they became potential sources of danger to the other members of their new organization.

In addition to infectious diseases brought in by recruits joining camps from civil life, many such diseases must also have been carried from one part of a

camp to another part and one camp to another. Soldiers were shifted more or less in the same camp and parties of soldiers were constantly being transferred; and while so far as the latter were concerned stringent orders were in force regarding the retention of carriers or contacts, there were undoubtedly frequent instances when men left camp after having been exposed to infectious disease, although the medical officers had no knowledge of such exposure. In this way a disease could be readily transmitted from one camp to another.

The usual precautions in reference to the spread of communicable disease were constantly observed at all camps.¹ Quarantine of infected organizations was effected when necessary; periodical examinations were made of all known contacts; search for carriers was promptly instituted; and efforts were made to prevent overcrowding, and to limit its ill effects by means of free ventilation and the placing of beds with heads and feet alternating.

Soon after the drafted men and the National Guard began to be mobilized in the new camps the Surgeon General's office formed the opinion that, despite the efforts already being made, it was impossible to prevent the frequent occurrence of numerous cases of communicable disease, and at times extensive epidemics, unless special measures were taken to segregate all new arrivals at camp during a period of at least two weeks. This opinion was strengthened as a result of the studies made by General Gorgas and his party during the inspections of southern and western camps between November 26 and December 17, 1917. (See Chap. II, "Epidemiology and the Work of Epidemiologists in Camps.") Recommendations for observation camps at certain points visited were contained in many of the letters and telegrams submitted to the Chief of Staff by the Surgeon General during this inspection tour. To fully carry out the segregation of new arrivals it was proposed not only to keep such men isolated in a given area, but also to hold together each group as it came and prevent its members from associating with those in another group. The period of detention would serve other purposes than isolation, as will be shown later. With the above ends in view, recommendations of a general nature were submitted by the Surgeon General to the Chief of Staff in the following letter:

DECEMBER 20, 1917.

From: The Surgeon General, United States Army.

To: The Chief of Staff.

Subject: Detention and quarantine camps.

1. The prevalence of serious epidemics of communicable diseases in camps and cantonments, in spite of observation of the usual preventive measures, has led to the necessity of applying more stringent measures in many infected camps for the proper control of these diseases. Recommendation has been made for the establishment of detention and quarantine camps in the camps and cantonments recently visited by me. As camp infection is now more or less general, it is considered necessary that the same preventive measures be applied in all camps and cantonments within the United States. It is recommended, therefore, that instructions be communicated to all commanding officers of camps and cantonments that a detention and quarantine camp be established in connection with each existing camp and cantonment to serve the purpose as hereinafter stated.

2. A *detention camp* should be established for each camp and cantonment where all fresh contingents of men will be held under observation for at least two weeks, or longer if considered necessary by the division surgeon, before being assigned to organizations in general camp. The purpose of the detention camp is the observation of new men for a certain period to prevent the introduction of communicable diseases into the noninfected

camp or cantonment from without. No new men should be placed in the general camp until in the judgment of the division surgeon it is safe to do so. The capacity of the detention camp should be such that it will accommodate the full quota of each contingent expected to complete the organization of the division. The period of detention should be utilized for physical reexamination of the men, the vaccination and immunization against typhoid and paratyphoid fevers, and such equipment and training as may be prescribed by the camp and cantonment commanders without bringing the men in detention camp into contact with other men of the division.

3. A *quarantine camp* should be established in each camp or cantonment by the camp or cantonment commander when a command is already infected with a communicable disease. This camp is to serve the purpose of segregation of contacts or carriers of these diseases and permit of intensive search for and treatment of carriers during their period of infectivity. The required capacity of the quarantine camp will depend upon the degree of infection of the command, and will be determined by the camp or cantonment commander after consultation with the camp or cantonment surgeon.

4. In establishing detention and quarantine camps, provision should be made for isolation of men in small groups. If accommodations are to be provided in conical wall tents five men only should be allowed in each tent. If in buildings, small rooms or huts should be provided, each room or hut to accommodate not more than five men each.

5. It is urgently recommended that no new men be sent to the various camps or cantonments until detention camps have been established where they may be held under observation as above indicated. This should apply as well to transfer of men from one camp or cantonment to another.

W. C. GORGAS,
Surgeon General, U. S. Army.

The fundamental reason for such camps, viz, isolation of new arrivals, was clearly set forth in this letter. There was, however, another advantage which would accrue to the individual during a two weeks' detention period. If recruits were immediately assigned to organizations and required to enter upon a course of intensive training, they had no opportunity to adjust themselves gradually to their new surroundings. A short stay in a properly conducted detention camp, with only a regulated degree of drill and other work, and in association with those men who had arrived at the same time, in the opinion of the Surgeon General, would unquestionably be the best means of enabling the neophyte to adapt himself to his new environment, both physically and psychologically.

The following indorsements show the action taken on the Surgeon General's request up to January 30, 1918:

[First indorsement]

WAR DEPARTMENT, A. G. O., *December 26, 1917.*

To the SURGEON GENERAL:

In connection with paragraphs 2 and 3, letter herewith, you will submit detailed tentative plan which is considered practicable for the carrying out of your recommendation as laid down in paragraph 1.

By order of the Secretary of War:

AUSTIN P. PARKER,
Adjutant General.

[Second indorsement]

WAR DEPARTMENT, S. G. O., December 31, 1917.

TO THE ADJUTANT GENERAL OF THE ARMY:

Returned.

1. *National Army cantonment.*—It is recommended that detention and quarantine camps be composed of wooden huts, each 20 feet by 20 feet, having a capacity of 8 men. Kitchens should be provided, but no mess halls are necessary, as it is contemplated that the men eat either out of doors or, in inclement weather, in their individual huts. Lavatory, bath, and toilet buildings for each 250 men would be required. Near each kitchen should be constructed an open shed with water and sewer connections where mess kits can be washed. Quarters for officers, storehouses, administrative offices, and a regimental infirmary building, at the rate of 1 for each 2,000 men, will be required for each detention camp. These accessory buildings will not be required for the quarantine camp. The required capacity for the detention camp will depend on War Department plans as to the number of men to be ordered into cantonments within each two weeks' period. This information is not available in this office, and the required capacity for the detention camp can not be estimated. For the quarantine camp a minimum capacity of 1,000 should be provided for each National Army cantonment, with available space for expansion if required.

2. *National Guard and other camps.*—It is recommended that detention and quarantine camps for National Guard and other camps be made up of huts the same size and capacity as recommended for National Army cantonments, or framed and floored tents. The hut construction is considered preferable. Latrine buildings, kitchens, and dish-washing sheds will be required. In the detention camp the required capacity will depend on the maximum number of men expected at the camp in a single contingent. For the quarantine camp a minimum capacity of 1,000 men should be provided, with space available for expansion of this nucleus as required by epidemic conditions.

3. There should be a wire fence about each detention and quarantine camp.

For the Surgeon General:

D. C. HOWARD,
Colonel, Medical Corps.

[Fourth indorsement]

WAR DEPARTMENT, A. G. O., January 12, 1918.

TO THE OFFICER IN CHARGE OF CANTONMENT CONSTRUCTION,

Fifteenth and M Streets NW., Washington, D. C.

For action as follows:

1. The estimate and plans for detention camps at cantonments submitted by your office under date of December 24, 1917, will be revised so as to meet the conditions set forth in second indorsement, Surgeon General's Office, dated December 31, 1917, which accompanies these papers.

2. Estimates and plans for a detention camp, of hut construction modified as indicated in Surgeon General's indorsement above referred to, will be prepared on the basis of accommodations for a draft contingent of 3,000 men, one such unit for each National Army cantonment.

3. Estimate and plans for a quarantine camp of hut construction, as indicated in Surgeon General's indorsement, will be prepared on the basis of accommodations for 1,000 men, one such unit at each National Army cantonment.

4. Estimate and plans for a quarantine camp of framed and floored tents, together with the necessary auxiliary buildings, as indicated in the Surgeon General's indorsement, will be prepared on the basis of accommodations for 1,000 men, one such unit at each Regular Army and National Guard divisional camp.

[Fifth indorsement]

WAR DEPARTMENT, CANTONMENT DIVISION,
January 23, 1918.

TO THE ADJUTANT GENERAL OF THE ARMY:

1. Herewith forwarded are estimates and plans for detention and quarantine camps revised as requested in above indorsement.

2. For a detention camp accommodating 3,000 men for each National Army cantonment, the following buildings will be required:

- 384 huts for men, 20 by 20 feet, plan No. 620-326.
- 35 huts for officers, 20 by 20 feet, plan No. 620-326.
- 12 kitchens, 20 by 40 feet, plan No. 620-339.
- 1 kitchen, 20 by 32 feet, plan No. 620-339.
- 12 lavatories, 20 by 49 feet, plan No. 25C.
- 2 lavatories, 20 by 21 feet, plan No. 25C.
- 1 administration building, 20 by 84 feet, plan No. 620-327.
- 2 storehouses, 20 by 96 feet, plan No. 620-318.
- 1 medical dispensary, 30 by 63 feet, plan No. 620-302, and 303.
- Estimated fence, 8,000 linear feet, plan No. 610-194.

* * * * *

3. For a quarantine camp accommodating 1,000 men at each National Army cantonment, the following buildings will be required:

- 128 huts for men, 20 by 20 feet, plan No. 620-326.
- 10 huts for officers, 20 by 20 feet, plan No. 620-326.
- 4 kitchens, 20 by 40 feet, plan No. 620-339.
- 1 kitchen, 20 by 32 feet, plan No. 620-339.
- 4 lavatories, 20 by 49, plan No. 25C.
- 1 lavatory, 20 by 21 feet, plan No. 25C.
- Estimated fence, 4,000 linear feet, plan No. 610-194.

* * * * *

4. For a quarantine camp accommodating 1,000 men for each National Guard and Regular Army divisional camp (including Fort Bliss, Tex.), the following buildings are required:

- 200 tents, floors and wall frames for men, 16 by 16 feet, page 333, C. Q. M., vol. 2.
- 19 tents, floors and wall frames for officers, 8 feet 11½ inches by 9 feet 2 inches, page 333, C. Q. M., vol. 2.
- 4 kitchens, for men, 20 by 40 feet, plan No. 620-339.
- 1 kitchen, for officers, 20 by 32 feet, plan No. 620-339.
- 4 lavatories, for men, 20 by 49 feet, plan No. 25C.
- 1 lavatory, for officers, 20 by 21 feet, plan No. 25C.
- Estimated fence, 4,000 linear feet, plan No. 610-194.

* * * * *

[Eighth indorsement]

WAR DEPARTMENT, SURGEON GENERAL'S OFFICE,

January 30, 1918.

TO THE ADJUTANT GENERAL OF THE ARMY:

1. Returned. The plans submitted by the cantonment division are satisfactory. It is recommended that funds be asked for to provide for necessary construction for detention and quarantine camps at National Army cantonments to provide for the needs of later drafts. As tentage becomes available it should be furnished National Guard camps in sufficient quantities and division commanders authorized and directed to establish detention and quarantine camps in accordance with recommendation from this office, January 6, 1918.

2. If funds were now immediately available to construct these camps as previously recommended, it would now be impossible to complete them before the date set for the induction of the next increment of drafted men. No more men should be brought into existing camps until detention and quarantine camps have been established, or extemporized for that purpose.

3. To meet the immediate emergency of caring for the last increment of the present draft, it is recommended that cantonment commanders be directed to report the number of new men that can be cared for in unoccupied buildings of the depot brigade or other separate and isolated accommodations. The number of men to be sent to a cantonment at any one time should be limited to the number that can be cared for in this manner. Cantonment commanders should be directed to establish an extemporized quarantine camp at each cantonment to care for suspects and contacts. This recommendation is made with the understanding that selected men yet due on the present draft are not to be sent to National Guard camps direct, but that all will pass through cantonments.

4. The arrangement suggested in paragraph 3 will be, at best, a makeshift, and not entirely satisfactory, but it appears to be the best that can be done to meet the present emergency, unless tentage should become available within a short time.

5. Attention is invited to recommendation from this office under date of January 5, 1918, to the effect that division commanders be not only directed to establish these camps, but that they be charged with actual construction of same and that necessary funds and material be placed at their disposal for this purpose. The recommendation referred to is now renewed.

* * * * *

As a considerable period of time must necessarily elapse before the construction asked for could be completed, the Surgeon General made the recommendation shown in paragraph 3 of the immediately preceding indorsement. The question of providing improvised detention and quarantine camps was also being agitated by the local authorities at many places. These improvisations were not intended as a substitute for the permanent detention and quarantine camps previously recommended; however, they would enable the camp commanders to take advantage of any local facilities for establishing these much-needed accommodations. As will appear later on, the War Department declined to authorize the subdivision of existing barracks into small squad rooms, but, nevertheless, detention camps were improvised at most of the large stations and in a measure served the purpose of segregating new arrivals for an authorized period,¹ even though they were generally mere makeshifts and in no way thoroughly accomplished the expressed wishes of the Surgeon General's Office.

The Surgeon General continued without cessation his efforts for the construction of detention and quarantine camps of approved type. On February 14, 1918, in a memorandum to the Chief of Staff on the general subject of sanitary improvements, the following paragraph was included:⁴

3. *The establishment of detention and quarantine camps* for each National Army cantonment and National Guard division or other independent camp has been recommended in various communications from this office since December 15. It is understood that decision in this matter is still pending in the War Department.

On February 21, 1918, The Adjutant General in an indorsement to the commanding general, Camp Wadsworth, S. C., stated that the subject of detention and quarantine camps for each division was then under consideration, but that 200 tents, pyramidal, have been ordered shipped to his camp to fill this purpose temporarily.

This indorsement clearly indicates that while the War Department was not yet ready to authorize the general construction asked for, nevertheless the importance of such a step was clearly visualized and commanding generals of camps were being aided in working out temporarily plans for this purpose.

A financial question here arose which later was occasion for considerable additional correspondence. The construction division of the War Department desired that the money expended for the building of detention and quarantine camps be charged to the appropriation for "Construction and repair of hospitals." The Surgeon General consistently maintained that such an expenditure from that source was not proper, these camps being intended not for the care of sick and wounded, but for the accommodation of incoming recruits and those who had been exposed to disease. In the event that any soldier in

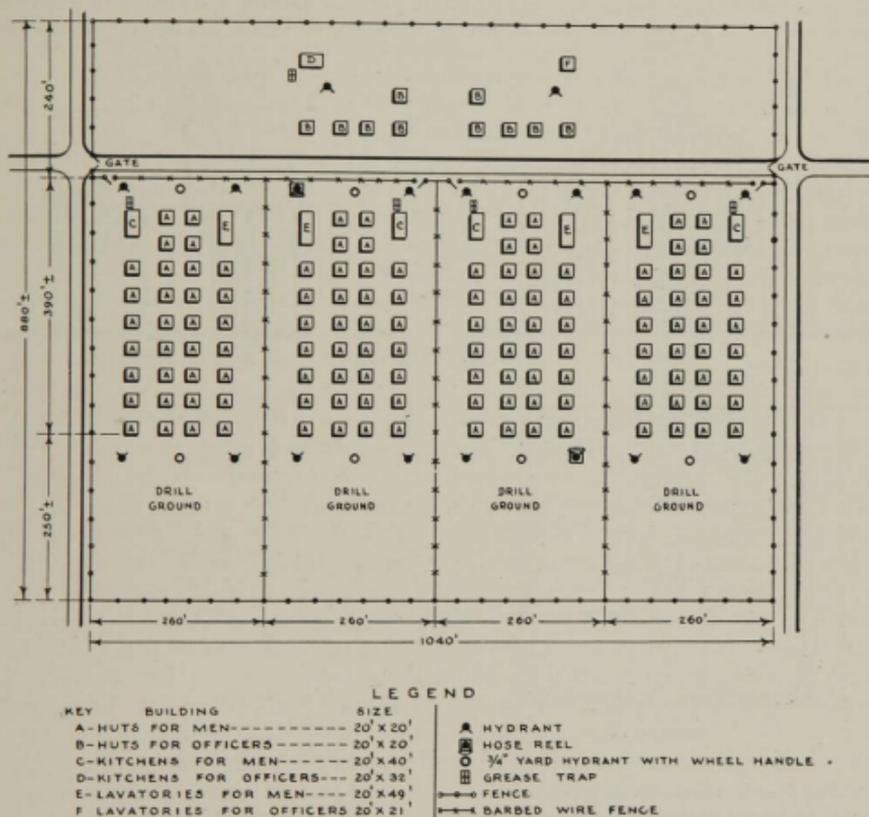


FIG. 24.—Typical quarantine camp for 1,000 men

either type of camp became ill, he would be transferred promptly to a hospital for proper medical attention. Ultimately the general contention of the Surgeon General was sustained, and the construction of both detention and quarantine camps was charged to the appropriation for "Barracks and quarters." However, in this particular case at Camp Kearny, since the commanding general there had completed the "isolation" camp from funds authorized for "Construction and repair of hospitals," the Surgeon General recommended approval of his action, but did not consider this action as in any way establishing a precedent.

As months passed and no definite action was taken with reference to the construction of detention and quarantine camps, the Surgeon General, on April 18, 1918, submitted the following letter to The Adjutant General:

1. Frequent recommendations have been made by this office for the construction of detention camps, composed of small huts to house eight men each, for the purpose of segregating incoming draft men at National Army cantonments. In the absence of such construction, depot brigade cantonments are being used for the purpose. The buildings in depot brigades are at present ill suited for detention-camp purposes. The rooms house large numbers of men, and if a single case of infectious disease occurs all occupants of the room are likely to be exposed to the infection. If it is deemed inexpedient to construct detention camps composed of small huts, it is recommended that depot brigade barracks be

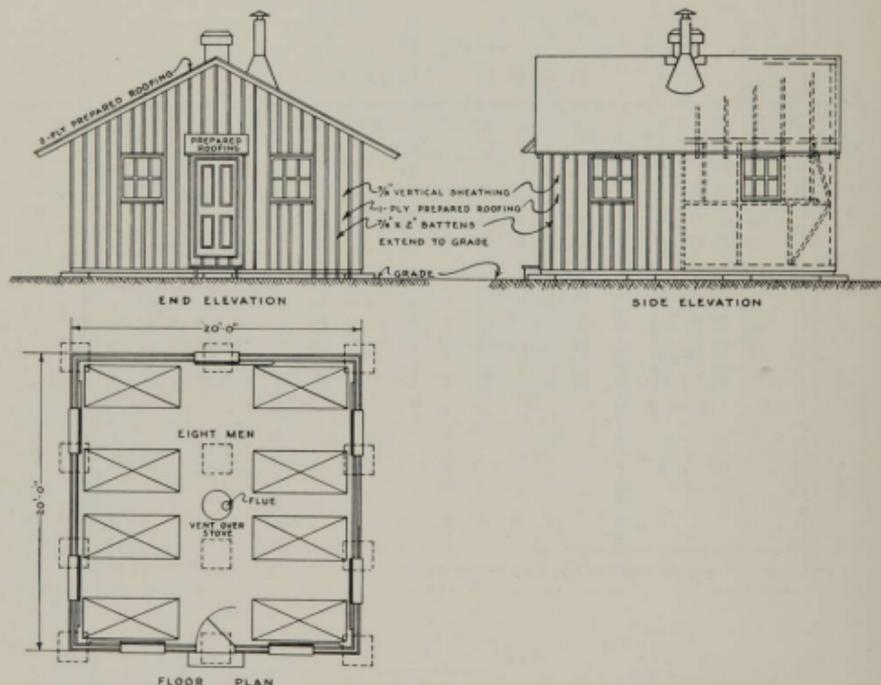


FIG. 25.—Typical detention hut

so altered as to provide a series of small rooms housing from 10 to 12 men each. This purpose can be accomplished by the construction of partitions of a single thickness of beaver board. Additional doors will be needed on both floors, and stairs and short porches on the second story, in order to provide separate access to the individual rooms. It is essential that each room should be entered from the outside and that there be no inside communication between the individual rooms. To facilitate ventilation, it is desirable that the new partitions be not over 7 feet high. The construction necessary to accomplish these ends would probably be far less expensive than the building of new eight-men huts, and would accomplish reasonably well the ends desired. Rough plans are attached outlining what is considered a suitable plan for modifying small types and large types of barracks. All new construction advised is drawn in red. The ultimate addition of provisions for heating of the individual rooms must also receive attention.

2. In the administration of such a detention camp every effort should be made to keep the room groups separated. Visiting should not be allowed. Drills should be by room

squads. At mess, room squads should sit together, with a space of at least 6 feet separating each room squad from the next. Proper arrangements should be taken to prevent mingling of groups in the lavatories. At least 50 square feet of floor space should be allowed each man in dormitories.

While detention in small rooms provided by remodeling existing barrack buildings was considered in no respect as satisfactory as a camp built on the hut plan, nevertheless any arrangement for segregating the incoming soldiers in small groups was thought to be a great aid in suppressing the spread of infectious diseases. On April 29, 1918, the above recommendation for the subdivision of barracks was disapproved by The Adjutant General because it was not considered that any action should be taken converting depot brigade buildings to adapt them for detention camp uses until it had been determined what action Congress would take with reference to the estimates included in the deficiency bill for the necessary funds to establish detention camps at the camps and cantonments.

In the meantime, detention and quarantine camps had been improvised at all the large stations. Existing facilities were taken advantage of in every way to perfect the arrangements deemed desirable. When barracks were used for this purpose the arrangements were not very good, since sufficient segregation of small groups of men could not be obtained. Where tents were available, results were much more satisfactory, but in only a few instances was it possible to have a camp arranged according to the ideas of the Surgeon General. A detention place of any character, however, served to keep the newcomers away from the men already at the station.

On July 16, 1918, the Surgeon General, having been informed by the construction division that money had recently been appropriated by Congress for the construction of 32 detention camps and 32 quarantine camps, and that tentative plans for this construction had been prepared, recommended that the construction of a detention camp with a capacity of 3,000 men and a quarantine camp with a capacity of 1,000 men be authorized and begun at the earliest possible moment at each of the following points: Camps Sheridan, Meade, Lewis, Wadsworth, Logan, McClellan, Gordon, Dix, Sherman, Bowie, Dodge, Sevier, Kearny, Taylor, Fremont, Funston, Devens, Custer, Hancock, MacArthur, Wheeler, Jackson, Lee, Travis, Pike, Grant, Shelby, Beaugard, Cody, Upton, and that camps of half the size recommended in paragraph 3 be constructed at Camps Humphreys and Greenleaf. It was further recommended that the detention camp be located as closely as possible to the depot brigade at camps where there was a depot brigade; and that the quarantine camp be located as closely as practicable to the base hospital.

The War Department did not authorize the entire program recommended by the Surgeon General in his letter of July 16, 1918, but did direct the building of detention and quarantine camps at certain points, viz, Camps Grant, Sherman, Custer, Dodge, Lee, and Pike (cantonment stations) and Sevier and McClellan (tented stations).⁶ Plans also were under consideration at the time the armistice was signed for similar construction at Camps Devens, Travis, and Greenleaf. While a large part of the carpentry work had been done, not one of these frame-hut detention and quarantine camps was com-

pleted on November 11, 1918, and, consequently, they were never available for the purpose intended, since no more drafts were called after that date, and nothing offers as to their value. Extensive detention and quarantine camps, composed of framed and floored tents, had been constructed at Camp Funston about one year before the armistice; and while not the equal of those desired by the Surgeon General, they nevertheless functioned in a fairly satisfactory manner.⁷ Less extensive improvisations with tentage had been made at many other stations.¹

The correspondence quoted shows the purpose for which these camps were desired and in general the manner in which they should function. It may be well, however, to summarize the plans of the Surgeon General in reference thereto.

On arrival at a camp, all newcomers, either from civil life or from another station, would be placed in a detention camp for a period of at least two weeks. During this time these men would be required to remain within the bounds of the camp and to associate only with those who were housed in the same hut, tent, or sleeping compartment. The number quartered together in one hut, tent, or dormitory, was to be small, not exceeding eight, and was to be composed of men who had arrived together and who, if possible, had come from the same locality. All would be inspected by medical officers as frequently as considered necessary for the detection of communicable disease, this examination to be at least daily. If disease were found, the patient would immediately be transferred to a contagious ward of the base hospital and all contacts (men living in same tent or hut) would be sent to the quarantine camp. "Carriers" detected in a detention camp, or elsewhere, would similarly be sent to the quarantine camp. While in the detention camp all necessary physical examinations for induction or other purposes would be made and records completed; the smallpox vaccination and the typhoid-paratyphoid immunization would as far as possible be carried out at this time. No gatherings of men, such as at moving pictures, plays, concerts, etc., would be permitted except in the open air, and close contact should be prevented even then. No mess hall was contemplated; on receiving their food the men were to eat outdoors in good weather and take it to their own huts during inclement periods. Shelters supplied with hot and cold running water for dish washing, and with sewer connections, were to be provided. In the lavatory there would be a partition between each two toilet seats and between each two hand basins. Drills were to be by units containing only the men in each hut or tent, and were to be graduated in character so as not to overfatigue men and thereby lower resistance. The most desirable site for a detention camp would be adjoining the depot brigade. A detention camp was to be surrounded by a barbed-wire fence, with similar fences separating each one of the company units (250 men).

In the quarantine camp, which should be located near the base hospital, would be segregated those men who were known to be carriers of disease or who had been in contact with patients having communicable disease. These men would be quartered in accordance with the nature of the cause for admission to this camp. Carriers of a certain disease would be held together and kept separated from other classes of men in the camp. Those who had been in

contact with a case of infectious disease would be brought together and placed in the same tent or hut, so that further spread of the disease from this source might be avoided. Contacts were to be examined at specified times, preferably twice daily. Arrangements were to be made for systematically taking cultures from the carriers and for giving them any necessary medication with a view to freeing them from the offending organism. In general the same rules with reference to sanitation would apply as were noted for the detention camp. In both detention and quarantine camps the interior administration must be most carefully supervised, and very strict discipline would be essential if satisfactory results were to be attained.

The plans finally adopted for the lay-out of these camps and for the construction of the individual eight-bed huts are shown in Figures 23, 24, and 25. The only objection to this arrangement of huts was the location of the latrines, which should have been at the center of each company line of huts instead of at one end. This would have made them much more convenient of access.

The adoption of such a plan as is outlined above was believed to be essential for the limitation of epidemic diseases during mobilization.

REFERENCES

- (1) Reports made by sanitary inspectors to the Surgeon General. On file, Record Room, S. G. O., File No. 721-1.
- (2) Second Report of the Provost Marshal General to the Secretary of War, on The Operations of the Selective Service System to December 20, 1918, Washington, Government Printing Office, 1919.
- (3) *Ibid.*, 80.
- (4) Memorandum from the Surgeon General to the Chief of Staff, May 3, 1917. Subject: Sanitary improvements needed in various camps. On file, Record Room, S. G. O., Correspondence File, 720 (Health and Prevention of Disease).
- (5) Fifteenth indorsement from the Judge Advocate General to the Officer in Charge Construction Division, War Department, June 13, 1918. Subject: Proper appropriation chargeable with the cost of constructing detention and quarantine camps. On file, Record Room, S. G. O., Correspondence File, 652 (Camp Kearny) (D).
- (6) Memorandum from the Assistant Chief of Staff, Director of Operations, to the Assistant Secretary of War, August 20, 1918. Subject: Additional construction in National Army and National Guard camps. (Approval of Secretary of War affixed thereto.) On file, Record Room, S. G. O., Correspondence File, 652 (General).
- (7) Annual report, 89th Division, Camp Funston, Kans., for the period September to December, 1917, made to the Surgeon General, by Lieut. Col. J. L. Sheppard, M. C. On file, Historical Division, S. G. O.

CHAPTER VII

THE ARMY RATION ^a

RATIONS IN USE AT OUTSET OF THE WORLD WAR

The 1908 rations of our Army ¹ were in force during the Mexican mobilization in 1912, the volunteer training camps of 1914, 1915, and 1916, and the punitive expedition into Mexico in 1916, and in 1917, when the United States entered the World War. Meanwhile, only one or two slight changes had been made; for example, lard compound, or, as it was later called, "lard substitute," was introduced as a possible substitute for lard;² this was a frying fat made largely from vegetable oils and therefore very much cheaper than pure lard. In the meantime, also, several emergency rations had been experimented with, and one of them, the so-called "chocolate ration," approved March 10, 1913, had been found so unsatisfactory in the Mexican punitive expedition that it was definitely abandoned.³ Another, the "bread and meat" ration, consisting of a wheat-and-meat mixture, and chocolate, had been tried with more success and in 1918 was called for by General Pershing; it was revised slightly and was manufactured in large quantity for use in France.⁴

LANDING RATION

The first new ration, resulting from the previously untried conditions in the World War, was the landing ration, or debarkation ration, provided to meet the need of troops going to France via England.⁵ Apparently this ration was used only upon a small number of transports, for most of the troops not carried on United States naval transports were carried on chartered British transports and were fed upon an English scale of rationing. Those carried upon United States naval transports were fed the Navy ration. For details concerning rationing our troops on British transports consult Chapter VI, "Sanitation, American Expeditionary Forces," in the second section of this volume.

PROPOSED TRAINING RATION

The nutritional surveys, which are described in the succeeding chapter, were calculated to exhibit not only the average amount of food consumed, but also the average amounts of various articles composing the diet selected. When, early in 1918, 227 messes had been reported upon, the average amount of each article supplied, whether by the quartermaster or by outside purchase, was carefully reckoned. It was seen at once that the ration selected represented a wide departure in certain respects from the prescribed ration, and, in the conviction that the unrestricted taste of the soldier was a fairly safe index of desirable alterations, particularly as they coincided with alterations indicated by the experience of many officers who reported upon the 1908 ration and agreed also with alterations dictated by the newer discoveries in the science of nutrition, a revision was proposed by the Surgeon General to The Adjutant General, June 3, 1918.⁶ The extent of the changes proposed may be gathered from Table 3, which exhibits in parallel columns the garrison ration as it was supposed to be computed under the provisions of paragraph 1221, Army Regulations, 1913, the food supplied to 227 messes, and the proposed "training ration."

^a For complete information concerning the rations of our Army, consult Chap. VI of the second section of this volume.

TABLE 3.—Proposed training ration compared with food consumed in 227 messes

Food article	Garrison ration prescribed by A. R. 1221, 1913		Food supplied in 227 messes		Proposed training ration		
	Component articles	Substitutive articles	Component articles	Substitutive articles	Component articles	Substitutive articles on basis of—	
						Energy	Protein
	Ounces	Ounces	Ounces	Ounces	Ounces	Ounces	Ounces
Beef, fresh	14		9.15		12		14.5
Mutton							9.07
Veal				0.26			20.7
Pork, fresh				.83			9.8
Poultry				.27			13.1
Fish, fresh:							
Salmon							18.1
Cod				.30			73.4
Fish, preserved				.27			23.2
Corned beef (canned)							14.7
Hash, corned beef				.19			22.7
Liver				.24			21.9
Total beef, etc.	{ 14		9.15	2.36	12		
		14	11.51		12		
Bacon		3.6		.50	2		
Ham				.72			3.7
Sausage				.94			4.7
Total bacon, etc.	{	3.6	.50	1.68	2		1.3
		3.6	2.18		2		.9
Flour	18		1.87		10		
Bread:							
Soft				7.98			* 10.67
Hard				.02			9.22
Total flour, etc.	{ 18		1.87	8	10		
		18	9.87		10		
Other cereals (oatmeal)			.40		1.5		
Cornmeal				.48			1.68
Farina				.37			1.65
Total other cereals	{		.40	.85	1.5		
			1.25		1.5		
Baking powder	.08				.08		
Beans:							
Dried	1.2		1.01		2.25		6.02
Baked, canned							7.34
Peas:							
Dried							2.18
Canned				.82			14.04
Corn, canned				.58			7.91
Total beans, etc.	{ 1.2		1.01	1.40	2.25		
		1.2	2.41		2.25		
Rice		.8	.45		1		
Hominy, dry				.30			1.00
Macaroni and spaghetti				.22			.98
Cornstarch							.97
Total rice, etc.	{	.8	.45	.52	1		
		0.8	0.97		1		
Potatoes:							
White	14		11.74		14		
Sweet				.77			9.43
Dehydrated							2.72
Sweet, dehydrated							2.63
Total potatoes	{ 14		11.74	.77	14		
		14	12.51		14		
Onions:							
Fresh		4	.74		4		
Dehydrated							.48
Cabbage:							
Fresh				1.11			6.44
Dehydrated							.52
Beets:							
Fresh				.09			4.63
Dehydrated							.51
Carrots:							
Fresh				.14			4.86
Dehydrated							.49
Spinach:							
Fresh				.21			7.07
Dehydrated							.61
Turnips:							
Fresh				.35			6.24
Dehydrated							.50
Total onions, etc.	{	4	.74	1.90	4		
		4	2.64		4		

* One 2-pound loaf for each three men.

TABLE 3.—Proposed training ration compared with food consumed in 227 messes—Continued

Food article	Garrison ration pre- scribed by A. R. 1221, 1913		Food supplied in 227 messes		Proposed training ration		
	Component articles	Substi- tutive articles	Component articles	Substi- tutive articles	Component articles	Substitutive articles on basis of—	
						Energy	Protein
	Ounces	Ounces	Ounces	Ounces	Ounces	Ounces	Ounces
Tomatoes:							
Canned.....	2		1.41		2		
Dehydrated.....						0.13	
Total tomatoes.....	{ 2		1.41		2		
			1.41		2		
Prunes.....	.38		.40		.5		
Apples, evaporated.....		.13	.13		.25		
Peaches, evaporated.....		.13	.21		.25		
Or pears, evaporated.....						.27	
Or apricots.....						.25	
Or raisins and currants.....				.13		.22	
Jam.....		.64	.58		.60		
Total prunes, etc.....	{ .38	.90	1.32	.13	1.60		
		1.28	1.45		1.60		
Fresh fruits, equivalent to 1.6 ounces preserved fruit:							
Apples.....						8.79	
Peaches.....						12.48	
Pears.....						7.44	
Pineapple, canned.....				.19		2.70	
Oranges.....				.94		11.38	
Bananas.....				.34		6.45	
Cranberries.....						9.00	
Lemons.....						13.34	
Total fresh fruits.....	{		1.47	1.47			
Coffee.....	1.12		1.08		2		
Tea.....						.5	
Cocoa.....						2	
Total coffee, etc.....	{ 1.12		1.08		2		
			1.08		2		
Sugar.....	3.2		3.39		5		
Milk:							
Evaporated.....	.5		2.05		3		
Fresh or reconstituted.....						5.94	
Total milk.....	{ .5		2.05		3		
			2.05		3		
Vinegar.....	.64				.12		
Or vinegar pickles.....	.32	.32			.18		
Total vinegar, etc.....	{ .32	.32			.30		
		.64			.30		
Pepper.....	.04				.02		
Salt.....	.64				.5		
Cinnamon.....	.014				.014		
Cloves.....		.014					
Nutmeg.....		.014				.014	
Ginger.....		.014				.014	
Total spices.....	.014		.003		.014		
Lard.....	.32		.11		.10		
Lard substitute.....		.32	.88		.60		
Total lard, etc.....	{ .32	.32	.69		.70		
		.64	.69		.70		
Butter.....	.25		.40		.5		
Oleomargarine.....		.25	.11		.5		
Total butter, etc.....	{ .25	.25	.51.5		1		
		.50	1		1		
Sirup.....	1.78		.72		.74		
Flavoring extract.....	.014				.014		
Energy supplied, calories.....		4,757	3,422		4,243		

^b Based on 4 per cent fat.

^c Equivalent to 0.16 gill.

^d Equivalent to 0.32 gill.

* 88 per cent of food supplied accounted for.

The term "training ration" was adopted in recognition of the probable eventuality that the requirement in campaigns in France would prove to be much larger. Practically without exception each army of the allied nations made such a distinction. The French had their "normal ration" for training and their "strong ration" for the field.⁷ The English had their "home ration" for training in home camps and their "field" or "field and trench" for actual military operations.⁷ The Italians had their "territorial ration" for home camps and "combative ration" for active campaigns.⁷ Aside from this, the term "garrison ration" is seemingly a misnomer for large concentration camps, for it is recognized generally that a division of troops in a training camp can, under proper supervision, be subsisted on a smaller ration than can a small garrison in an isolated post.

The revisions proposed may be summarized as follows: (1) Reduction of meats, flour, pickles, pepper, salt, and sirup. (2) Increase of beans, rice, dried or fresh fruit, jam, sugar, milk, and butter. (3) Addition of oatmeal as a component.

The total energy value of the proposed ration is 4,243 calories as compared with 4,757, calculated upon the same analyses, in the existing garrison ration. That this amount is more than enough for a training camp, even after allowing 7 per cent for waste and providing a safe margin for savings, is proved by the nutritional surveys of 427 messes summarized in Chapter VIII.

The following reasons from the nutritional point of view were urged in the letter of June 3, 1918,⁶ for the adoption of this ration: (1) It conforms to actual usage. (2) Protein provided is more than sufficient, as shown by actual consumption of meats, and is of better quality. (3) Reductions are counterbalanced in nutritive value by increases. (4) Is a better balanced ration, as regards protein, fat and carbohydrate, and mineral salts. (5) Provides more roughage.

From the standpoint of food economy or conservation, the following reasons also were urged: (1) Since meat and bread are the principal items of waste, they should be reduced; (2) the existing ration is excessive; (3) the new ration would cost 3 cents less than the garrison ration.

As a result of this communication, and of other considerations growing out of the observed enormous savings made by many organizations, the Secretary of War directed the Quartermaster General to revise the system of rationing the Army in training camps,⁸ and a conference was called, comprising representatives of The Adjutant General, the Inspector General, the Quartermaster General, and the Surgeon General, to recommend changes. This conference met at the offices of the chief of the subsistence division, Quartermaster General's Office, on July 19, 1918, and the recommendations of the Surgeon General as regards the amount of components and substitutes were adopted.⁹

The subsistence division, Quartermaster Department, prepared the recommendations for presentation to the General Staff. In conference with the Surgeon General, some additions were made in the list of substitutes, the purpose being to include all the articles which might reasonably be expected to become available at different seasons of the year, so that a definite authorized list might be prepared for the use of camp quartermasters. The final system proposed contemplated the purchase of all materials through the quartermaster and the elimination of savings. In the latter recommendations the Surgeon General did not concur, holding that for hospitals, especially, it was

essential that the mess funds be expended by the mess officer under the direction of the commanding officer; and that the savings principle at least should be retained for all messes as a stimulus to economy, even though the amount of savings should be reduced.¹⁰

The result of the recommendations made by the Surgeon General and the Quartermaster General was the authorization of changes to Army Regulations Nos. 83, 84, and 86, which became effective April 1, 1919. The ration was not changed, a sliding scale for organizations of different size was adopted, the savings principle was eliminated, and purchases were directed to be made by the camp quartermaster only. From various reports which were received, officially and unofficially, the Surgeon General formed the opinion that the net results were unsatisfactory. The regulation as to purchases by the quartermaster applied to hospitals as well as to other messes; in hospitals nearly universal dissatisfaction with the new regulation was expressed.¹¹

Because of difficulties in mess management, to which the above-mentioned changes in Army Regulations gave rise, a further change was made in paragraph 1220, Army Regulations, on October 9, 1919, to become effective December 1, 1919.¹² In this change, the sliding scale for organizations of different sizes mentioned in the preceding paragraph was made to include one averaging 25 men, thus removing one objectionable feature formerly obtaining particularly as regards small organizations; for example, many small hospital detachments. Also, ration savings was again authorized (not to exceed 25 per cent of the total value of the ration allowance), such savings to be applied solely to the purchase of food or refreshment of the organization concerned.

REFERENCES

- (1) A. R., 1220, 1908.
- (2) A. R., 1220, 1913.
- (3) Memorandum from Chief of Quartermaster Corps, to Chief of Staff, February 24, 1913. Approval indorsed thereon. Also: Letter from the Quartermaster General to The Adjutant General, March 15, 1916. Subject: Emergency ration, and first indorsement thereto. On file, Record Room, A. G. O., Correspondence File, 1376382 and 2094525 (Old Files), respectively.
- (4) Cablegram, S. O. S. 127-2, September 13, 1918, from Harbord to Quartermaster General, ordering 3,000,000 additional emergency rations. On file, Mail and Record Section, Subsistence Division, Quartermaster General's Office 430.28. Also: Report of The Quartermaster General, U. S. Army to the Secretary of War, 1919, 70, 71.
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- (9) Weekly report from officer in charge of food and nutrition division, July 19, 1918. On file, Record Room, S. G. O., Weekly Report File (Food).
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CHAPTER VIII

WORK CARRIED OUT BY NUTRITIONAL SURVEY PARTIES AND NUTRITION OFFICERS ^a

Food and nutrition work at military stations in the United States was handled through two agencies: Nutritional survey parties, which were most active from October 1, 1917, to July 1, 1918,¹ nutrition officers stationed in camps of over 10,000 men subsequent to July, 1918.² Nutritional survey parties continued to function after the establishment of nutrition officers but to a less extent than before. In addition, other officers were sent out from time to time to meet specific needs with regard to particular problems, such as food storage, hospital messing, and special nutritional surveys.³

The duties of the nutritional survey parties included: (a) The collection of data with regard to food consumption, food waste, and the sanitary care and handling of food in the Army, both in the mess and outside the mess, as for instance, in canteens (camp exchanges). The data collected were of particular value as the basis of all subsequent work, because the results obtained were in terms of actual figures and not matters of opinion. (b) Inspection of mess conditions, particularly with regard to the proper preparation of food and the character of the menus.¹ In the course of this work, in which the inspecting officer was usually accompanied by a regimental medical officer and the immediate commanding officer, deficiencies were pointed out and suggestions made for correcting them. The fundamental basis upon which the criticism was made was pointed out.¹ Additional information with regard to deficiencies and errors in mess management was obtained in the course of the nutritional studies, which was not evident from the limited opportunity for observation during the inspections.

Certain defects in the messes were found to be more or less common to a whole camp or to many camps.⁴ Such general deficiencies or needed changes were made the subject of report and recommendations to the camp surgeon for action. At other times the changes applied only to a regiment or smaller unit, in which case the attention of the commanding officer would be called to the defects and remedial measures recommended.

In addition to the inspections and nutritional surveys the nutritional survey parties instructed the mess officers, mess sergeants, and cooks with regard to the general principles of nutrition, the detection of spoilage, the care of food, and general kitchen economy.⁴ Campaigns for the reduction of food waste were also instituted. These activities of the nutritional survey parties were particularly important at the beginning of the war. At this time gross errors in the conduct of messes and care of food were most evident because of the rapidity of mobilization, with the consequent lack of opportunity for instruction and training of mess sergeants and cooks and the lack of experience

^a For details concerning the administrative activities of the Food and Nutrition Division, Surgeon General's Office, consult Vol. I, Chap. X.

in so far as food and nutrition are concerned, of many organization commanders and inspectors.⁵ Since the parties who had examined conditions in many camps had seen different methods of handling similar difficulties they were able to correct and to advise most effectively. Nutritional surveys were of importance in the training of new men to become future nutrition officers. The chief difficulty in the work of nutritional survey parties lay in the fact that, having determined the defects in messing and the care of food and made recommendations which would lead to their correction, the parties left the camp and could not follow the changes to their ultimate completion.

General Orders No. 67, War Department, July 15, 1918, created the office of nutrition officers, and outlined his duties. It was the nutrition officer's task to bring about sufficient organization and cooperation among all concerned to achieve the desired result—a well-fed soldier. The extent to which he influenced or made use of these various agencies varied widely according to the local conditions.

The nutrition officers concerned themselves with: Food, its quality, quantity, and proper storage; prevention of waste; instruction, menus, miscellaneous duties.

FOOD, ITS QUALITY, QUANTITY, AND STORAGE

During the active period of the war food for Army messes was obtained in two ways:⁶ From the supply officer (quartermaster), and through local purchase.⁶ Prior to the change indicated in the footnote below, the food which the quartermaster furnished to troops, with the exception of beef, potatoes, and onions, was either canned, dried, or preserved, and usually not subject to rapid deterioration.⁷ But at certain seasons of the year some of the foodstuffs suffered spoilage from the growth of insects or from the effects of intense heat; e. g., dried fruits, cereals, and canned goods. While, as a rule, the quality and condition of the food obtained were good, occasionally material of poor quality was found in the warehouses or issued to the messes.⁵ The nutrition officer, through periodical inspection of the food stored in the warehouses, was able to detect inferiority in the foods, or, more often, evidence of spoilage which had occurred since delivery. Such discoveries many times resulted in the saving of considerable sums of money to the Government through redemption by the manufacturer or producer. Inspections in mess halls or kitchens provided more prolific source of information with regard to inferior or spoiled food, particularly when canned or boxed. In the course of his mess inspections the nutrition officer saw the food as it was being prepared and was able to note and to report to the supply officer cases of inferiority or of spoilage which might otherwise have been unnoticed. Also, through careful watch of the number of spoiled cans of food found in the kitchens, an idea of the relative quality of canned goods was obtained. Insistence upon the return of spoiled cans to the supply officer for redemption and subsequent survey resulted in saving to the messes. Mess sergeants were prone to consider one or two spoiled cans as negligible and to discard them. By emphasizing the fact that one or two cans multiplied by the number of messes in the camp represented a relatively large

⁶ Changes Nos. 83, 84, and 86 (effective Apr. 1, 1919), in par. 1220, A. R., required the purchase of all foods from or through the quartermaster and did away with the outside purchase.

amount of food, that in many cases the supply officer could recover the value of the article, and that the money value therefor would help to improve the dietary, mess sergeants often were convinced of the desirability of returning spoiled cans.

Because of his intimate contact with the subsistence officer and the messes, the nutrition officer was able to help the subsistence officer to dispose of foods with which this officer might be overstocked. Through data collected in the messes he was able to indicate to the subsistence officer immediate or impending need for particular foods.

The control of foodstuffs obtained from local dealers often presented difficulties. Through cooperation with the food and drug commissioner and other local and Federal officers in the neighboring towns, the nutrition officers were able to secure improvements in the quality of the goods furnished by the local dealers.⁵ In many cases, with the aid of the camp authorities, consignments of outside purchases were subjected to inspection before delivery, time and method of delivery were prescribed, and protection against excessive charges was obtained. In some camps the nutrition officer arranged a schedule for the agents selling food products, these men being required to visit a definite area at a given time, at which place and time the mess sergeants came to meet them and gave their orders.⁵ This arrangement saved the time of the mess sergeants and prevented undue persuasion on the part of the salesman to purchase food not really needed or wanted. As many as 14 different agents have been known to visit the same mess hall in the course of a day and to stay for from 5 to 20 minutes each. Changes in Army Regulations Nos. 83, 84, and 86 (effective April 1, 1919) abolished this practice and centered all purchasing in the quartermaster.

The handling and care of the food in the messes was a matter to which the nutrition officer paid particular attention in the course of his inspections and talks.⁵ Where necessary, plans for properly constructed and ventilated vegetable bins were submitted. These materially reduced spoilage. Bread boxes were examined to see that they had neither too much ventilation, which led to dry bread, nor too little ventilation, which resulted in molding and sweating. The advantage of galvanized iron cans (new garbage cans) with well fitting lids for the storage of flour, bulk cereals, sugar, coffee, and beans to protect these staples from moisture, dust and particularly vermin, as compared with other containers such as wooden bins, was emphasized.

Emphasis was placed on the necessity for a proper arrangement of the food in the storeroom so that the canned goods would not be subjected to excessive heat from the stove or range or from the heat of the sun in the summer time.⁵ In tent camps it was necessary to recommend ventilators in the roofs of the mess halls to allow the hot air to escape from above the level of the eaves, not only for the benefit of the cooks, but also because of the heating of the food stored on the highest shelves.⁵ On the other hand, in the winter methods of storage to protect the food from freezing were suggested.

The proper ways of keeping left-over foods were indicated; also the danger of holding left-over foods too long, particularly in the form of hashes. The care and use of refrigerators was impressed both during lectures and at inspec-

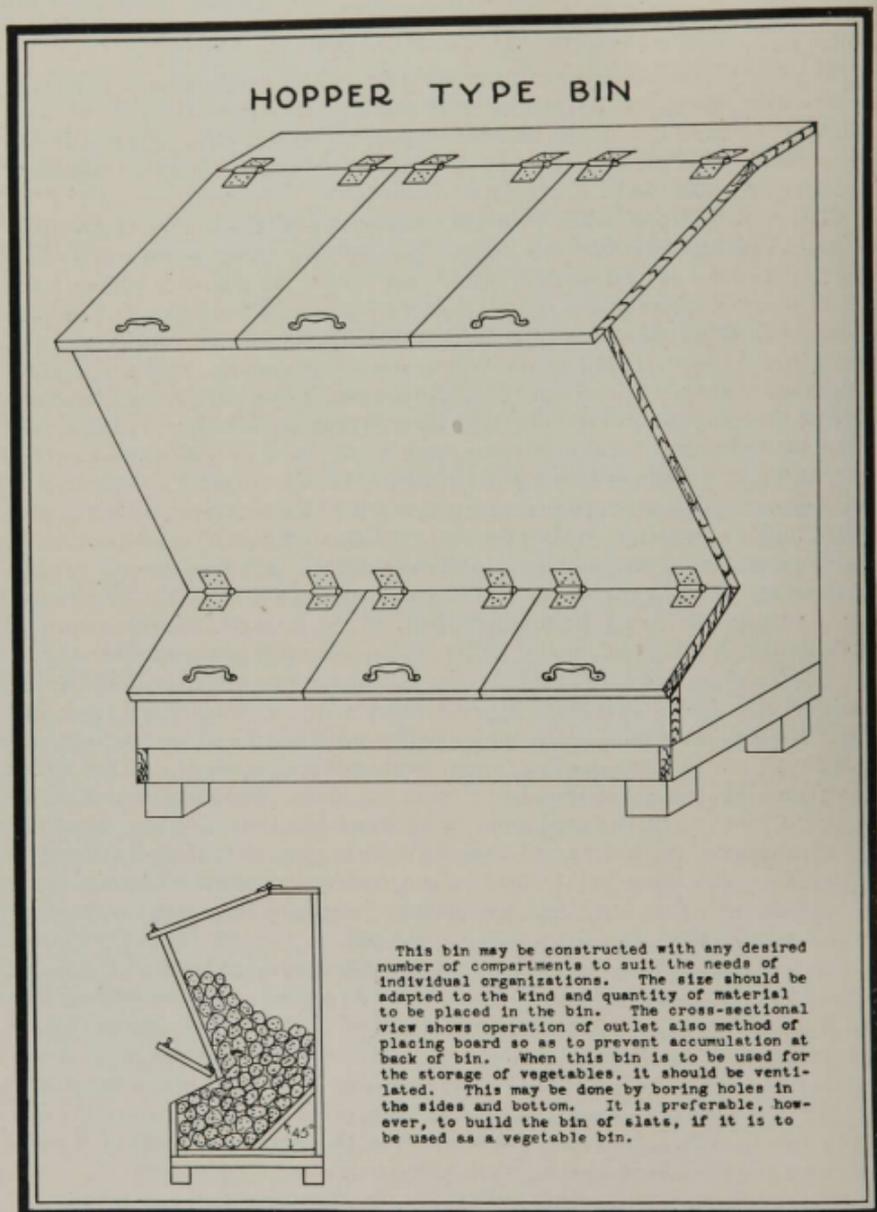


FIG. 26.—Hopper-type bin

tions; the fundamental principles of refrigeration were discussed, such as the necessity for a free circulation of air, which is so easily prevented by filling the lower part of the refrigerator with boxes or pans of food, or by the improper hanging of the beef; the advantages of a full ice chamber, as well as the ill effect of keeping the doors open too long were indicated; and the absorption of odors by milk and butter when stored with such foods as onions and cheese was touched upon. The stock pot required attention to see that it was kept boiling and not at a lukewarm temperature at which bacteria could multiply rapidly.

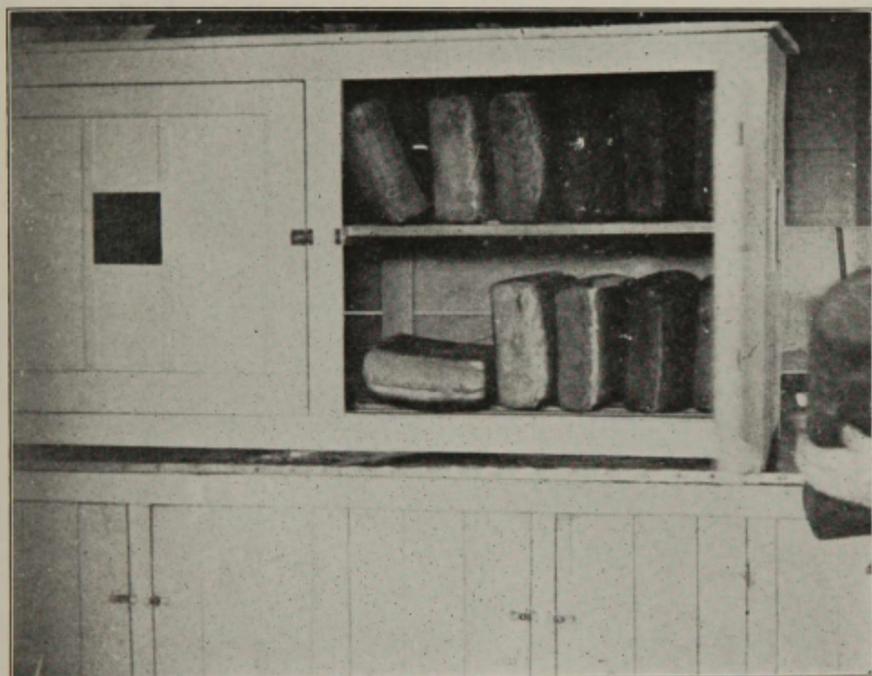


FIG. 27.—Ventilated bread box, Camp Grant, Ill.

FOOD ECONOMY AND PREVENTION OF WASTE

The matter of conservation of food and the prevention of waste received the attention of nutritional survey parties and of nutrition officers throughout the war.⁵ Particularly attention was given to the use and the advantages of substitutes for wheat and meat; to the necessity of saving fats; to corrections for the diet when fat substitutes were used; to the economical paring of potatoes and boning of meat; to the cutting of bread, so as to obviate the unpopular "heel"; to cutting meat across the grain and in thin slices; to the utilization of left-over material through change of form or flavor, or by incorporation in other dishes; to the waste resulting from poor cooking, underseasoning, improper drainage of cans; and to the accumulation of excessive stocks of goods in the storeroom. The importance of these factors was emphasized by talks to mess officers, mess sergeants, instructors from the school for bakers and cooks, and the cooks themselves, both individually and collectively, and through orders and bulletins issued from camp headquarters.

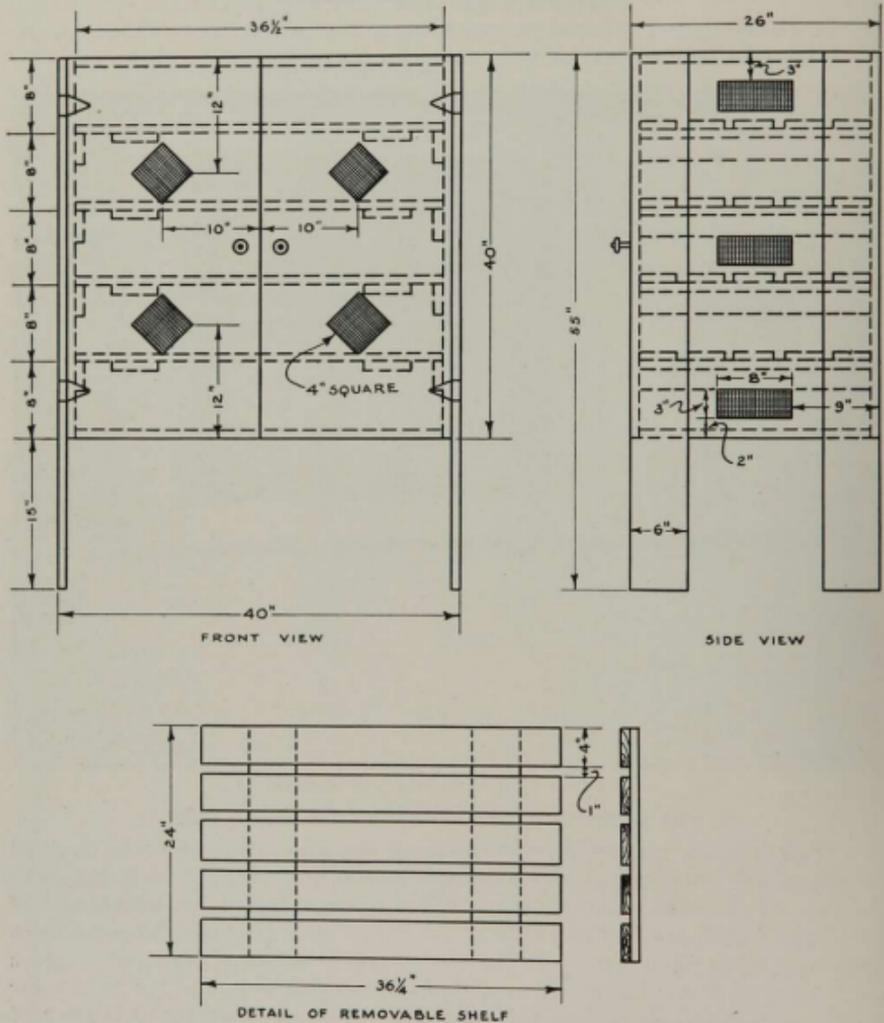


Fig. 28.—Plan of a bread box, provided with removable, slatted shelves and screened openings for ventilation. All material seven-eighths inch thick. This box will hold 15 sheets of bread

The nutrition officers made themselves acquainted with the possibilities of drawing upon the surrounding country for seasonable produce through the country agents of the Department of Agriculture and presented these possibilities to the camp.

The relation between the waste of food and methods of serving were carefully studied by the nutritional survey parties and by the nutrition officers. Two general systems of food service were in vogue—the cafeteria or “line system” and the “family style.”⁵ Under the former method the men received the food in their mess kits as they filed in line past a serving counter; under the second the men seated themselves at tables, upon which platters of food had



FIG. 29.—Vegetable cellar, Camp Sherman, Ohio

previously been placed, and served themselves. In the cafeteria system the food was dispensed more or less arbitrarily. With the “family style” of service each man was responsible for what was taken on his plate, and waste control was more easily attained. While the family system, when well managed, generally gave better satisfaction among men, under either system the soldiers could be easily educated up to the point where the table or plate waste was very small.

The nutrition officer gathered information with regard to food waste in the camp either directly by weighing it or through the camp salvage officer, whose duty it was to see that the garbage was properly separated and disposed of.⁵ Assistance was rendered the salvage officer in his campaigns against excessive waste; also he was advised as to the best means of classifying and dis-

posing of the garbage. The fact was pointed out in some instances that the classification adopted by the salvage officer did not give a good indication as to actual food waste, since included in his classification as "other garbage" were the cooked cereals, potatoes, and desserts, together with potato peelings, melon rinds, etc. By reducing figures obtained directly by the nutrition officer or from the monthly figures of the salvage officer, to the man-per-day basis, the nutrition officer could point out the need of greater activity in the reduction of waste in kitchen and mess hall.

FORMAL INSTRUCTION

In addition to the individual teaching and suggestions given to mess sergeants and cooks, the nutrition officer also gave more or less formal courses of instruction by means of lectures and demonstrations to the mess officers, to

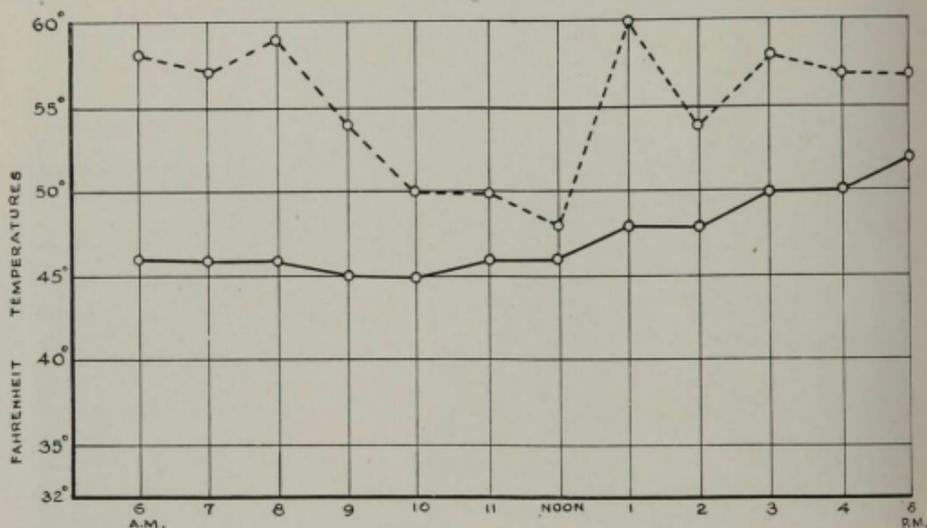


CHART II.—Ice-box temperatures. Dotted line shows fluctuation of temperature during the day in an ice box which was opened too frequently. Solid line shows corresponding fluctuation of temperature in a box which was opened a few times as possible. Data from report on Ebert's Field

the sergeant instructors of the cooks' schools, and to the mess sergeants and cooks throughout the camp.² Ordinarily, these courses were given in connection with and at the local school for cooks and bakers. The general principles of nutrition, the physiology of digestion, food hygiene, mess economy and sanitation, and the construction of Army dietaries were discussed. Special attention was paid to the more urgent conditions in each particular camp, and the practical applications of the theoretical matter were thereby constantly demonstrated. For instance, the ever-present need for proper variety in the menus and the importance of a more liberal use of fresh vegetables and fruit were emphatically impressed from all angles upon the mess officers and sergeants. Direct appeals for greater economy and methods of waste prevention were frequently made. The adaptation of the food to the weather conditions and to the grade of work performed by the various troop units was

urged. Questions on individual problems encountered by the officers and sergeants in their daily affairs were invited and discussed both in their immediate and their general aspects. Often it was possible by means of these courses of instruction to bring about marked improvements in food conditions throughout the camp.

MENUS

Menus offered the most important field for the efforts of nutrition officers, for dietary defects were numerous.⁵ While it could rarely be said that these defects actually had given rise to demonstrable disease, there is no question but that where they existed they were lowering the morale of organizations



FIG. 30.—Proper form of potato parer

by interfering with the proper enjoyment of meals, by tending to produce constipation, and by tempting the men to bolt their food rather than to masticate it properly; furthermore, some of the defects, while not causing acute symptoms which would immediately be identified, nevertheless tended to produce disorders likely to be ascribed to other causes.

The menus as posted in the mess houses were criticized constantly, and suggestions for improvements made. In some cases special forms, such as the following, were used by the nutrition officer to report the foods found in the mess, together with a notation opposite each article as to whether more or less of it should be used.⁸

FORM FOR REPORTING ON MENUS

Memorandum to the commanding officer:

Examination of _____ consecutive bills of fare of your organization, dated _____ to _____, shows that the following foods were served the number of times indicated below. A red check opposite a food indicates that the mess would be improved by serving the food oftener or in larger quantities. A blue check indicates that the mess would be improved by serving less of the food or by serving it less frequently.

Soup.	Jam, preserves, sirup, etc.
Stew.	Butter.
Meat.	Oleomargarine, etc.
Eggs.	Gravy.*
Beans.	Coffee.
Macaroni.	Cocoa.
Potatoes.	Tea.
Salads.	Iced tea.
Vegetables, other than potatoes.	Lemonade.
Cereals, different kinds of grain.	Water.
Fresh fruit.	Pound meat per man per day.
Dried or canned fruit.	Pound potatoes per man per day.
Pastry.	Per cent rations saved.
Other desserts.	Per cent ration shortage.
Corn bread.	

Remarks:

Recommend that these suggestions be put into effect.

_____,
Nutrition Officer.

_____,
Surgeon,
Camp _____, _____ *Division.*

Monotony in diet detracts materially from enjoyment. Pawlow⁴ and others have proved that the mere sight of savory food is of itself sufficient to stimulate digestive secretions throughout the alimentary canal, and it is a matter of popular knowledge that the appearance, or even the thought, of food readily can stimulate the appetite. Appetite also stimulates digestion, so that from either standpoint attractiveness is one of the primary desiderata in drawing up a dietary schedule. Monotony is avoided not only by the introduction of additional articles, but also by changing the order in which dishes appear. It has been found that if a certain menu recur on a given day of the week the men will soon learn what is to be served and become dissatisfied in advance. If the menus are made up over 8, 9, or 10 day periods this trouble is done away with.

Another very common defect was the excessive use of nitrogenous foods.⁵ The ash of meats and cereals is acid by reason of the predominance of sulphur, phosphorus, and chlorine as compared with the bases. If this acidity is not neutralized by some other constituent of the food there will be a continual drain upon the alkaline reserve of the body. The persistent tendency toward acidosis was not known to have eventuated in any recognizable disorder, but it seemed wiser to advise the neutralization of these acids directly by consumption of foods which themselves are capable of furnishing sufficient bases for

* Not counted when butter or oleomargarine are served at the same meal.

this purpose. Such foods are, predominately, the vegetables and fruits, and it was usually exactly these in which the diet of the soldier was poorest. It was commonly thought by the mess personnel, as well as by many of the commanding officers, that the best way to keep the men contented was to feed them all the meat they could eat.⁵ This belief was controverted whenever encountered but the desirability of temperance in the use of meat was one of the hardest lessons the nutrition officer had to teach. Usually, however, the protein consumption decreased after the men had been living for some time on the Army ration.



FIG. 31.—Line service, mess hall, Camp Meade, Md.

The consumption of fat often was excessive, partly as a result of the large meat consumption and partly because the cooks were for the most part inexperienced and resorted largely to frying, a method which imposed minimum demands upon equipment and skill.⁵ Moreover, to large numbers of soldiers, particularly those from country districts of the South and West, frying was the familiar method of cooking; both cooks and men, therefore, regarded it with favor.

The use of eggs was, like that of meat, often excessive, but this to a certain extent regulated itself, since they had to be purchased from the mess funds.⁶ Another article used to excess was coffee; it was often served three times a day. Toward the end of the war camp coffee roasters had begun to appear.⁵

These furnished high-grade, recently ground coffee in air-tight, metal containers. Excessive use of coffee, however, was deprecated; it was taught that it would be much more desirable to drink milk so far as it could be obtained from safe sources, and in any case greatly to increase the quantity of water drunk.

Under the mess system in vogue in the Army until April 1, 1919, the ration was regarded largely as the measure of the money allowance, and for any food not drawn in kind an equivalent money credit was issued to the organization.⁶ In this way, it commonly happened that a considerable sum accumulated to the credit of various organizations. This was in itself un-



FIG. 32.—Table service, Camp Grant, Ill.

desirable. It was urged that the money should be spent for fresh foods, milk butter, and other articles either not provided by the quartermaster or furnished in insufficient quantities. The money value of the Army ration was so liberal that, except where market facilities were restricted, almost anything in reason could be furnished the soldier. The purchases by soldiers of candy, ice cream, sweet drinks, and pastry at post exchanges were surprisingly large. The craving for such articles appeared to be based on physiological grounds, and it was accordingly advised that it be gratified at the mess table by increased allowance of sweets, and perhaps by the addition of candy itself. This, together with other metabolic aspects of the ration, will be discussed in subsequent chapters.

Finally, in making up menus it was taught that the mess sergeant should consider the habits of the men in his mess. The fact that many men have learned to prefer frying has been mentioned above. Recruits from the South, being accustomed to the extensive use of soft breads and rolls, at first usually ate only the interior of the Army bread. Soldiers from other sections refused to eat carrots or turnips. These and many other prejudices had to be borne in mind, but it was found that tact and patience, supplemented by the example of others and the efforts of a competent cook, soon induced the men to eat and enjoy a wholesome, well-balanced diet.



FIG. 33.—Sanitary dish washing, line system, Camp Grant, Ill.

MISCELLANEOUS ACTIVITIES OF NUTRITION OFFICERS

The more or less well-defined duties and activities which have been described herein could not and did not cover a multiplicity of exigencies which were arising continually in the camps and with which the nutrition officer was called upon to deal. He was popularly known in his camp as the "food expert," and as such he would be called occasionally by the camp inspector to render an opinion on the possible legitimacy of complaints received by him concerning the food.⁵ Upon the adoption of the regulations providing for the purchase of all foods from or through the quartermaster, the nutrition officer was called upon in some of the camps to help in the working out and application of this new system. In one camp a nutrition officer, with the sanction of the camp authorities and with the help of the county agent, was able to establish a cooperative organization among the farmers of the locality.¹⁰ The organization undertook to furnish the camp regularly with country produce.

It was the aim of the survey parties to avoid any conflict or overlapping with the duties of local sanitary inspectors, and to report to them anything of an unsanitary nature seen in the messes. The nutrition officer, being a part of the permanent Medical Department personnel of the station, was under the immediate jurisdiction of the camp surgeon, who could coordinate his sanitary activities with those of the sanitary inspector, as seemed best.

Especial attention was paid to the matter of dish washing, whether done by hand, as in the smaller messes, or by the use of machines, as in the larger. The desirability of sterilizing the dishes by actual boiling was emphasized.

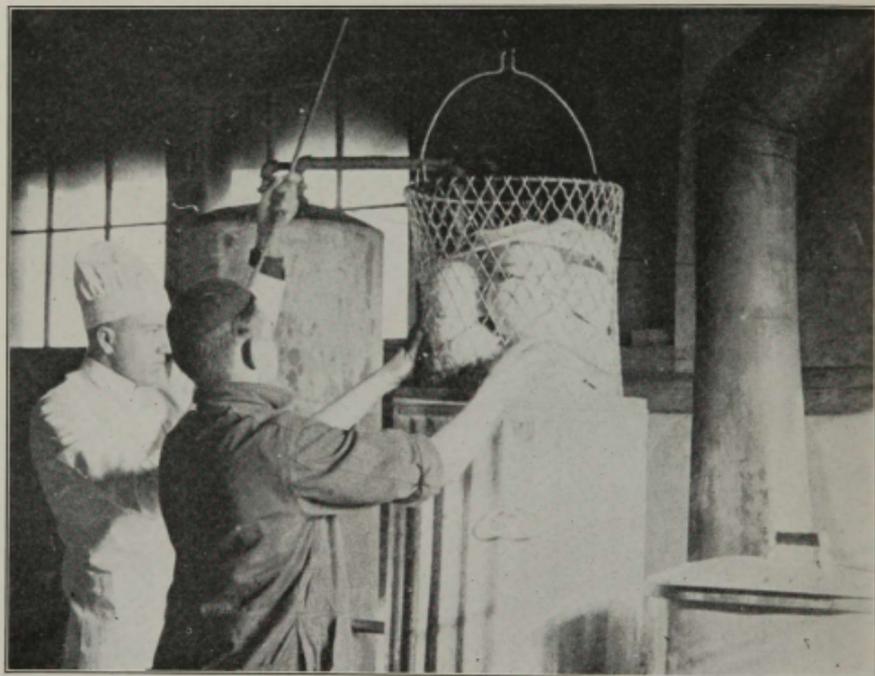


FIG. 34.—Sterilizing dishes in bulk, Camp Taylor, Ky.

Much thought was given to increasing the efficiency of the separate messes. From this point of view they were criticized as to the adequacy and state of repair of equipment; the arrangement of this equipment; the state of orderliness in the storeroom; the arrangement of foods in the refrigerators; the system of menus; the mess accounting; the amount of savings; and the training of the kitchen personnel. Instruction in mess management and mess economy was given, especially in camps where a school for bakers and cooks had not yet been installed.

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- (2) G. O. No. 67, W. D., July 15, 1918.
- (3) Annual Report of the Surgeon General, U. S. Army, 1919, Vol. II, 1026.
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CHAPTER IX

TECHNICAL AND SCIENTIFIC STUDIES RELATIVE TO FOOD PROBLEMS

DEHYDRATION OF FOODS

In feeding large bodies of men, particularly when, as was the case in the American Expeditionary Forces, it is necessary to supply them from far distant bases, the advantage of transporting and storing food in a dry rather than in the natural watery condition is considerable. But before indorsing the extensive use of dehydrated foods, it was believed that careful study should be made of the advantages and disadvantages of these products and of the methods of manufacture necessary to insure the best results.^a

DEHYDRATED VEGETABLES

The principal advantages in the use of dehydrated vegetables are as follows: (1) The possibility of utilizing much food which is often wasted owing to low prices at the time of production or to some difficulty in marketing. (2) The plants for dehydrating can be located at centers of production and the drying can be undertaken while food material is in prime condition. (3) Dehydrated products can be transported much more cheaply, due to the reduction in weight and bulk. Saving in tonnage involved in transportation was, of course, particularly important during the World War by reason of the enormous quantities of provisions to be handled, and the scarcity of ships. (4) Less expense is involved in storage, and there is hardly any loss by freezing, crushing, or spoilage. An investigation was carried on for several months at the laboratories of the department of biology and public health of the Massachusetts Institute of Technology to learn just what conditions are necessary to insure satisfactory preservation. It was there found that the use of paraffined paper containers is highly unsatisfactory if the parcels are to be subjected to warmth and high humidity, the products gradually absorbing moisture and, consequently showing discoloration and loss of quality. Bacteriological and mycological examinations demonstrated that, while dehydrated vegetables are not absolutely sterile, the germ content is small as compared with the fresh material and the low moisture percentage inhibits further growth of organisms. Such organisms as do persist are harmless. The deteriorations taking place when the material is subjected to continuously warm, moist conditions are due largely to mold or perhaps in part to autolytic enzymes of the catalase or oxidase type. (5) A uniform quality can be assured. (6) The preliminary preparation of the foods is accomplished at the factory, and when about to be cooked, no further labor is required except that involved in the necessary preliminary

^a An officer of the division of food and nutrition was detailed to conduct experimental work on the dehydration of vegetables and to study the conditions of production and the various processes employed in different factories. In these duties he at first represented the Army solely, but later, at the request of the Secretary of Agriculture, in addition to his other duties he was detailed to the Department of Agriculture to take charge of the dehydrated food investigations which that department was about to undertake. This work was carried out by Maj. Samuel C. Prescott, S. C., assisted by First Lieut. W. T. Johnson, Jr., S. C., Second Lieut. C. E. Mangels, S. C., and Second Lieut. P. F. Nichols, S. C.

soaking. (7) With large armies in the field it is impossible to obtain sufficient fresh vegetables to insure such wide variety in the diet as can be provided by the use of dehydrated articles. (8) As compared with canned goods, dehydrated products better represent the fresh flavor. Dehydrated foods are also much more concentrated.

The disadvantages in the use of dry materials are few; from the nutritional standpoint there is a certain loss of the natural vitamins found in fresh products. Just how serious this loss may be appears to depend, at least in part, upon the temperature at which dehydration is effected; and possibly upon the rate of drying, as determined by the method used. At the instigation of the division of food and nutrition this question was investigated by Dr. M. H. Givens at the University of Rochester, N. Y.¹ The results with materials dried by the tunnel process indicated that potatoes lose all antiscorbutic properties whether dried at high or low temperature; that cabbage suffers the same loss when dried at high temperature but retains some antiscorbutic activity when dried at low temperatures; that tomatoes, carrots, and citrus fruit juices retain much of their antiscorbutic value when dehydrated by the ordinary processes. Until these experiments shall have been confirmed by practical experience with man it is undoubtedly the wisest course not to place much dependence in dried foods in general, so far as the vitamin needs of the body are concerned. However, the experiments at Rochester, confirmed also by other observers, make it very probable that dehydrated tomatoes and dehydrated citrus fruit juices can, to a considerable extent, be depended upon to prevent scurvy. However, it is best to insist that any diet which is to be long continued shall include a certain amount of fresh vegetables. Recently it has been shown by Chick and Hume² that sprouting beans and probably other seeds will supply the necessary quantity of antiscorbutic vitamin. Aside from (in certain products) deficiency in vitamins, dehydrated vegetables are capable of supplying as well as fresh the nutritional requirements of the body. The only other disadvantage to be considered is the necessity for a rather prolonged soaking previous to cooking; also that slightly longer cooking is necessary than with fresh vegetables. An intelligent cook, however, quickly learns the treatment essential to insure satisfactory flavor and appearance.

When properly prepared, all types of vegetables are capable of preservation, and first-class dehydrated products yield foods which only with difficulty can be distinguished from fresh. Some specimens of dried vegetables were sent to the aviation fields at Fort Sill, Okla., where they were distributed among eight messes, comprising as many companies. The men failed to detect that they were not being fed upon fresh materials, and the reduction of kitchen police work in preparing the vegetables made a favorable impression on the mess personnel. A second test was conducted at Camp Greenleaf, Ga., and a third at the Walter Reed General Hospital, Washington. From both of these tests favorable reports were received.³

Based upon the principles enumerated, the following specifications were prepared. They were approved by the Department of Agriculture and the Food Administration. The Quartermaster's Department adopted these standards as specifications for dehydrated vegetables to be used in the Army.⁴

SPECIFICATIONS FOR DEHYDRATED VEGETABLES

VEGETABLES, GENERAL STANDARDS

The manufacture of dehydrated, anhydrous, desiccated, or dried vegetables on a commercial scale is a modern development. By dehydration is understood the rapid removal of water through the use of air, heat, or vacuum to such an extent that the resulting product is dry to the touch and does not contain in general more than 10 per cent of water and when soaked will return to approximately the bulk, appearance, and character of the material before drying. The color, flavor, and texture of the products when cooked shall be essentially as in cooked fresh material.

The vegetables here considered include those ordinarily purchasable only in fresh, green, or canned condition and do not include *mature* dried beans, peas, lentils, corn, or other vegetables of similar character.

The purpose of the "standards" here suggested is to prevent the marketing of products made from stock of poor quality or rendered inferior as a result of excessive age, wilting, fermentation, or attacks by organisms of plant disease, or products made from originally suitable raw material which has become undesirable, unattractive, or nutritionally of low value through the use of careless, insanitary, or unscientific methods of preparation, or of products which, while originally of good quality, when dried have deteriorated from age.

To obtain a uniform and high-grade product necessitates the use of good green vegetables and a system of processing according to certain fundamental principles.

1. All vegetables used for dehydration shall be of good quality, free from disease, sun scald, frosting, or any other injury whereby they are rendered unsuitable for table use.

2. All vegetables so used shall be thoroughly washed, and other necessary treatments, as peeling, trimming, blanching, and cold-dipping, shall be performed with the same care as that used when preparing vegetables for the table or for canning.

3. No detailed process of drying shall be specified, but the process shall be such that the product will not deteriorate while in the drier from spoilage, either as a result of the action of yeast, molds, or other microorganisms, or from physiological causes, and will not be affected in color or flavor by scorching or otherwise altered so that they will not return to approximately their natural color and appearance on being soaked in water.

4. According to the best information at present available, certain products, if given a preliminary blanching treatment by steam or by dipping in hot water, are superior in general character, keeping quality, color, and flavor to those not so treated. Products which are parboiled before dehydration shall be dried to a moisture content not exceeding 10 per cent. In vegetables dried raw a moisture content of 5 per cent to 8 per cent, according to the vegetable, should not be exceeded. The following list shows the vegetables which have been most successfully dehydrated when blanched: Beets, Brussels sprouts, cauliflower, green beans (shelled), green peas, kohlrabi, okra, parsnips, spinach, string beans, sweet corn, sweet potato, white potato. Successfully dried without blanching: Cabbage, carrots, celery, onion, parsnips, spinach, sweet potato, tomato, turnip.

The above statement is not final but expresses the best information which it has been possible to obtain up to this time.

5. All dehydrated vegetables shall be free from living insect eggs or cocoons, or other insect deposits.

6. Adequate protection against vermin, insects, molds, etc., shall be provided in the factory by the use of suitable tight receptacles or bins for storage and for shipping of the vegetables after dehydration.

7. The preparation of all dehydrated vegetables shall be conducted under cleanly and sanitary conditions and shall be subject at all times to inspection by properly authorized officers or agents. The methods of handling the finished product shall be such as to preclude infection from dust and dirt from floors, implements, or any other source.

Irish potatoes.—Irish potatoes to be used for dehydration shall be of good varieties, sound, and well matured. They shall be free from dirt or other foreign matter, frost injury, sunburn, worms, or mechanical means which would make them unsuitable for table use.

The potatoes shall be thoroughly washed, peeled, and eyed. After this treatment, if not immediately cut up for drying, they shall be kept submerged in clean cold water. The form in which the potato is to be prepared is not specified, except that in any case it shall be blanched (parboiled) to prevent oxidation and blackening.

The dehydrated product shall not contain more than 10 per cent of moisture and shall not be discolored to indicate scorching, or blackened by oxidation. They shall, when soaked in water, come back to the natural form and color of the portion used (except granulated) and shall be capable of making a satisfactory mashed potato. They shall not be bleached by the use of sulphur dioxide or by other chemical means.

Carrots and turnips.—Carrots and turnips should be thoroughly washed, the outer skin removed by paring, and then cut in longitudinal slices or strips. The slices are blanched by steam or hot water and immediately dried thereafter. The blanching prevents oxidation and loss of color.

The moisture content should be reduced to less than 10 per cent. No chemicals should be used in their preparation. When soaked they should have approximately the color, structure, and appearance of fresh slices, and when cooked should have the flavor of the freshly cooked raw vegetables.

Onions.—Onions may be dried to the form of slices without blanching, although a short steam treatment is often advantageous. They should be dried to a water content of not more than 10 per cent (6 to 8 per cent is better). When soaked back the slices should have the crispness, color, and flavor of the raw onion.

Large quantities of material purchased by the Quartermaster's Department unfortunately did not conform in all respects to these specifications, and much of the product must be regarded as of inferior quality.⁵ It should, however, be borne in mind that the industry was still in a formative condition, and only a few plants were in a position to turn out products of the high quality.

DRIED MILK

The advantages of dried milk correspond in a general way to those of dehydrated vegetables, but because of the more perishable nature of milk the gain so far as shipment and storage are concerned is much greater.

Milk has been dried in a small way for some years, and on a commercial scale for at least a decade. While milk powder has for some time been successfully applied to various culinary purposes, the mere suspension of this powder in water does not yield a satisfactory beverage. Not only is the taste and appearance of such a suspension unattractive, but since the powder usually is made from skim milk the lack of fat greatly decreases the nutritional value. The liquid so produced can not be regarded as a substitute for fresh milk. Skim-milk powder is a useful source of salts, protein, and milk sugar, but in order to obtain the most satisfactory product certain precautions should be observed in its manufacture. Only milk of the best quality should be used, and this must be protected as carefully as possible from dirt and from microorganisms. The dehydration must be conducted rapidly, yet the milk must be held at so low a temperature that little or no change will be produced in the proteins. If this precaution be not observed, the familiar "cooked milk" taste will be found and possibly disadvantageous alterations in the protein constituents. Prepared with the above precautions, milk powder constitutes a valuable food. In practice there are two general methods of effecting the dehydration—the milk is passed over heated surfaces, or it is sprayed into heated air.

While the success of milk powder in cooking and ice cream making was already demonstrated, for the purpose of the Army interest centered chiefly about the possibility of making from the powder a satisfactory beverage capable of replacing fresh milk. To prepare such a beverage from milk powder, butter fat, and water, special machines have been devised. These machines first bring about a perfect emulsification of the unsalted butter, this being even finer than that in native milk, and by reason of the temperature at which this operation is conducted Pasteurization also is effected. The liquid is then thoroughly aerated and promptly cooled. The leading commercial machines on the market to-day effect these objects in a wonderfully perfect manner, and when using butter and skim-milk powder of the highest grade and when carefully operated are capable of producing a beverage greatly relished by those fond of fresh milk.

The nutritive value of reconstituted milk appears to be in every respect the equivalent of the fresh product, with the exception that the ferments and vitamins may have been in part destroyed. At the request of the Surgeon General experiments were undertaken in the department of physiology at the University of Rochester to determine the extent of such destruction. This work, in agreement with that of other investigators, showed that milk dried by the hot-roller process or by the spray process had not suffered any injury with respect to the antineuritic or the fat-soluble vitamins, but had lost a part of its antiscorbutic substance.⁶

A number of reemulsifying machines of different makes have been installed in the Army and have given great satisfaction. Up to March 1, 1919, the following camps or hospitals made use of this method of supplying at least a portion of their milk:⁷ Camp Gordon, Ga.; base hospital, Camp MacArthur, Tex.; embarkation hospital, Camp Stuart, Va.; Camp Sheridan, Ala.; Camp Jackson, S. C.; Camp Wadsworth, S. C.; Camp Funston, Kans.

Under the best conditions milk is produced regularly in these machines with any fat content desired and of excellent quality. The Surgeon General had consistently recommended a much larger use of milk as a routine matter in the diet of the soldier, and especially in the case of the sick. By a wider adoption of reconstituted milk it was easily possible to put this recommendation into effect. It was found difficult to obtain sufficient suitable milk for forty or fifty thousand men in the neighborhood of many of the camps, but inaccessibility offers no serious handicap to the production of the reconstituted product.

DEHYDRATED MEAT

The dehydration of meat was studied at length by a member of the food and nutrition division of the Surgeon General's Office, at the Harriman Research Laboratory, New York City.⁸ With meat dehydration is considerably more difficult than with vegetables or fruit. Dehydration by simple heating in a current of air is impracticable. The first result of attempting to proceed in such manner is the formation of a resistant layer on the surface of the meat which prevents the drying of the inner part; furthermore, the fat is likely to turn rancid by the action of the oxygen of the air. There is also danger of partial coagulation. The only method which in the hands of these investi-

gators has so far given satisfactory results is dehydration *in vacuo*. The outlines of the process are as follows: The meat, free from bone, is cut into small pieces, subjected to vacuum, and heated to a temperature below that at which changes in the protein take place. The vacuum should be continually maintained at such a degree that the vapor pressure of water is greater than the pressure within the vacuum drier, thus causing boiling and evaporation of the water from the inner parts of the meat as well as from the surface. A sufficient quantity of heat must be employed to enable the large amount of water to be evaporated.

In practice it was found necessary to modify in several particulars the vacuum driers then on the market, since their construction did not permit of sufficient heat being radiated across a partial vacuum. The vacuum drier experimented with (Devine drier) was modified in the following manner: In place of the solid shelves, special ones of hollow metal were substituted so connected as to allow hot water to circulate continuously from below upward. This water was heated before entering the drier by steam or a steam coil at 70° C. The temperatures of the water as it entered and as it left were observed, and also the temperature of the interior of the drier. The meat or material to be dried was placed on nickel-wire gauze trays which could readily be run in onto the shelves; by using gauze instead of solid trays, evaporation of water downward as well as upward was facilitated. The vacuum was maintained at about 28 inches of mercury, and the temperature of the circulating water held at 70° C.; drying was allowed to proceed for 12 to 14 hours. In so far as the temperature of the meat being dehydrated is concerned it is noteworthy that, at first when the material contains most water and is most sensitive to changes due to heat and other agencies, it is probable that, because of the large amount of water being evaporated, the meat does not rise above 50° C. As dehydration proceeds and evaporation with its cooling effect decreases, the meat becomes correspondingly warmer until toward the end of the process, when danger of decomposition by heat is least, the temperature undoubtedly becomes that of the shelves within which the water is circulating.

Beef contains on an average about 75 per cent of its weight in water. When this meat, free from bone, is treated as described above, the loss in weight in a 12-hour run is in the neighborhood of 65 per cent. A further loss can be brought about in the drier by continuing the process longer than 12 hours, and no harm will result from so doing; but here a more economical method of working is possible. Beef which has lost about two-thirds of its weight of water when exposed to the atmosphere does not take up water again, but, on the contrary, loses additional water. Therefore, by exposing the partially dehydrated meat from the vacuum drier to the atmosphere, preferably in a slow current of air for two or three days, further decrease in weight takes place until the meat weighs in the neighborhood of 28 per cent of its original weight. Under these conditions approximately 10 per cent of its final weight is water. Certain precautions must be exercised with regard to this air drying. If the meat is not dehydrated sufficiently in the vacuum drier, then in the subsequent process a dry mold will appear on the surface. This mold is harmless and does not spread after the meat is once satisfactorily dehydrated, but it does not look

well and should be avoided. The loss of water should be checked from time to time by weighing, and with lean beef it is advisable not to consider dehydration finished until the loss in weight has reached 70 per cent or more.

Meat prepared as described in reddish brown color, but on standing becomes darker. There was, however, no sign of its having been even partially cooked. Bacteriological studies conducted by Dr. F. Hulton-Frankel show that this product after removal of surface contamination is sterile.⁹ Dehydrated meat was kept under different conditions of temperature, in both open and closed containers, for a number of months. Chemical analyses of the meat before dehydration, immediately after dehydration, and at intervals thereafter up to four months, were made. The results showed no marked or deep-seated changes. Such slight changes as did occur appeared to be of a secondary nature, and were so small that they could not be expected to change the properties of the meat. Nevertheless, it should be stated that dehydrated meat can not replace meat as ordinarily handled.

PHYSICAL CHEMISTRY OF DEHYDRATION

The practical methods of dehydrating vegetables already described have been sufficiently well worked out to yield products that are usually satisfactory. Imperfectly explained difficulties are, however, occasionally met with, to be expected in any large technical procedure based almost entirely upon empirical processes. The importance to the Army of the dehydration industry justifies continued effort to throw additional light upon its limiting conditions. But little is known of the nature of the proteins and enzymes of the common vegetables, yet it is possible that these have considerable effect in determining the character of the finished product.

The proteins of potatoes,⁵ carrots, and tomatoes were studied, their isoelectric points determined, and the state in which they exist pointed out.⁸ The acidity of the juice of these vegetables was estimated with the concentration cell, and the solubility (precipitation) of the proteins in the juice at different hydrogen ion concentrations noted. Recent investigations have suggested the course of certain chemical reactions that involve changes in the solubility of proteins. The latter seems to be largely dependent upon ionization as amphoteric electrolytes; the combination of the protein molecule with acid or basic radicals effects a change in the solubility of the protein in the sense that compounds of protein with simple acids or bases generally are more soluble than uncombined proteins; some special peculiarity in the behavior at a certain reaction of the free protein molecule, the so-called isoelectric point. In the neighborhood of the isoelectric point protein substances are usually less soluble and less swollen than at other points. While the scientific observations governing this matter are of recent origin, the empirical fact has long been known; and both in the laboratory and in industry the preparation of proteins has been based upon variations in solubility depending on differences either of reaction or concentration of electrolytes.

⁵ With the exception of a small amount of protease only one well-defined protein was isolated from the potato—the globulin *tuberin*. It is present to the extent of from about 1 per cent to 2 per cent in the juice, and can be isolated and prepared from it or from the sodium chloride extract of the whole potato.

The determination of the isoelectric point depends upon the fact that by reason of their amphoteric properties protein can migrate to either cathode or anode, and the direction of the migration is dependent upon the hydrogen ion concentration; at the isoelectric point no migration occurs. Accordingly the isoelectric point is the measure of the relative strength of the protein as acid or base. The isoelectric point of the proteins of the vegetables mentioned was determined by the method of cataphoresis. The technique described by Rona and Michaelis¹⁰ was so modified as to meet the needs of the research being considered.

The hydrogen ion concentration of the juice of the potato is slightly less than 10^{-6} N. If the juice is freed from suspended material—mostly starch—by filtration through pulp the hydrogen ion concentration is further reduced to about 10^{-7} N. A precipitate separates upon the addition to the juice of either acids or alkali. These precipitates disappear upon adding an excess of the precipitant. Differences in the amount of electrolyte present have a very large influence upon the behavior of this acid or alkali precipitation. The maximum solubility of the protein in the juice was found to be at the natural reaction of the potato; and the maximum precipitation when hydrochloric acid was added occurred at slightly greater than 10^{-8} N. The acid precipitation was much the larger, but both were very incomplete. In comparing the juice of fresh vegetables with that from dehydrated vegetables to which the proper amount of water had been added (and ground and extracted as described later), it was found that less acid and more alkali were required to bring the juices of dehydrated products to given hydrogen ion concentrations than with fresh vegetables. This difference was greater with air-dehydrated products than with vacuum-dehydrated. It seems to point to changes in the contained protein.

In the electric field protein in the juice at natural reaction migrates toward the anode. It exists therefore either as a simple salt of a base or in combination with very weak acid. In conformity with either of these deductions is the observation that the charge of the protein is not changed by increasing the alkalinity of the juice. The direction of the migration of the protein is, however, reversed by the addition of acid. The direction of migration changes at a slightly lower hydrogen ion concentration than 10^{-4} N. At that reaction the protein does not migrate in either direction. It exists, therefore, uncombined at its isoelectric point. The numerical value of this point reveals that the acid property of this protein predominates over the alkaline.

The behavior of the protein of the carrot is remarkably similar to that of the potato. The reaction of the juice, the isoelectric point, and amphoteric constants of the protein in both vegetables are essentially identical. The juice of the carrot is also precipitated by both acid and alkali, the maximal precipitations occurring at the same respective reactions; but in the case of the carrot the precipitation by alkali is considerably greater than with the potato.

The juice of the tomato behaves quite differently. By reason of a high concentration of the organic acids (chiefly malic, phosphoric, and citric), the juice of the ripe tomato has a hydrogen ion concentration of nearly 10^{-4} N.

Filtering the juice reduces this to nearly 10^{-5} N. The protein of the unfiltered juice usually migrates to the cathode. A slight reduction of the acidity reverses the sign of the protein; the latter, therefore, exists near its isoelectric point and probably slightly on the acid side of it.

The enzymes, including oxidase, peroxidase, catalase, and amylase of cabbage, carrot, yellow and white turnip, tomato, and potato juices were studied at different hydrogen ion concentrations. The preparation of the fresh vegetables used in this work was as follows: The carrots and turnips were scraped, the potatoes peeled, the outer leaves of the cabbage removed; the vegetables were then weighed, ground finely in a meat chopper, and squeezed through muslin by hand until as much extract as possible was obtained. The tomatoes were cut and then similarly squeezed. The extract was in each case strained through fresh muslin a second time to remove the coarser particles which had been forced through the first muslin. The residue was weighed and its moisture content determined by drying to a constant weight at 100° C. The volume of the extract was measured and its hydrogen ion concentration determined. The hydrogen ion concentration of all the vegetables mentioned, with the exception of tomatoes, was found to be in the neighborhood of pH 6. The air-dehydrated vegetables were specially prepared by blowing a current of heated air (40° C. to 65° C.) for from 18 to 60 hours over the vegetables until the substance was sufficiently dried. Some commercial preparations were also bought in the open market. The vacuum-dehydrated products were prepared by heating the sliced vegetables at 55° C. to 65° C. at 40 mm. to 50 mm. pressure for 8 to 12 hours. The moisture was then determined in these products by drying to a constant weight at 100° C. The nitrogen was determined by the Kjeldahl method and the ash by ignition to a constant weight.

To obtain the juice from the dehydrated vegetables, the average amount of water lost at dehydration was added and the mixture allowed to stand for 20 minutes and then passed through a food chopper; the chopped vegetable was then returned to the water in which it had been soaked, ground with it in a glass mortar and allowed to extract for 30 minutes, crushed through muslin and treated as with fresh vegetables. In preparing in this way the juice from dehydrated vegetables it was found that no more enzyme was extracted by treating in the manner described for 2 hours or even longer than when the extraction terminated at the end of 30 minutes. It was also found that if the extraction was long continued there was some deterioration or loss of activity in the enzymes.

There is no one method for testing for the presence of enzymes; however, a number of different reagents have been proposed, which under proper circumstances are capable of demonstrating qualitatively the presence of particular enzymes. The results of the various tests used may be summarized as follows: (1) The enzyme reaction of all the vegetable juices studied was destroyed by heating to boiling for several minutes. (2) The oxidase reaction with carrot, yellow and white turnip, and potato juices was greatly increased on dilution. Evidently some substance (chemically unsaturated) was present which combined with the oxygen preventing it from taking on the reagent. (3) There is

no well-defined optimum hydrogen ion concentration for oxidase, peroxidase, and catalase. In general terms, however, it may be said that they were more active in the more alkaline solutions, the most favorable range being between pH 7 and 10. They were inhibited in a markedly acid solution, pH 2 and 3 for the oxidase and peroxidase, and pH 4 for the catalase, except in the case of the tomato. On the other hand, inhibition occurred in these enzymes in some cases at pH 11 or 12. (4) With regard to the changes brought about by dehydration on the behavior of these three enzymes, vacuum-dehydrated cabbage and carrots gave a stronger oxidase reaction than did the fresh. In every other case the enzyme action was less in the juice from the dehydrated vegetable than in that from the fresh. As regards the difference between the vacuum and the air-blast methods of preparing the vegetables, the enzymes were more completely destroyed in the latter. The enzyme test on the solid residues from the extraction also showed that air-dehydration caused greater destruction of the enzymes than did vacuum-dehydration. (5) The amylase action in the case of cabbage, carrots, and white turnips was most active at about pH 6. With yellow turnip juice the optimum action extended from pH 4 to 7. From these figures it is apparent that for this enzyme the optimum reaction corresponds with that naturally found in the juices. Using the Wohlgenuth method, a number of experiments were carried out to determine the effect of the presence of various salts on the amylase activity. Little difference was found as the result of the addition of salts, which would indicate that the concentration of electrolytes, as well as the reaction, in natural juices is such as to give about the optimum conditions. The effect of dehydration on the amylase activity is the same as with the other enzymes; that is, it is decreased in every case, and with a greater decrease in the case of air dehydration than vacuum dehydration. Experiments were further instituted in order to compare the activity of the juice with that of the solid residue of cabbage and yellow and white turnips. These experiments showed that two-thirds or more of the total activity was contained in the juice.

CHEMISTRY OF MEAT SPOILAGE

While to the expert inspector the gross appearance of meats is usually a safe guide in determining whether the material is or is not suitable for human food, for less skillful persons some more exact test is highly desirable. With this object in view, a study of the possibility of finding some simple chemical test to determine the suitability of meat for consumption was made at the Harriman Research Laboratory in New York City at the direction of the chief of the division of food and nutrition, Surgeon General's Office.¹¹ The work, begun in the spring of 1918, rapidly expanded until it included an elaborate study of the nonprotein compounds found in meat, of the action of various bacteria on meat, and of the toxicology of meat poisoning.

It was decided to estimate in fresh meat and then in meat which had undergone progressive degrees of spoilage the ammonia, nonprotein, purines, creatine plus creatinine, and residual nonprotein nitrogen. In addition a number of experiments with amino nitrogen were made by the Van Slyke method, but the conclusion arrived at was that the quantity of amino-acid present would be a measure of autolysis rather than an indication as to whether the meat had

suffered injurious deterioration. The methods used for these various estimations in meat were necessarily modified from those previously proposed for other materials, and in some cases the degree of novelty amounted actually to new processes.

A new method for the isolation of methylguanidine was worked out. The object was to determine whether this highly toxic substance is present in fresh or only slightly decomposed meat. This was found not to be the case, and there was no positive evidence that it occurs even when extensive decomposition has taken place.

As toxic substances were suggested the possible formation by bacteria of histamine from histidine, and of tyramine from tyrosine, as well as possible degradation of products from carnosine and tryptophane. Also it is possible that studies of the action of bacteria on pure purines might be of value. In badly decomposed meat methylguanidine may perhaps be the toxic substance. However, in the work at the Harriman Laboratory neither this nor other toxic products in amounts sufficient to have caused poisoning were obtained. Certain definite conclusions can, however, be drawn. Most of the cases of meat poisoning which have been described in the literature have been due to the presence of bacteria either in the animal before slaughter or to contamination after slaughtering. At least two well-authenticated cases of heat-stable toxins found in meat from animals infected while living have been described. Practically all other poisonings could have been avoided by sufficient cooking or heating of the meat. In the work described in this chapter there was no evidence of the formation of heat-stable toxins. Careful inspection of the living animal and of the meat immediately after slaughtering would eliminate the probability of the formation of heat-stable toxins by virulent strains. If after slaughtering the meat becomes infected, heat-stable toxins do not appear to be formed, but the bacteria must be killed. Thorough cooking will reduce the danger of poisoning to a minimum. From the taste, looks, or odor of meat it is not possible to say definitely whether a poisonous substance is or is not present; but meat in which the above criteria are unsatisfactory may be assumed to be invaded by bacteria, and if any use is to be made of such meat most thorough cooking is to be insisted upon. The flesh of animals suspected of infection with organisms of the paratyphoid group should never be used for food.

PHYSICAL CHEMISTRY OF BREADMAKING

When, early in the war, it became evident that there was certain to be a considerable shortage of wheat, it was realized that the use of other grains as substitutes would soon become necessary. It is, however, a well-known fact that wheat alone, with possibly the exception of rye, is capable of producing a light, satisfactory bread. It is also well known that this peculiar power of wheat flour to give a dough which can be properly raised by the gas generated during the fermentation produced by yeast is due to gluten. The coherent gluten imparts the peculiar tenacity and elasticity on account of which the dough can be stretched and distended so as to assume the cellular texture of bread, when the volume of the dough may have been increased four or five fold. No other constituent in the flour of wheat or any other grain possesses the necessary physical properties.

While the above facts are matters of common knowledge, the scientific conditions governing the usefulness of gluten in this connection have never been worked out. Deeming it wise to learn as much as possible concerning the essential nature of this interesting substance and its action in bread before attempting to find a substitute for it, Dr. Carl L. Alsberg, Chief of the Bureau of Chemistry of the Department of Agriculture, together with Prof. L. J. Henderson, of Harvard University, laid out an extensive course of research concerning its physico-chemical properties and in general the physical chemistry of bread making.¹² Upon their invitation by the Surgeon General, through his division of food and nutrition, to cooperate, several officers of that division were detailed to cooperate with Professor Henderson. The investigation was divided originally into a series of problems, beginning with the simplest and most abstract and proceeding to the most complex and most concrete.

Since the known facts seemed to point to the colloidal properties of the proteins, glutenin and gliadin, which compose gluten, as the significant factors, the first study undertaken was on the equilibria between these proteins (in suspension or solution) and various acids and bases. These investigations were carried on by means of concentration cell measurements of the hydrogen ion concentration, with observations upon the electrical conductivity and upon the solubility and swelling of the proteins. In this way was determined the precise characterization of the avidity of each protein for acids or bases at varying hydrogen ion concentration. Essentially the relationship amounts to a salt formation between the amphoteric proteins and the simple acid or base.

The second stage of the investigation consisted of a study of the colloidal properties of gluten in the presence of a variety of solutions of electrolytes. These experiments showed that gluten behaves like the proteins of which it is chiefly composed. Studies of the viscosity were undertaken and also an investigation of the influence not merely of acids and bases, but also of a variety of salts.

The third stage of the investigation consisted of the extension of these methods to the study of dough. It was found that the results previously obtained concerning the purified proteins and then the gluten itself were also applicable to dough. The viscosity of dough was measured directly by a viscosimeter. These measurements showed that there is a well-marked minimum of viscosity at a definite hydrogen ion concentration; but, in addition to this factor, some influence is also exerted by the amount of electrolyte present.

The fourth study consisted of an examination of the alcoholic fermentation in the dough and involved observations upon the growth of yeast in dough at different hydrogen ion concentrations. The addition to dough of weak acids, as lactic or acetic, favors the production of carbon dioxide and consequently the rapidity of rising.¹³ The amount of acid that may be advantageously added can best be judged by determining the acidity of the baked loaf. This can readily be done by allowing to fall upon a slice of bread a few drops of a weak solution (0.02 per cent in 60 per cent alcohol) of methyl red. It was found that the most favorable acidity is indicated when the methyl red just turns from orange to full red. In bread making the acidity of the dough at the time of baking appears to be the most important variable factor. In addition to meas-

urements of the rate and magnitude of the rise of the dough, observations were also made regarding the leakage of carbonic acid. It is a well-known practical fact that as the dough expands more and more the loss of gas increases, because the surface of the dough becomes greater, while the walls of the gas-containing cells grow more thin and leaky. When the loss of gas becomes nearly as great as the production, the loaf must be baked, regardless of size; and it is therefore evident that the more tenacious and elastic the dough the larger will be the volume before baking becomes imperative.

Along with the basic studies described above were conducted a large number of practical experiments in the actual baking of loaves containing considerable amounts of substitute flours.¹⁴ With these substitutes the dough is always "short"; that is, it does not hold together and show the proper distensibility, and so can not retain the carbon dioxide that is produced within it. Substitute flours, with the possible exception of rye, do not contain any naturally occurring substance capable of replacing the gluten of wheat. Such a substance has, however, been found in the protein of serum. Many experiments have shown that the addition to a mixed flour of 2 or 3 per cent of dry powdered serum (which must be freely soluble) yields a dough quite as easy to handle as that produced from pure wheat flour.

The loaf resulting from such a mixture containing serum is larger, more elastic, of better color and texture, and in all respects superior to loaves made from the same mixture but lacking the serum. Such bread is perhaps in some particulars inferior to that made from pure wheat flour, but, nevertheless, possesses certain important qualities of its own, and the use of this expedient in bread making appears to be in all respects perfectly justifiable.

The disease known as "rope" in bread is produced by the action of microorganisms, the spores of which in the center of the loaf survive the heat of the oven and later when the bread has cooled to a favorable temperature develop and attack the loaf. Their growth is rapid at 80° F., which explains the relative frequency of epidemics of rope during summer weather. Fortunately, the rope organisms can develop only in media of low acidity.¹⁵ Bread which is sufficiently acid is quite immune, and this fact can be depended upon to prevent the disease. One of the tasks undertaken at the Wolcott-Gibbs Laboratory was to ascertain the minimum acidity which would make bread safe, and then to find a suitable indicator by which any Army baker could immediately learn whether the desired acidity was present. It was fortunately found that that acidity which was most favorable for the general purpose of bread making, at least as practiced in America, is also sufficient to safeguard the bread.¹⁵ It was found that the rope can not develop if the acidity exceeds about 10^{-5} N. A safe acidity is indicated by a full red color of the indicator methyl red, the use of which has already been described in connection with the most favorable reaction for baking. Bread should be adjusted to this degree of acidity, especially when there is danger of an epidemic of rope. This is best done by the addition of increasing amounts of acid to the dough of successive batches until the baked loaf gives the desired color with the indicator. Generally the right amount of lactic acid is between 1 and 2 pounds of the commercial product per barrel of flour. Since wheat substitutes usually have the power of combining with more acid than has wheat

flour, the substitutes neutralize to some extent the acidity of the dough; and therefore the larger the proportion of substitute the greater is the amount of acid that must be added to bring the bread to the desired acidity.

ANALYSIS OF FOOD AND WASTE

One of the functions of the division of food and nutrition was to investigate the suitability of the soldiers' feeding. This study was concerned primarily with the Army ration (see Chap. VII), but, by reason of the mess savings and of the post exchanges, the dietary actually consumed by the soldiers in training included most of the commercial food materials and nonalcoholic beverages sold in this country. Consequently, questions concerning the value of a large variety of products were continually arising. In order to answer these questions intelligently, analytical data were collected from many sources, but it was also necessary to make a large number of special analyses. Concerning some products no figures were available, while in the case of others there was reason to believe that changes in composition had occurred.

This analytical work was made possible through the cooperation of the Department of Agriculture and the kindness of the Chief of the Bureau of Chemistry. The various laboratories of the bureau throughout the country were cheerfully made available, and in four of them, those at Washington, New York, Savannah, and New Orleans, officers and specially qualified enlisted men of the division of food and nutrition were detailed to this duty.¹⁶ The regular civilian personnel of the laboratories also devoted such time as was possible to furthering the work.

The total number of analyses made to March 15, 1919, amounted to nearly 2,000, and included a wide variety of products. These are enumerated below with the number of analyses made:

Beverages:	Analyses		Analyses
Alcoholic.....	3	Ice cream.....	4
Nonalcoholic.....	40	Impurities, alkaloids, poisons.....	102
Baking powders.....	5	Milk, evaporated.....	824
Beans, soy.....	6	Mince meat, sausage.....	10
Butter, cheese, oleomargarine, lard..	20	Miscellaneous foods (1 analysis of each).....	79
Candy, jams, preserves.....	41	Oil, cottonseed and olive.....	9
Canned goods.....	60	Pudding, powders for.....	3
Coffee.....	4	Sugar, sirup, honey.....	19
Coloring, artificial.....	7	Vinegar.....	3
Fat in grease.....	15		
Flavoring extracts.....	19		
Flour, bread, crackers.....	68	Total analyses of foods.....	1, 355
Flour, dried.....	14		

In addition to the above, there were made in connection with camp surveys some analyses of sewage and about 550 analyses of garbage. Fully one-half of the latter were done by the personnel of the Bureau of Chemistry.

Frequent subjects of inquiry were the composition or healthfulness of various nonalcoholic drinks. These were sold at the canteens and were consumed in large quantities. They offered ready opportunity for sophistication, particularly in the direction of stimulants and narcotics. The composition of many of these beverages had already been determined by the Bureau of

Chemistry, but they increased in number so rapidly that it was necessary to make additional analyses in order to cover even the more common ones. The unsatisfactory character of many of them, together with the fact that they are often prepared by hygienically irresponsible business firms, or even small tradesmen, who cared nothing about the physiological desirability of their product, caused the Surgeon General's Office to issue on September 11, 1918, a cautionary circular to all division and camp surgeons recommending that the use of artificial soft drinks be discouraged, but pointing out that natural fruit juices put up without antiseptic are usually free from objection other than their relatively high cost.

Evidence of poison intentionally introduced was carefully searched for and was not established. Among the 102 analyses shown above for "impurities, alkaloids, poisons," a few samples showed some glass, but it was uncertain whether this had found its way into the food by accident or had been introduced with malicious intent. While the latter may occasionally have been the case, it is certain that attempts at poisoning soldiers were much less common than was popularly supposed, even if they occurred at all.

It will be observed that of 1,355 food analyses considerably over half were to determine the character of evaporated milk. Such milk is required to contain not less than 25.5 per cent of total solids and not less than 7.8 per cent of milk fat.¹⁷ Because of the universal employment of this milk as a part of the ration, and because Army supplies were furnished by several different manufacturers, it became necessary in order to insure adherence to the standard to analyze a large number of specimens.

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CHAPTER X

WATER SUPPLIES AND PURIFICATION PLANTS

GENERAL CONSIDERATIONS

Water supply and sewerage problems were studied in relation to construction and in connection with the various camps, and plans for these utilities were developed locally. Recommendations regarding plans for water and sewers were made to the central office of the cantonment division in Washington, where they were approved or changed as was found to be necessary, and construction was then eventually authorized.¹ In most cases this work was completed without reference to the Medical Department, although much of it had a very distinct sanitary bearing.

While our large camps and cantonments were being constructed, aviation fields also were being established and constructed, under the supervision of the buildings and grounds section, Department of Military Aeronautics, independently of the cantonment construction division of the Quartermaster General's Office.² The water supply, sewerage, and other engineering problems at aviation fields were handled by representatives from the construction department (aviation) assisted by civilian engineers who were assumed to be somewhat familiar with the local conditions.³ Also, other camps, designed for various departments or corps, soon were started, usually under the direction of the branch of the Army most concerned, and many of the water-supply, sewerage, and other utility problems in these camps were undertaken by various officers of the Army, assisted by civilian consulting engineers, without reference either to the cantonment division or to the Medical Department.⁴

On the beginning of construction work at the large camps an experienced medical officer, assigned to each as camp surgeon,⁵ assumed supervision over sanitary matters, though having in large part to adjust himself to conditions as he found them. After the arrival of the camp surgeons, when extensions and additions to the utilities were made, this was done with the knowledge of the Medical Department. That these were accomplished was in many instances chiefly due to the energy and initiative of the Medical Corps and Sanitary Corps officers on duty at the camps.⁶ Through the reports of these officers, and from various other sources, the division of sanitation in the Office of the Surgeon General was kept informed of the local conditions, and soon a spirit of cooperation developed between the construction division and the Medical Department, manifested both in Washington and in the field, whereby the design and the operation of the utilities were much improved.

Prior to the World War the utilities at Army stations had been operated by the post quartermasters, assisted by limited numbers of enlisted men and civilians.⁷ Now, because of the great size of the utilities at the new camps and cantonments, and the many complicated problems involved in their management, a special force for their maintenance and operation was found necessary; this functioned under the nominal supervision of the local camp

quartermaster concerned.⁷ The difficulties became so great, however that on July 2, 1918, a new and separate organization, known as the maintenance and repair branch, was authorized⁷ and made independent of the Quartermaster Corps. This branch was a section of the construction division and had charge of the operation of general utilities, and of the maintenance and repair of roads, walks, wharves, buildings, water works, and sewerage plants. A great effort was made to secure and commission experts and to place them in charge of the utilities at each station. A central office was maintained at Washington, which exercised control over the local utility organizations.

At first, immediately after the completion of the utilities at the aviation fields, their operation was supervised by the Government superintendents of construction, but this policy was later changed and maintenance officers were appointed from the personnel at each such post by the commanding officer.⁸ With the advisory assistance of a Medical Corps or Sanitary Corps officer, the maintenance officer then had immediate charge of water supply, sewerage, sewage treatment, etc., working under the general supervision of the buildings and grounds section, Air Service property division.⁸

While ordinarily, as just stated, officers of the Medical Corps were the technical advisers of the officers in charge of utilities, in some instances the camp sanitary engineer (an officer of the Medical Department), or one of his assistants, was placed in complete control of water purification and sewage-disposal plants.⁹ The camp sanitary engineer was available for advice and consultation whether in charge of operation or not. Some municipalities which furnished water to military establishments proved to be unable to meet the sanitary specifications as to quality, and in a few instances Sanitary Corps officers were placed in immediate charge of such water-purification plants, supervising the treatment of water furnished to city and camp alike.¹⁰

QUANTITIES OF WATER

Many obstacles were encountered in designing water works, though many of these were anticipated, and to a considerable extent overcome, by the adoption of certain general principles in the plans and specifications. After a careful study by the water supply officers of the construction division, in cooperation with the Council of National Defense, it was decided to design the plants for the National Army camps on the basis of a daily consumption of 55 gallons per capita, with suitable provision of storage and booster pumps for supplying the peak consumption.¹¹ Pressures were intended to be held roughly within the range of 60 to 85 pounds per square inch, the lower being considered sufficiently great to provide adequate fire protection, and the higher the maximum safe working pressure for the distribution system.¹² Three typical layouts for the grouping of the buildings in camp were developed by the camp planning section, known as the "straight line," the "square," and the "horseshoe," of which examples are found, respectively, in Camp Dodge, Camp Funston, and Camp Lee.¹³ Even with the modifications in groupings which proved necessary in some instances, the section was able to develop economical standard layouts for the three types of water distribution involved, including the location of mains, valves, and fire hydrants, etc.

The amount of water to be provided was a matter of great concern, and it was discussed thoroughly before deciding to allow 55 gallons per capita daily at the National Army camps, which was equivalent to about 50 gallons per day for each man and 15 gallons per day for each animal, on the assumption that there would be about one animal for each three men.¹⁴ This was much more water than was supplied in the European cantonments,¹⁴ and it was nearly double the minimum amount stated as necessary for permanent camps, when provided with bathhouses and sewer systems.¹⁵ On the other hand, it was less than one-half the average quantity of water actually supplied to the majority of Regular Army posts throughout the United States before the war.

The same factors which influence the quantity of water used by a municipality apply in large degree to military consumption in camps of this character. Among these are the domestic requirements for cooking, drinking, bathing, flushing toilets, washing clothes, etc.; leakage from mains and distribution system and from plumbing; careless waste by individuals, and legitimate uses of water for industrial purposes (in the camps these were practically confined to heating plants, laundries, railways, and fire fighting). Theoretically at least, waste of water in the military service should be controllable much more effectively than in a municipality, because of the following facts: The individual soldier may be held to stricter accountability for the water used; the relative compactness of a camp results in a reduction of distributing mains, service pipes, and fixtures per capita, as compared with civil practice; at the military stations under discussion the plumbing was new and practically all exposed, so that leakage was limited and was promptly discoverable and easily preventable.

In National Guard camps complete sewer systems were not installed until the fall of 1918, although adequate shower-bath and washing facilities were provided from the outset, the waste water being carried off by surface ditches.¹⁶ It should be remembered that the frame structures at this type of camp were limited to warehouses, mess halls, kitchens, bath shelters, and latrines, the men being housed in tents. The quantity of water to be supplied these tent camps was originally based on a consumption of 35 gallons per capita daily,¹⁷ and therefore the supply systems were designed on a somewhat smaller scale than those at the National Army cantonments. In the National Army cantonments distributing pipes up to 16 inches in diameter were used whereas at the National Guard camps all the original mains in the distribution system were 6 inches in diameter;¹⁸ consequently with authorization of sewer systems for the National Guard camps, which was in point of fact effected, it became necessary to plan extensions and enlargements in the sources of supply and in the distribution systems; a daily allowance of 55 gallons per capita was then provided for these camps also.¹⁷

The water consumption in aviation fields practically always, as it proved, was in excess of 55 gallons per capita.¹⁷ The figures on record for these camps are not as reliable in most instances as those from other classes of stations. This higher consumption was probably due in part to the fact that the development of water supplies for the relatively small aviation fields was not so difficult as for the divisional camps, and consequently with an ample supply, as is always

the case, no such vigilance was exercised in limiting use and preventing waste as was displayed at the larger stations. Many instances of excessive leakage from wooden pipes in aviation fields are of record, and it is believed that a considerable part of the higher consumption mentioned may have been due to wastage.¹⁹

A particular example of such wastage was recorded at Kelly Field, Tex.,^{10 20} which was one of the two largest aviation stations. At this field 140 latrines were installed, consisting of several lengths of 12-inch or 15-inch sewer pipe laid horizontally with an open T in each section, the long arm of which faced upward. Each T was fitted with a wooden seat. The lower end of the horizontal pipe line connected through a reducer and trap with the sewer system. A small reservoir constructed of two or three sections of sewer pipe erected vertically received a continuous flow of water from a cock on the end of a 1-inch water line from the nearest main, and it discharged intermittently through the horizontal pipes described by means of a Miller automatic syphon, thus flushing the contents into the sewer. It was intended that the water in the reservoir, amounting to 45 gallons, should be discharged through the latrines at intervals of 15 minutes. The interval was regulated by the rate of flow of water through the cock. The difficulty of economical operation lay in the fact that an ordinary water cock could not be regulated for so small an amount as 45 gallons in 15 minutes, and, further, if the latrine were in service at night the same quantity of water was necessary for the infrequent use as was necessary in the daytime when the latrines were in almost continual use. At the time of an inspection of this camp by an officer from the sanitary engineering section of the Surgeon General's Office, the portion of the camp in which these latrines had been installed was not occupied, but practically none of them had been shut off. The reservoirs were filling and discharging at intervals of less than six minutes, thus occasioning an immense waste of water. At that same time a water shortage at this field was considered imminent, yet practically 500,000 gallons per day were being wasted, incidentally overworking the sewage-disposal plant. Fortunately occurrences of this sort were rare.

The amount of water used varied with the season and also somewhat with the station. In a few of the National Army cantonments the barracks and other buildings were heated by steam, there being usually a boiler house for each regimental area. These plants were not equipped with return-flow pipes for water of condensation and consequently consumed from 600,000 to 1,000,000 gallons of water daily, which amount, based on an average population of 40,000, represented from 15 to 25 gallons per capita, or from 27 to 45 per cent of the total supply allowed for each individual.²¹ Of course these plants operated only in winter, when the use of water for certain other purposes was reduced. Originally many of the camps were not provided with laundries or ice plants. In some the water required for locomotive boilers was not as great as in others. During the summer, under the conditions of military life, in these camps with an exclusively adult male population generally engaging in strenuous outdoor exercises in the high temperatures which so often prevailed throughout the day at most of the stations, and oftentimes amid clouds of

flying dust, a greatly increased use of water occurred, not only for drinking and bathing but also for washing clothing, sprinkling roadways and areas about the buildings, and cleaning kitchens and dormitories. Furthermore, many of the distribution systems involved the use of large quantities of wood-stove pipe, and as a result there was in such stations a higher loss from leakage than in others equipped with mainly cast-iron or steel pipe, which suffered comparatively little in this respect. Delousing, especially in the port camps where this was carried out on a large scale within a very limited time, involved the use of great quantities of water.

Notwithstanding the efforts made to keep the per capita consumption low, most of the large camps exceeded the figure of 55 gallons daily during a large part of the year, although it was apparent during the latter period of their occupation that this standard was proving approximately sufficient and that in some instances even a less quantity of water was being used.²² Following demobilization, with the low average populations in the camps, the per capita consumption greatly increased, as was to be expected largely because leakage was practically constant, whether the camp was fully occupied or not, and actually increased as plumbing fixtures and distributing mains rapidly fell into a state of poor repair.

Holding in mind the factors just discussed which governed the variations in water consumption at the different camps and cantonments, it should be recognized that exceptions to the general rule were justified and that the quantity of water necessary per capita can not be considered the same for all camps, regardless of latitude, purpose, and other circumstances. Fifty-five gallons daily may be considered as having been sufficient in ordinary weather for camps with low industrial requirements and low leakage factors, even though strenuous efforts were constantly necessary on the part of the officer in charge of the utility to prevent excessive use. These measures took the form of carrying much lower pressures on the distributing system than originally were provided for, of reducing the capacity of the sprinkler heads in shower baths and of reconstructing the reservoirs in flush toilets so that smaller quantities of water per flush were delivered.²³ In camps with high industrial requirements, such as those provided with steam heating plants, laundries, ice plants, etc., in those where wood pipe formed a considerable part of the distribution system, and in many others during hot, dry, dusty seasons, particularly if located in the South, a daily allowance of 55 gallons per capita can not be regarded as having been sufficient. It is clear that no camp should be provided with a water supply based so inflexibly on this quantity that restrictions on the free legitimate use of water may become necessary.

SOURCES OF WATER SUPPLY FOR CAMPS

Among the many matters requiring consideration in connection with the selection of suitable camp sites, water supply, although of recognized importance, was only one factor and not the controlling one. Therefore, in many instances, the problem of providing sufficient potable water proved to be extremely complicated, and it often became necessary to choose sources of supply which would not have been considered favorably, had sites more appro-

priate from this standpoint been selected originally, or thereafter had more time been available for locating or developing other water sources. This was the case, for instance, at Camp Dix, N. J., where one of the strong arguments advanced for the site, which was near Wrightstown, was the abundant supply of wholesome well water said to be easily available in the vicinity of the camp.^{10, 24} After a hurried but adequate investigation by experts, a supply of easily purified surface water from Rancocas Creek, of undoubted adequacy, was chosen, rather than a supply from wells, which was apparently limited. At Camp Pike, Ark., the city supply of Little Rock, having the Arkansas River as its source, and necessitating 6 miles of main pipe line and two booster pumping stations in order to get the water into camp, was chosen rather than to risk the development of a ground-water supply at a great loss of time, although water was obtainable through wells in a location somewhat closer to the camp than was the city supply.^{10, 25}

Wherever possible, supplies from near-by municipalities were selected in preference to developing independent sources, the main idea being to conserve time, materials, and money, particularly time. But all camps were not situated in close proximity to cities, and in some instances the city supplies were not acceptable from the standpoints either of dependability or quality, or perhaps both. In fact, some of the city supplies which were utilized proved inadequate to furnish the water desired, and it became necessary for the Government practically to rebuild a number of the municipal plants and to take over the operation of a few.¹⁷

In all over 275 water-supply projects were undertaken by the Army—approximately 111 were in camps, cantonments, and aviation stations, the remainder being in ordnance plants, storage depots, hospitals, etc. There were 50 very large stations to be supplied, including the 32 National Army and National Guard divisional camps, 10 special training camps, 3 embarkation camps, 2 port terminals, 2 aviation concentration camps and flying fields, and 1 large arsenal.¹⁰

Bearing in mind the original intention that the National Guard camps should be of more temporary character than the National Army cantonments, it is interesting to note that 10 out of the 16 cantonments were supplied by new plants designed and constructed by the War Department, the remaining 6 being served by existing supplies of near-by communities. On the other hand, at only two of the National Guard camps were new sources of supply developed, while the remainder depended upon the water systems of adjacent cities.

QUALITY OF WATER

The importance of a safe and an esthetically satisfactory water supply was recognized throughout the planning and development of the camps. As a matter of fact, particular stress was laid on these features in the original instructions for choosing camp sites issued to the department commanders by the Chief of Staff (see Chap. IV). Yet, as explained before, a few camp sites with unusually difficult water-supply problems were chosen. In all instances, when necessary, a great effort was made to provide equipment for satisfactorily treating the water in order to insure a safe supply. Willingness to expend

large sums of money to accomplish this end was evident, and modern water purification plants were installed at camps where there was any question of contamination. Certain necessary precautions were emphasized in instructions prepared by the advisory engineer on water supply, Construction Division, as follows: ²⁶

- (a) The covering of all storage reservoirs to prevent accidental or intentional pollution and the formation of algæ.
- (b) The furnishing of chlorinators to all cantonments and camps, even when the supply might be regarded as normally safe.
- (c) The prohibition of the use of wells in shallow strata on inhabited watersheds, or in any other stratum or location in which it might be possible for the wells to become contaminated.

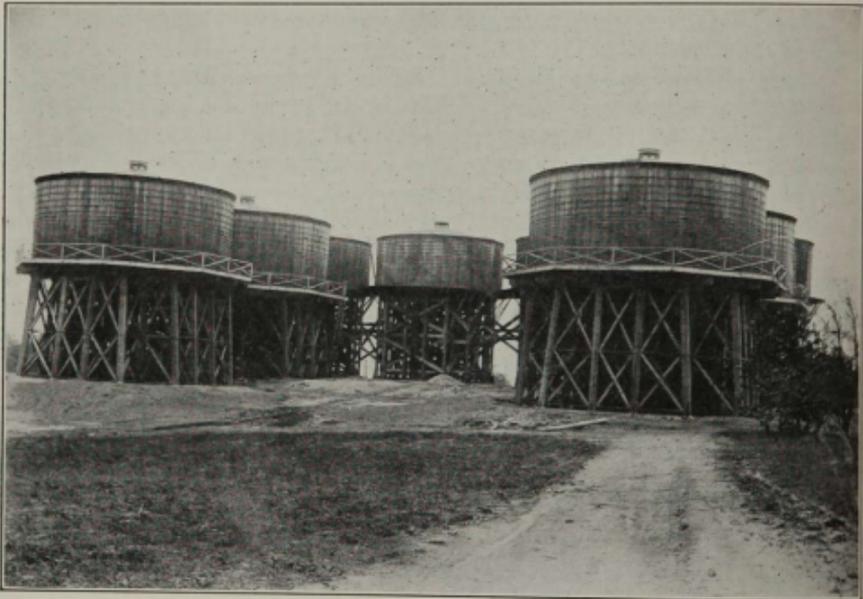


FIG. 35.—Clear-water reservoirs, Camp Meade, Md.

(d) The absolute prohibition of any distribution mains carrying polluted water, whether for fire protection or industrial or any other use, and of any outlet or fixture from which such water might be drawn, or of any arrangement that would permit the later introduction of any such outlet or fixture.

Twenty-eight of fifty big camps were supplied with water from surface sources, 15 utilizing large streams or rivers, 9 drawing from small streams or creeks, and 4 employing impounding reservoirs.¹⁰ All of these 28 stations, with 3 exceptions (Camps Dix, Doniphan, and Sevier), were equipped with rapid sand filters and disinfecting equipment for the treatment of the water.¹⁰ At Camp Dix the water was treated by chlorination alone, it being taken from a small stream which was only moderately contaminated and never turbid.¹⁰ Camp Doniphan, at Fort Sill, Okla., and Camp Sevier, at Greenville, S. C., were both supplied from large impounding reservoirs with practically unin-

habited watersheds.¹⁰ Chlorination rendered the water at each place safe, but growths of microscopic organisms and occasional high turbidities in Lake Lawtonka, from which Camp Doniphan was supplied, resulted in the ultimate installation (in 1919) of rapid sand filters. All of the Government-owned surface supplies for the smaller camps, aviation fields, and hospitals were equipped with filters as were practically all of the municipal surface supplies which were utilized by camps of this class. Careful sanitary surveys were made of watersheds, limited, with respect to large streams, to the region lying within a few miles of the intake, but covering, in the case of the smaller streams the entire drainage area. Regular patrols consisting of detachments of enlisted

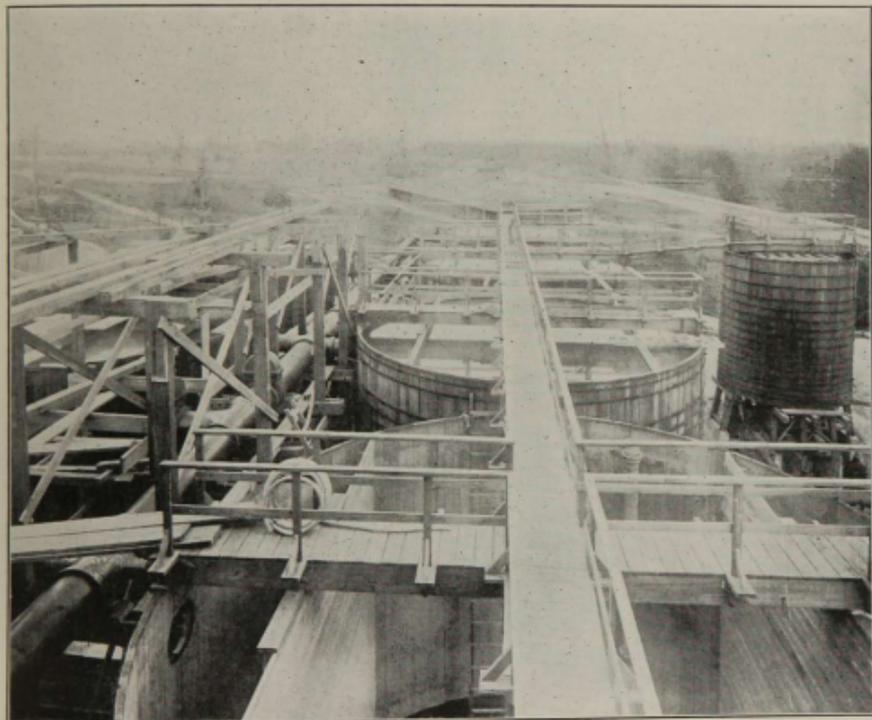


FIG. 36.—Coagulation and settling tanks, Camp Meade water-purification plant

men were maintained on smaller watersheds under the immediate direction of the camp sanitary engineers, and unusual efforts were made, on a scale seldom even approximated in municipal practice, to secure the abatement of conditions deemed prejudicial to the quality of the supplies.²⁷

The operation of the Government-owned waterworks was usually conducted by the maintenance and repair branch of the Construction Division, with close and careful supervision by the Medical Department through an officer of the Sanitary Corps.⁶ Municipal supplies were generally operated by municipal employees, with the same close supervision by the Medical Department as was exercised in the case of Government-owned plants, but in

certain instances (notably Petersburg, Va., supplying Camp Lee; Augusta, Ga., supplying Camp Hancock; Lawton, Okla., supplying Camp Doniphan, Fort Sill, and Post Field; and Watervliet, N. Y., supplying Watervliet Arsenal), the operation was controlled by the Medical Department through the agency of Sanitary Corps officers.¹⁰ The Red Cross and the United States Public Health Service, in their extra cantonment work, also gave much valuable assistance in controlling the operation of municipal plants through their laboratories and sanitary engineers.⁶

In general, the supplies of water obtained from the ground for the use of the Army camps were subjected to the same rigid tests as were those secured from sources naturally subject to more immediate and dangerous pollution. Control measures, where deemed necessary, were exercised in no uncertain fashion. Experienced sanitary engineers are familiar with the difficulty of securing ground-water supplies (especially from relatively shallow water-bearing strata) which will give negative results with presumptive tests for the *B. coli*. Such tests are unquestionably too severe in the vast majority of cases and it is probable that many safe supplies were thereby condemned and abandoned, or else were subjected to unnecessary treatment. Nevertheless, it is apparent that such tests err on the side of safety and that they have the very real advantage of directing the attention of sanitary authorities to those supplies which do not demonstrate absolute acceptability on the basis in question. In this way physical and other investigations may be undertaken which will show whether or not such waters are by any possibility subject to dangerous pollution and which will indicate the means of control or remedy. Doubtless many perfectly safe ground-water supplies at military stations were regularly or occasionally subjected to treatment by disinfection because of adverse laboratory findings; however, as stated, it was the well-defined policy of the War Department to avoid taking any chances where the hygienic quality of a water supply was concerned.

The physical conditions and factors affecting the quantity and quality of ground-water supplies received careful attention. Percolating or collecting areas, when not too remote, and geological formations, were investigated, and as a result in many cases information was secured from which it was possible not only to forecast the quantity of water available but also to determine roughly the probable quality of the supply from a chemical and bacteriological standpoint. In this connection the estimated time factor or period required for water to pass from a collecting point or area to the place of withdrawal has been of extreme interest. Much attention was given to the elimination of sources of pollution in the neighborhood of ground-water collecting works, and surface water was carefully excluded by proper construction methods at all plants installed.

DISINFECTION OF WATER SUPPLIES

No great reliance was placed on the ability of filters to produce more than an esthetically satisfactory water; consequently, disinfection by chlorination was instituted for every surface water supply as well as for all ground water of doubtful quality.²⁷ A wealth of data is available in the military records, as

well as from civil experience, to prove the necessity for this precaution. Table 4 presents the situation as defined by Army experience and contains a summary of a part of the data for Camp Meade, which was supplied with a coagulated, settled, and filtered water from Little Patuxent River, a stream heavily polluted with sewage only a few miles above the camp intake. The filters were very efficient in the removal of turbidity, since the effluent supplied was practically always clear and attractive, although very high turbidities were occasionally encountered in the raw water. Their efficiency was not so

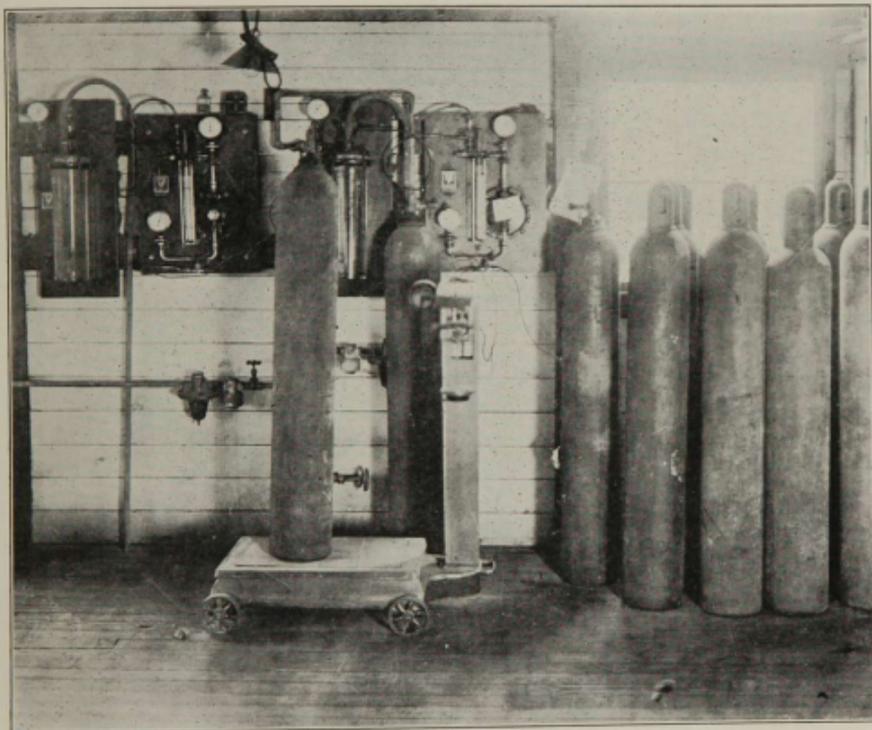


FIG. 37.—Sterilization equipment, Camp Meade water-purification plant

satisfactory in the removal of bacteria. While the total number of bacteria (agar 37 per cent, 24 hours) present in the filtered water was well within the limits of the United States Public Health standards, which were adopted as the Army criterion of potability, nevertheless, *B. coli* was present with great frequency in 1 c. c. samples in both the presumptive and the confirmed tests (the latter are not shown in Table 4). In the chlorinated water the total count was greatly reduced and *B. coli* was seldom found in 10 c. c. samples by the presumptive test, the few thus found being practically never confirmed on Endo's medium.²⁸

TABLE 4.—Record of bacterial efficiency, water purification plant,^a Camp Meade, Md.²⁸

Month, 1918 to 1919	Total count, agar, 37° per c. c.			Per cent bacterial removal by filters	Presumptive tests for <i>B. coli</i>				<i>B. coli</i> confirmed in chlorinated water, 10 c. c.	Dose of chlorine average part per million
	Raw	Filtered	Chlorinated		Filtered water		Chlorinated			
					Number of tests	Per cent positive in 1 c. c.	Number of tests	Per cent positive in 10 c. c.		
February	970	64		93.4						
March	890	10		98.9						0.59
April	910	30	6	96.7	54	16				.55
May	4,800	78	5	98.4	61	26				.55
June	760	42	4	94.5	46	24				.58
July	700	44	2	93.7	79	6				.55
August	2,300	207	16	91	137	16				1.22
September	1,080	31	5	97.1	360	37.5	360	16.5	0	1.28
October	318	24	3	92.5	370	10.8	116	.8	0	1.09
November	434	82	8	81.1	372	17.4	144	9.7	0	1.07
December	1,500	15	1	99	712	14.6	240	7.8	0	1.57
January	422	8	.37	98.1	612	7.3	135	2.9	0	1.22
February	250	2.4	.2	99	352	6.8	120	.0	0	1.20
March	615	9.5	.64	98.5	448	5.5	145	3.3	0	1.26
April	700	21	.78	97	369	26.5	120	5.8	0	1.01
May	381	9.4	.45	97.5	175	39	125	1.6	0	1.01

^a Source of supply, Little Patuxent River; nominal capacity of filters, 3 M. G. D., rapid sand, gravity type; capacity of coagulation and settling tanks, 400,000 gallons; coagulant used, aluminium sulphate.

Experience with waters only slightly polluted, in which *B. coli* appeared occasionally in 1 c. c. samples indicates the same inability of filters, even with the most careful operation, to produce water which will regularly measure up to the standard. This is shown by Table 5, which is a summary of a part of the reports from Camp Bowie, Tex. This camp was supplied by the city of Fort Worth, which secures water from a large artificial lake having a capacity of 40,000,000,000 gallons, formed by a dam across the west fork of the Trinity River.²⁹

TABLE 5.—Record of bacterial efficiency, water purification plant, Fort Worth, Tex., supplying Camp Bowie²⁹

Month, 1918 to 1919	Total count, nutrient agar, 37.5°			Per cent bacterial removal by filters	Presumptive tests for <i>B. coli</i>				<i>B. coli</i> confirmed in chlorinated water, 10 c. c.	Dose of chlorine average part per million
	Raw	Filtered	Chlorinated		Filtered water		Chlorinated			
					Number of tests	Per cent positive in 1 c. c.	Number of tests	Per cent positive in 10 c. c.		
September	420	52	^a 1,500	80.6	30	0.0	30	0	0	1.05
October	307	57	^b 365	81.4	29	20.7	29	0	0	.77
November	1,297	273	^b 68	78.9	29	10.4	29	0	0	.56
December	1,096	280	^b 52	74.4	31	3.3	31	0	0	.60
January	1,986	475	^b 53	76.0	28	.0	28	0	0	1.12
February	806	201	^b 54	76.8	28	3.5	28	0	0	1.02
March	241	58	^b 30	75.9	31	.0	31	0	0	.55
April	979	310	^b 58	68.3	30	.0	30	0	0	.38
May	419	196	^b 46	53.2	31	.0	31	0	0	.51

^a Chlorine applied before entering clear wells where aftergrowth developed.

^b Chlorine applied to pump suction.

This subject is not discussed with a desire to minimize the importance of filters, because their value in water purification can hardly be assailed, but for the purpose of emphasizing the necessity for supplementary treatment by disinfection.

The use of liquid chlorine, either constantly or at times, for the disinfection of the water supplies at the camps, was almost universal. Table 6 contains the names of the 48 largest stations, together with a statement as to whether or not disinfection was employed regularly, intermittently, or in one or more cases of emergency. In the smaller camps a larger percentage of ground-water supplies was utilized. In the Air Service, disinfection was employed at 11 of 28 stations which utilized ground-water sources developed by the Government, at 2 of 8 ground-water sources developed by near-by municipalities, and in all surface-water supplies (2 developed by the Government, 15 by municipalities) except at one field, which was supplied by the city of Washington.¹⁰

TABLE 6.—Showing source of water supply, ownership, and treatment at 48 large camps and cantonments¹⁰

Camp	Located near—	Source of supply	Ownership*	Filtration†	Chlorination‡
Beauregard	Alexandria, La.	Wells	G	None	I
Benning ^d	Columbus, Ga.	Upatoi Creek	G	Yes	C
Bowie	Fort Worth, Tex.	Trinity River	M	Yes	C
Bragg ^d	Fayetteville, N. C.	Little River	G	Yes	C
Charleston Port Terminal	Charleston, S. C.	Goose Creek	M	Yes	C
Cody	Deming, N. Mex.	Wells	P M	No	E.
Custer	Battle Creek, Mich.	do	G	No	E.
Devens	Ayer, Mass.	do	G	No	C.
Dix	Wrightstown, N. J.	Rancoos Creek	G	No	C.
Dodge	Des Moines, Iowa	Wells	G	No	C.
Doniphan	Fort Sill, Okla.	Lake Lawtonka	M	Under construction	C.
Edgewood	Edgewood, Md.	Winters Run	G	Yes	C.
Enstis	Lee Hall, Va.	Wells	G	No	E.
Forrest	Chickamauga Park, Ga.	Tennessee River and wells— Chattanooga city supply.	M and G	Yes*	C.*
Fremont	Palo Alto, Calif.	Galleries	P M	No	None. ^f
Funston	Fort Riley, Kans.	Wells	G	No*	C.
Gordon	Athanta, Ga.	Chattahoochee River	M	Yes	C.
Grant	Rockford, Ill.	Wells	G	No	E.
Greenleaf	Chickamauga Park, Ga.	See Forrest	M and G	Yes*	C.*
Greene	Charlotte, N. C.	Catawba River	M	Yes	C.
Hancock	Augusta, Ga.	Savannah River	M	Yes	C.
Humphreys	Acetotink, Va.	Acetotink Creek	G	Yes	C.
Jackson	Columbia, S. C.	Congaree River	M	Yes	C.
Johnston	Jacksonville, Fla.	Wells	G	No	None.
Kearny	San Diego, Calif.	Morena and Otay Reservoir	M	Yes	C.
Knox	Stithton, Ky.	Otter Creek	G	Yes	C.
Las Casas	San Juan, P. R.	Rio Piedras	M	Yes	C.
Lee	Petersburg, Va.	Appomattox River	G	No	None.
Lewis	American Lake, Wash.	Springs	G	No	None.
Logan	Houston, Tex.	Wells	M and G	No	I.
MacArthur	Waco, Tex.	Well and Brazos River	M	Yes	C.
McClellan	Anniston, Ala.	Springs	M	No	C.
Mende	Annapolis Junction, Md.	Patuxent River	G	Yes	C.
Merritt	Tenafly, N. J.	Hackensack River	P M	Yes	C.
Mills	Garden City, Long Island	Wells	G and P	No	None.
Newport News	Port of Embarkation, Va.	Warwick River	P M	Yes	C.
Norfolk	Port Terminal, Ark.	Reservoirs	M	Yes	C.
Pike	Little Rock, Ark.	Arkansas River	P M	Yes	C.
Sevier	Greenville, S. C.	Little Mountain Creek	M	No	C.
Shelby	Hattiesburg, Miss.	Wells	G	No	None.
Sheridan	Montgomery, Ala.	do	M	No	None.
Sherman	Chillicothe, Ohio	do	G	No	C.
Stanley	San Antonio, Tex.	do	G	No	C.
Taylor	Louisville, Ky.	Ohio River	M	Yes	C.
Travis	San Antonio, Tex.	Wells	P M	No	None.
Wadsworth	Spartanburg, S. C.	Lawsons Fork	M	Yes	C.
Wheeler	Macon, Ga.	Ocmulgee River	M	Yes	C.
Upton	Yaphank, Long Island	Wells	P G	No	None

* M, municipal supply; G, Government; P G, privately owned but Government controlled; P M, privately owned municipal supply.

† Filtration was preceded in all cases by coagulation and sedimentation.

‡ C, constant; I, intermittent; E, emergency.

^d Camp under construction June 1, 1919; new water supply being developed.

^e Well water chlorinated only; river water filtered and chlorinated.

^f Part of supply from surface source was chlorinated.

^g Filters were constructed after armistice.

Bacillus coli was found frequently in several of the ground-water supplies where extended investigations by competent persons showed that dangerous contamination was improbable, and these supplies were intermittently chlorinated. In practically all camps the presence of *B. coli* in the water supply was demonstrated immediately after the completion of the systems, due probably to the entrance of dirt into the wells and distribution systems during construction.²⁸ In one camp a sharp outbreak of diarrhea occurred during February, 1919, among men who were quartered in a section of the camp in which new distributing pipes were being laid. The water at its source and throughout the other sections of the camp was of excellent quality, while that in the area

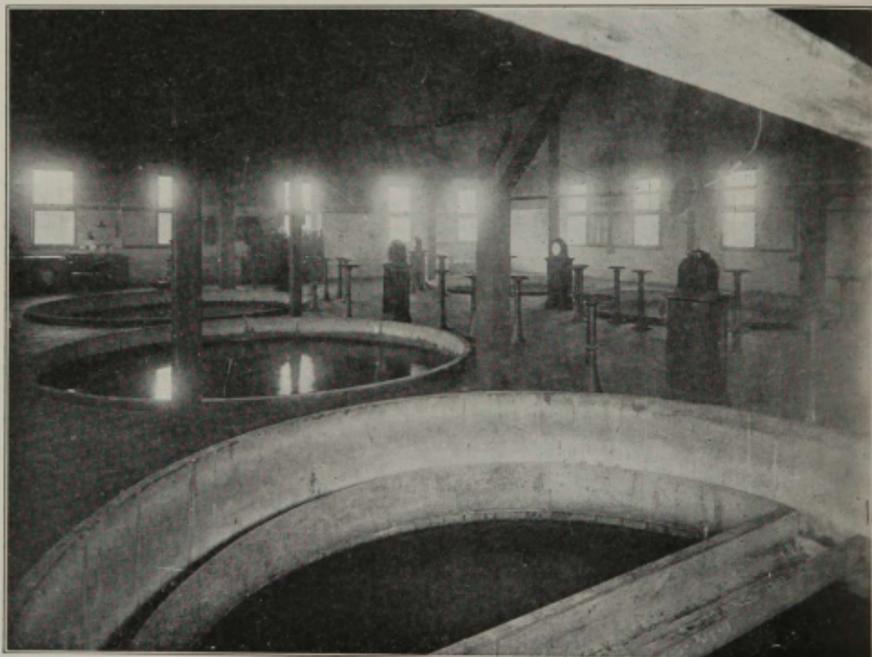


FIG. 38.—Filter room, Camp Meade water-purification plant

in question was highly polluted. Careful investigations proved beyond a doubt that the infection was introduced during the laying of the new pipes. In some camps, where a large part of the distribution system consisted of wood pipe, there were many blowouts and repairs, thus causing a more or less frequent recurrence of conditions prejudicial to the quality of the water supply. Careful chlorination was necessary, and in most instances was accomplished, in cases of this type.

The application of chlorine under the many and varied conditions encountered indicated that the equipment for this purpose is not yet ideal, and it was manifest that careful and trained operators are necessary in order successfully to accomplish disinfection. Doses ordinarily ranged from 0.25 to 1 part per million, but in two camps, Dix and Meade, regular doses of from 1.25 to 1.6

parts per million were used, with maximum doses as high as 3 parts per million. An effort was made to maintain duplicate equipment and spare parts at each installation, and the occasional failures of machines to function properly have justified this policy.

LABORATORY CONTROL FOR DETERMINATION OF QUALITY OF WATER

Laboratory facilities to a surprising extent were available for the examination of water. Over 100 large and complete laboratories were established and maintained within the continental limits of the United States by the Medical Department of the Army; they were grouped as follows:³⁰

Department laboratories—permanent (eastern, ^a northeastern, ^a southeastern, southern, central, and western).....	6
Station laboratories—permanent (Fort Slocum, Fort McDowell, Columbus Barracks, Jefferson Barracks, Vancouver Barracks).....	5
Port of embarkation laboratories.....	2
Base hospital and other large laboratories, approximately.....	48
General hospital laboratories (3 permanent).....	43
Total.....	104

In addition to these, there were two departmental laboratories in our tropical possessions, one in Hawaii and one in the Philippine Islands. In Europe numerous general and special laboratories were developed and maintained to serve the American Expeditionary Forces, and the facilities there were fully equal to those at home. In addition to general laboratories pertaining to the Medical Department, many laboratories exclusively for water control work were provided abroad. Of this type, which pertained to the Engineer Corps, there were 11 large fixed laboratories and 10 mobile units, 4 of which were mounted on trucks and 6 contained in specially devised chests.³¹ At those laboratories which were operated by the Medical Department, Sanitary Corps officers were usually on duty in charge of water examinations.

Practically all of the many laboratories of the Medical Department were fully equipped for making bacteriological examinations of water, milk, sewage, etc., according to the standard methods of the American Public Health Association and of the Army, which were virtually identical. A few laboratories were equipped to perform complete chemical examinations of water, milk, sewage, etc., as well as the so-called sanitary chemical analysis. Of the 14 large permanent Army laboratories, 5 at least were equipped for this type of analytical work and for the conduct of researches of considerable scope along similar lines.³² Certain base and general hospital laboratories had like equipment. A notable example of a provision for the investigation of sanitary engineering problems and for proper assistance in the conduct of practical sanitation in a military station was furnished by the sanitary section of the base hospital laboratory at Camp Meade, Md.²⁸ This establishment was equipped to perform chemical and bacteriological work in connection with the examination and analysis of water, milk, foodstuffs, sewage, grease, various waste products, and of the materials and supplies employed in the control and operation of water purification and sewage treatment works. It was operated under

^a At Army Medical School, Washington, D. C.

the immediate supervision of Sanitary Corps officers trained and experienced in these procedures. In this laboratory, during the year or more of its existence, hundreds of samples of water, sewage, milk, ice cream, soft drinks, and miscellaneous products and materials were examined chemically and thousands of samples were examined bacteriologically.

As is explained more in detail elsewhere, laboratory methods in the Army were fully standardized and a very complete manual of procedure was published.³³ The material in this section concerning the sanitary examination of water and sewage was compiled by officers of the sanitary engineering section of the Surgeon General's Office. A form for recording and reporting the results of the bacteriological examination of individual water samples was devised by this section for use at all Army laboratories. A valuable pamphlet, entitled "Interpretation of Water Analyses," was also prepared by the sanitary engineering section and distributed for use of medical and sanitary officers.³⁴

In addition to those already mentioned few laboratories for making chemical and bacteriological examinations of water, sewage, and other materials, were developed by the maintenance and repair branch of the construction division, which was charged with the operation of water and sewage works in all Army camps.³⁵ These utilities laboratories were installed for the immediate purpose of controlling water filtration operations, but in some instances they were extended in scope to permit investigations of sewage treatment and of other problems.

In connection with its extracantonment activities, the United States Public Health Service maintained about 40 bacteriological laboratories, all of which were equipped for water examination work.³⁶ These laboratories contributed liberally to the solution of problems relating to the safety of drinking water supplies, not alone in extracantonment zones but sometimes within military reservations as well. Red Cross laboratories also generously extended aid in solving practical sanitary questions of some Army camps, including the determination of the quality of water supplies and the hygienic safety thereof.³⁷

HEALTH OF TROOPS AS RELATED TO THE WATER SUPPLY

It is of course now well recognized that the so-called water-borne diseases (typhoid and paratyphoid fevers, cholera, dysentery, certain diarrheas, etc.) are not conveyed by water alone. As every sanitarian knows, milk and other foods infected in various ways, human carriers, mild or missed cases, direct and indirect contact, flies, perhaps certain other insects, and possibly unknown factors, as well as water, may be responsible for the spread of this group of maladies. It should also be explained that the plan of the Army sanitarian was so laid out and conducted as to eliminate, to the fullest possible extent, all of these factors. In general the program for controlling the intestinal diseases comprised two basic methods of attack: (a) General and mass control by improvement of the environment. (b) Specific control by the immunization of the individual against certain diseases, as for instance typhoid and paratyphoid.

Practically every officer and soldier in the Army, and as far as possible civilian employees, were systematically vaccinated against typhoid and paratyphoid fevers.³⁸ It was not considered necessary to vaccinate against cholera at home. A successful vaccine to protect the individual against dysentery had not been developed.

Discussion of vaccination in detail will be found elsewhere, however, and in this and the following chapters the object has been to describe the control of the environment of the soldier, as related to the provision of a safe water supply and the proper disposal of wastes. Yet, it must be explained here that experience in the Army and elsewhere seems to indicate that vaccination against typhoid and paratyphoid fevers does not invariably protect every individual at all times against massive infections or against doses of exceptionally virulent bacteria, especially when such infective material is directly encountered, as is the case with a recently and grossly contaminated water or food supply. The obvious conclusion is that sanitation must not rely wholly on vaccination, but must endeavor to block all known avenues of infection. This principle was most consistently applied in Army sanitation, with results which have been nothing short of epochal in so far as intestinal diseases are concerned. Among the means of controlling intestinal diseases, purification of water supplies is by no means the least.

During the period from January 1, 1917, to December 31, 1919, in which time the mean strength of the Army in the United States, officers and enlisted men, was about 2,301,371, there occurred therein 74 deaths from typhoid fever and 20 deaths from dysentery.³⁹ Many of the men developing typhoid are known to have been in the incubation stage at the time of their entrance into the military service, or at least, which amounts to the same thing, before anti-typhoid vaccination was accomplished.

The importance of not relying too implicitly upon the protection afforded by typhoid-paratyphoid vaccination was emphasized in the following extract from Changes No. 4, dated March 11, 1919, and amplifying Special Regulations No. 28:

The triple typhoid inoculation confers a high degree of protection against typhoid and paratyphoid fevers, but it does not give absolute protection against massive infections with the causative organisms. The use of the triple inoculation has enormously reduced the incidence of enteric fevers in armies, but its use does not warrant neglect of the other well-known sanitary precautions against these diseases. One of the most ready means of causing massive infection with typhoid and paratyphoid organisms is through the agency of a "carrier" employed in the handling of food.

While this caution dealt particularly with the question of human carriers, the principle laid down had equal bearing on the subject of water purification.

CHEMICAL CHARACTERISTICS OF WATER SUPPLIES

The quality of the water supplies as regards inorganic substances contained therein ranged between wide limits, but in no instances were these constituents of marked sanitary interest. They were, however, of much importance in relation to the operation of camp utilities, such as boilers, laundries, etc. Certain characteristics of the municipal water supplies in various sections of the country were duplicated in the camp water supplies. Soft waters were found

in the eastern and far western camps. Waters moderately hard were furnished in several of the southern camps, while hard waters were supplied in the middle western stations, such as Camps Custer, Dodge, Funston, Riley, Sherman, and Grant.¹⁰ The following table serves to illustrate the mineral content of the waters supplied at certain points:

TABLE 7.—*Showing typical waters supplied certain camps. (All are ground-water supplies)²⁵*
[Results are in parts per million]

Camp	Total solids	Temporary hardness as calcium carbonate	Permanent hardness as calcium carbonate	Total hardness	Soap consuming power	Calcium	Magnesium	Alkalinity	Iron	Chlorine
Custer.....	336	160	30		226			264	0.1	6
Devens.....	57			23				32	.1	2.8
Dodge.....	571			351		188	163	325	.1	6
Funston.....	669			351		182	169	300	.1	18
Grant.....				299		130	169	285	.1	8
Lewis.....		10.5	19.5		30			34.5	None.	7
Sherman.....			60	360			107		High.	12
Travis.....	270	40	0		181			205		12
Upton.....	40	8	0		14			15	Trace.	6

Softening was practiced in a few instances to prepare the water for certain special purposes, such as laundry or heating-plant use, but no large plants for this purpose were installed. Iron in the soluble ferrous state was present to a considerable extent in the supplies at Camps Custer, Dodge, Funston, and Sherman.²⁸ Its oxidation to the insoluble ferric state, following exposure to the air, imparted an objectionable color and turbidity to the water and stained toilet fixtures. A deferruginization plant, consisting of equipment for thorough aeration, coagulation, and filtration, was constructed in 1919 to treat the entire supply at Camp Funston.¹⁰

The water supply at Camp Dix, N. J., was secured from Rancocas Creek, which drains a large area of pine barrens, cedar swamps, and cranberry bogs. The water was always free from turbidity, but the color at times exceeded 300 parts per million. The mineral content was unobjectionable, and the alkalinity was low, the reaction occasionally reaching acidity. Carbon dioxide was usually present and caused the water to be corrosive at high temperatures in the steam boilers. Auxiliary wells were drilled to provide a water suitable for use in the boilers at the pumping station and at the base hospital.¹⁰

There is no evidence that there was any physiological effect, other than temporary, caused by the chemical or mineral constituents of any camp water supply.

SOME LESSONS TAUGHT BY ARMY EXPERIENCE AT THE CAMPS IN THE UNITED STATES

The variability in bacteriological quality observed with respect to a considerable number of ground-water supplies shows that frequent examinations should be made of samples collected from various points in the water-supply system. This should be done regardless of the cause of the variation in quality. Variations may be due to differences in intensity of contamination at the source itself, to repairs to well casings, etc., or to disturbances in the distributing system on account of breaks or extensions.

Unless a ground-water supply can establish a record of consistently good quality, based upon thorough laboratory examinations throughout a considerable period of time, it should be regarded with suspicion and treated accordingly.

Except under extraordinary circumstances, involving exceedingly successful design and construction combined with the most vigilant and intelligent operation, the effluents of rapid sand-filter plants, when waters polluted with fecal wastes to a significant degree are being treated, can not be considered as consistently safe, and should therefore receive further systematic treatment, preferably by chlorination.

Extraordinary inefficiency and lack of intelligence were too frequently noted with respect to the operation of rapid sand-filter plants, especially those serving the smaller communities in which the authorities did not recognize the value of expert services and the relative economy of the highest skill.

All surface-water supplies from whatever source should be regarded as potentially unsafe and should receive adequate disinfection unless or until, through a sufficient period, their satisfactory quality without disinfection is consistently demonstrable through comprehensive laboratory examinations.

The required dosage of disinfectant, whether that disinfectant be liquid chlorine employed at a large purification plant or calcium hypochlorite employed in a Lyster bag, should be predetermined and should be adjusted from time to time to conform, at least approximately, to variations in character and composition of the supply undergoing treatment.

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CHAPTER XI

SEWERS, SEWAGE, AND SEWAGE DISPOSAL

GENERAL CONSIDERATIONS

Two methods, a water-carriage system and latrine pits, were originally contemplated for camps in the United States.^{1 a}

Sewers were not at first planned for the 16 National Guard tent camps because of their supposedly temporary nature, and in them it was proposed to care for human excreta by the pit-latrine system.¹ Before the completion of most of these camps, however, sewers were initiated for the base hospital which was an adjunct to each camp and of semipermanent frame construction.² In March, 1918, a complete water-carriage system for the entire occupied areas of these camps was authorized at all of the 16 National Guard camps except at Camp Doniphan, which was being abandoned, and at Camp Mills which had ceased to exist as a National Guard concentration point late in 1917, though its site was subsequently occupied by a sewered cantonment, also designated Camp Mills.³ This action in itself indicates that the saving in time and money incident to the use of latrines instead of sewers was not deemed justifiable by the War Department.

The subcommittee on preliminary planning, sanitation, and engineering relative to cantonment construction, of the Council of National Defense, mentioned before, assisted the officers of the Construction Division in the general layout and specifications for the sewer system at the 16 original National Army camps; these projects proceeded simultaneously with those relating to the water supply.⁴ A large part of the original engineering work was carried out in the field, and most of the sewer systems were actually designed by the supervising engineers at each camp, although standard plans for sewage-disposal plants were drawn in the central office in Washington, and these plans, slightly modified to meet local conditions, were used where sewage treatment was deemed necessary.

Nearly all of the miscellaneous cantonments which sprang up so rapidly were provided with sewer systems at the time of building, or sometimes later. Among these were the training camps for special corps, the ports of embarkation, the arsenals, the ordnance depots.⁵

The sewerage problems in the aviation fields were handled in much the same manner as were their water supplies. Civilian engineers, usually from the same general vicinity as that in which a field was located, or else the engineer, employed by the contractors, planned the sewer systems and also designed the sewage disposal plants whenever these were necessary, acting under the supervision in most instances of the officers of the buildings and grounds branch, supply section, Division of Military Aeronautics.⁶ No radical departures from standard practices were observed. This work was entirely

^a For general considerations concerning latrine pits consult Chap. VIII of the second section, this volume.

independent of the construction division until late in the summer of 1918, by which time practically all of the military stations were completed; installations of this character were thereafter taken over by the construction division of the Army.⁷

DESIGN OF SEWER SYSTEMS AND CHARACTER OF FLOW

No unusual methods were employed in the sewer systems. Salt-glazed vitrified tile pipe, with capacities based on minimum grades necessary to secure self-cleansing velocities (approximately $2\frac{1}{4}$ feet per second), and with maximum capacities based on full flow, was adopted.⁸ In some instances where the sewer was subject to unusual stress, cast-iron or concrete pipe was used.⁸

The lack of definite knowledge at first as to the size and locations of company units resulted in an assumption that it would be necessary to limit the use of shower baths to one brigade at a time in order to prevent overcrowding of the sewer systems, but the ultimate layouts resulted in practically no necessity for limitations of this nature.⁸ It was anticipated that the maximum rate of flow would be between two and one-half and three times the average for 24 hours. Data contained in Tables 8 and 9 show some of the experience on rates of flow.

Square concrete manholes with wooden covers were used at intervals of about 350 feet.⁹ In some camps these covers were the source of considerable trouble owing to the ease with which they could be lifted off, the manholes then being used as receptacles for garbage and rubbish, and it became necessary in many instances to secure them in place with locks.¹⁰ Laterals were 8 inches in diameter or larger, while the main outfall sewers were usually 24 to 30 inches in diameter. House connections usually were of 6-inch vitrified terra-cotta pipe, although 4-inch pipe was sometimes used.¹¹

The quantity of daily sewage flow was approximately the same for all camps of similar type having equal populations. This was due principally to three factors; first, the efforts of the authorities to maintain the water consumption at the same quantity per capita; second, the similarity in the layout of buildings and facilities and in the daily routine of the organizations; and, third, the fact that practically all the sewer systems were shallow and located in drained terrain, thus offering slight opportunity for infiltration. The total quantity of sewage per capita in the large camps was considerably less, as was the case with water consumption, than is usual in the average municipality, but in aviation camps both sewage flow and water consumption approximated municipal experience. Rates of flow varied greatly at different periods of the day, due to the routine hours for bathing, sprinkling, etc.

Excellent data on the total flow from a large camp, when filled to capacity, showing the relation between maximum, average, and minimum rates of flow, in total daily quantities and in gallons per capita, are given in Tables 8 and 9, which contain summaries of certain information collected at Camp Meade, Md., in May, 1918, during an investigation of the sewage disposal plant.

TABLE 8.—Rates of sewage flow per hour and the percentage of the average, in main sewer, Camp Meade, Md.,^a May 12-21, 1918¹²

Hour, a. m.	Flow		Hour, p. m.	Flow	
	Cubic-foot seconds	Percentage of average		Cubic-foot seconds	Percentage of average
12-1	1.05	42	12-1	2.90	115
1-2	.88	35	1-2	3.35	135
2-3	.76	30	2-3	3.12	125
3-4	.70	28	3-4	2.87	115
4-5	.67	27	4-5	2.54	100
5-6	.68	27	5-6	3.25	126
6-7	1.40	56	6-7	2.93	118
7-8	4.24	173	7-8	3.45	138
8-9	4.62	185	8-9	3.15	125
9-10	3.75	150	9-10	3.25	126
10-11	3.12	125	10-11	3.87	155
11-12	2.62	105	11-12	1.97	80

^a Net population of camp: Men, 36,590; animals, 11,000.

TABLE 9.—Ratios between maximum, minimum, and average rates of sewage flow, Camp Meade, Md., May 12-21, 1918¹²

Date, May, 1918	Maximum to average	Minimum to average	Maximum to minimum
13	1.87	0.302	6.18
14	1.83	.290	7.03
15	1.93	.290	7.43
16	1.71	.256	6.67
17	1.81	.199	9.10
18	2.11	.276	7.62
19	2.00	.250	7.98
20	1.70	.250	6.81
Average	1.87	.257	7.35

Table 10, which is also a summary of a part of the data collected during the same investigation, shows the relation between the water consumption in the camp and the sewage flow, both in million gallons daily and in gallons per capita.

TABLE 10.—Relation between water consumption and sewage flow, Camp Meade, Md., May 12-21, 1918¹²

Date, May, 1918	Water consumption		Sewage flow		Percentage of sewage flow to water consumption
	Million gallons daily	Gallons per capita	Million gallons daily	Gallons per capita	
13	1.973	53.3	1.647	44.9	83
14	2.025	54.9	1.664	45.4	82
15	2.089	56.5	1.710	46.7	82
16	2.016	54.4	1.612	44.1	80
17	2.413	64.9	1.878	51.3	78
18	1.887	50.6	1.542	42.2	82
19	1.695	46.4	1.395	38.1	82
20	2.092	56.4	1.780	48.6	85
Average	2.024	54.7	1.653	45.2	82

Table 11 contains the per capita water consumption, the per capita sewage flow, the ratio of sewage flow to water consumption, the pipe material used in the water distribution system, and certain remarks bearing on the same. These data were mostly secured by the buildings and grounds section of the Department of Military Aeronautics, covering short periods of time, and they have been supplemented in this table by figures collected by the sanitary engineering section of the Surgeon General's Office.

TABLE 11.—*The per capita water consumption and sewage flow in gallons and the ratio between sewage flow and water consumption at certain aviation fields*¹²

Aviation field	Per capita water	Per capita sewage	Per cent sewage flow to water consumption	Type of water pipe	Remarks
Barron.....	98	99	101	Cast iron.....	Taken during low population.
Brooks.....	245	274	112	Wood stave.....	
Call.....	66.5	66.5	100	Cast iron.....	High rate of filtration into sewage lines.
Carlstrom.....	74	65.5	88	.....do.....
Chanute.....	112.9	98.2	87	.....do.....
Dorr.....	65.5	64.0	97	.....do.....
Eberts.....	142	156.0	110	Wood stave.....	
Ellington.....	125	114	91	Wood and cast iron.....	
Gerstner.....	112	144	128	Wood replaced with cast iron.....	
Kelly No. 1.....	171	215	125	Wood stave.....	
Kelly No. 2.....	90	104	115	.....do.....
Love.....	125	124	99	Cast iron.....	
March.....	107.7	74.3	69	Wood.....	
Mitchell.....	42	70	166	Cast iron.....	
Park.....	91	82	90	.....do.....
Payne.....	86	69.8	81	.....do.....
Post.....	66	63	95	.....do.....
Rich.....	136	115	85	.....do.....
Scott.....	194	66.6	34	.....do.....
Selfridge.....	100	61	61	Cast iron and wrought iron.....	
Souther.....	152	142	93	Cast iron.....	
Taliaferro.....	188	186	99	.....do.....
Wilbur Wright.....	83	81	97	.....do.....

These tables are representative of a considerable quantity of data collected in many camps under various conditions by officers of the section of sanitary engineering of the Surgeon General's Office, and the results are typical of camp experience generally.

THE QUALITY OF CAMP SEWAGE

Camp sewage differed materially from municipal sewage in that it was much more concentrated, as a result of the relatively low water consumption, and contained large quantities of uncomminuted material and practically no trade wastes. The Army was made up of an adult male population which consumed a heavy diet of high protein content and furnished a greater amount of excrement per capita than is found in normal municipal sewage containing the wastes from persons of both sexes and all ages. This influenced the character of the sewage considerably. There was found also a much larger proportion of grease (ether-soluble matter), of small particles of garbage, and of other kitchen wastes, than usually is found in domestic sewage.

Tables 12, 13, and 14, contain a summary of a part of the data on chemical characteristics of the untreated sewage, collected during the previously mentioned investigation of the sewage disposal plant at Camp Meade, Md., May 12-21, 1918.

TABLE 12.—*Constituents of untreated sewage, Camp Meade, Md., average of analyses over period of one week, May 12-21, 1918*¹⁴

[Results in parts per million]

Sample	Flow, cubic-foot seconds	Solids			Nitrogen						Oxygen consumed			Chlorine	Alkalinity	Ether soluble	
		Dis-solved	Sus-pend-ed	Total	Free am-mo-nia	Ni-trites	Organic			Dis-solved	Sus-pend-ed	Total	With-out acid			With acid	
							Dis-solved	Sus-pend-ed	Total								
Day.....	3.17	520	367	827	49	0	13	18	31	84	67	151	69	230	147	173	
Night.....	0.97	218	54	272	34	.022	6	7	13	30	12	42	38	156	.....	20
Composite..	2.55	483	276	759	47	.003	12	17	29	78	60	138	66	220	.....	154

TABLE 13.—*Relation between sewage flow, total suspended matter and ether-soluble matter, Camp Meade, Md., May 16, 1918*¹⁴

Time, May 16, 1918	Average two-hour flow, cubic-foot seconds	Total suspended matter, parts per million	Ether soluble with acid, parts per million	Percentage, ether-soluble matter to total suspended matter
7 a. m. to 9 a. m.....	4.26	756	184	24.3
9 a. m. to 11 a. m.....	3.11	.....	312	.....
11 a. m. to 1 p. m.....	2.59	812	296	36.4
1 p. m. to 3 p. m.....	3.16	964	300	31.0
3 p. m. to 5 p. m.....	2.50	410	256	62.4
5 p. m. to 7 p. m.....	3.10	436	212	48.6
7 p. m. to 9 p. m.....	3.63	388	228	58.8
9 p. m. to 11 p. m.....	3.84	328	128	39.0
11 p. m. to 1 a. m.....	1.45	64	52	81.2
1 a. m. to 3 a. m.....	.73	44	16	36.3
3 a. m. to 5 a. m.....	.58	18	12	66.6
5 a. m. to 7 a. m.....	.95	68	32	47.0

TABLE 14.—*Quantity of ether-soluble matter of sewage in "after meal" periods, Camp Meade, Md., May 12-21, 1918*

Date	Parts per million			Date	Parts per million		
	7 a. m. to 9 a. m.	1 p. m. to 3 p. m.	6 p. m. to 8 p. m.		7 a. m. to 9 a. m.	1 p. m. to 3 p. m.	6 p. m. to 8 p. m.
May 13.....	60	264	84	May 17.....	128	284	120
May 14.....	172	432	88	May 18.....	84	144	236
May 15.....	96	344	108	May 19.....	140	156	104
May 16.....	184	300	144	May 20.....	520	208	76

The sewage from aviation fields was usually somewhat weaker than that from the large cantonments, due principally to the dilution afforded by the greater per capita sewage flow, but in many instances data were collected which demonstrated that the organic constituents in aviation field sewages were much higher than in normal municipal sewage and were practically as high as in those from the larger camps. Table 15 contains the analyses of composite samples of normal sewage from two aviation fields, one large and one small, and with them, for comparison, the analysis of the composite sample from a very large station (Camp Meade), as already shown in Table 12.

TABLE 15.—Analyses of composite samples of sewage collected at two aviation fields and one from a large camp

	Results in parts per million		
	1.25 million gallons daily, Kelly Field, No. 1	0.155 million gallons daily, Kelly Field, No. 2	1.653 million gallons daily, Camp Meade
Solids, total.....	649	636	759
Suspended.....	269	178	276
Dissolved.....	380	458	483
Nitrogen as free ammonia.....	10	13	47
Nitrites.....	.02		.000
Nitrates.....	.2	.5	0
Organic nitrogen.....	25.7		29
Oxygen consumed.....	83	92	138
Ether-soluble matter:			
With acid.....	22.5	20	154
Without acid.....	22.8	15.4	
Biochemical oxygen consumed.....	186	143	381

To illustrate the statement that aviation camp sewage frequently was encountered which was very strong, two analyses from Carlstrom Field, made in June, 1918, are given in Table 16.

TABLE 16.—Analyses of two samples of sewage, Carlstrom Field, June, 1918¹⁶

	Parts per million			Parts per million	
	Raw sewage	Raw sewage		Raw sewage	Raw sewage
Solids, total.....	2,598	895	Oxygen consumed.....	190	986
Suspended.....	1,469	155	Ether-soluble matter:		
Dissolved.....	1,129	740	With acid.....	599	156.4
Nitrogen as free ammonia.....	29.1	23.8	Without acid.....	378	125.6
Organic nitrogen.....		14.6			

SEWAGE DISPOSAL—GENERAL CONSIDERATIONS

About the middle of June, 1917, general specifications and plans for sewage disposal were provided for constructing quartermasters, as follows:¹⁷

1. Where practicable, sewage will be discharged directly into adjoining streams without treatment.

2. Where sewage treatment is required, single-story septic tanks will be used, designed on the basis of a gross capacity of about 10 gallons per capita, the entire capacity below the flow line being considered to be the gross capacity.

3. The arrangement of the tanks will conform in general to the typical plans, but grit chambers will not be provided except in special cases. These plans show both wood and concrete tanks, and the decision will be made at each cantonment as to whether one or the other will be used, preference being given, other things being equal, to the material that will enable the tanks to be completed in ample time for the service requirements.

4. No provision will be made for sludge beds, on account of lack of funds, and also because of lack of immediate need for these beds, which, however, will be required later. The disposal of the sludge may be best accomplished in the interval by machine trenching; or hand trenching if necessary.

5. At Ayer, Mass., and Wrightstown, N. J., sand filtration appears to be necessary, and the decision will be made by the construction quartermaster as to whether or not tankage shall precede sand filtration.

6. Where cantonments are not near large streams, as referred to in paragraph 1, and excepting the locations specified in paragraph 5, trickling filters will form part of the complete installation, although not to be constructed immediately. These filters will have beds 6 feet in depth, designed on a basis of 30,000 persons per acre. In general, the plans for trickling filters will conform to the typical plans; the details however, must be decided by the construction quartermaster, to suit local conditions.

7. Septic tanks shall not be less than 300 feet from the nearest barrack or occupied buildings, and at a greater distance, if practicable.

8. The elevation of the septic tank, with reference to the available outlet for the effluent from the sewage-disposal works, should be such that the vertical distance between the flow line in the tank and the outlet of the trickling filter effluent drain is about 15 feet. In places where the effluent discharges into streams which ordinarily contain clear water, or only very little water, it will be necessary to provide in addition small settling tanks to clarify the effluent from the trickling filters, and these will require about 1 foot of additional head. Such tanks should be designed to have a capacity of 3 gallons per capita. Sludge from these tanks will be disposed of on sludge beds later to be provided, or in the trenches.

9. Except where sand filters are used, automatic chlorinating apparatus is to be provided at all sewage treatment plants as a part of the original installation, and such apparatus is to be used whenever required. On account of cost, and for other reasons, treatment by ultraviolet rays is not to be considered.

The following is an extract from the report of the chief of the construction division for 1918:¹⁸

Discussion at Washington last year led promptly to the selection of a single-story tank from 10 to 12 feet deep, as compared with the more customary two-story tank of much greater depth. It was recognized at once that, at sites of unknown conditions as to soil, there would be much greater likelihood of having built by September a shallow as compared with a deep tank, particularly if the excavations were to be in wet running sand or in rock. It was reasoned that a single-story tank actually built would be infinitely superior to a two-story tank unavailable until the following spring. Furthermore, it was recognized by those at Washington that camp sewage would contain much more coarse incomminuted suspended matter, such as toilet paper, particles of feces, and debris from the kitchens, than is the case with ordinary city sewage after having had an opportunity to become comminuted by flowing for some miles in a relatively long system of sewers. Grease is also a very large factor in the composition of fresh camp sewage.

Hence a settling tank at these cantonments would face "flotation" rather than "sedimentation" conditions, to a large extent, when account is taken of what practice reveals as to the influence of grease and the buoyancy of relatively coarse suspended particles commingled with entrained gas. That is to say, with the deep two-story tank, as with the shallow single story, there is a strong likelihood that most of the solid matter, at times at least, would be in the upper rather than in the lower portion of the tank.

With either type of tank, moderate success is to be expected with adequate and skillful operation, but in neither case, without such operation, is failure surely to be avoided. Efficient operation means adequate labor, and facilities for sludge removal, which can not be put off indefinitely either in tanks as built or in tanks several times as large. * * *

The sewage from only 2 of the 16 National Army cantonments was disposed of through the sewer systems of near-by municipalities (Camp Taylor, near Louisville, Ky., and Camp Travis, near San Antonio, Tex.), while 4 of the 16 National Guard camps (Camp Bowie, Fort Worth, Tex.; Camp Hancock, Augusta, Ga.; Camp Logan, Houston, Tex.; and Camp MacArthur, Waco, Tex.) were cared for in this manner.¹⁹ The sewage of the large miscellaneous stations developed during the war was disposed of independently of municipalities. In aviation fields disposal by dilution without previous treatment was carried on at but two places, and the discharge in each of these instances was

into the ocean. At two of these fields it was found practical to utilize the sewer system of a near-by municipality. In all other cases treatment was necessary.¹⁹ Tables 17 and 18 show the methods utilized at the principal military stations. More complete data concerning sewage disposal in all Army establishments are on file in the office of the Surgeon General.

TABLE 17.—*Methods of sewage disposal^a at the 16 National Army cantonments¹⁹*

Camp	Sewage treatment	Disposal of effluent
Custer.....	2 original outlets (1917) provided with septic tanks; third (1918) emptied to river direct.	Kalamazoo River; large stream not used for water supply. Cities of Battle Creek and Grand Rapids emptied untreated sewage into river near camp.
Devens.....	3 separate plants consisting of coarse screens and intermittent sand filters; filters for main camp underdrained.	Nashua River; relatively large stream.
Dix.....	Septic tanks, trickling filters and chlorination.	South River; a small stream with drainage area only 1.5 square miles above sewer outlet.
Dodge.....	No treatment.....	Des Moines River; large stream.
Funston.....	.....do.....	Kansas River; large stream.
Gordon.....	Septic tanks and trickling filters.....	Little Peachtree Creek; small creek. Drainage area about 25 square miles above sewer outlet.
Grant.....	No treatment.....	Rock and Kishwaukee Rivers; large streams.
Jackson.....	Septic tanks, chlorination.....	Wild Cat Creek; small creek. Drainage area 2 square miles above sewer outlet. Emptied to Congaree River 8 miles below camp.
Lee.....	.....do.....	Baily Creek; small creek. Drainage area 3 square miles above sewer outlet.
Lewis.....	No treatment.....	Puget Sound.
Meade.....	Septic tank and chlorination.....	Patuxent River. Dilution satisfactory. Drainage area 142 square miles above sewer outlet.
Pike.....	Septic tank and trickling filters.....	Five Mile Creek; small stream. Drainage area 2 square miles above sewer outlet.
Sherman.....	.....do.....	Scioto River; large river. Drainage area 3,847 square miles above sewer outlet. Dilution satisfactory.
Taylor.....	No treatment.....	Ohio River via Louisville City sewers; large river.
Travis.....	.....do.....	Mitchel Lake via San Antonio sewers. Sewage used for irrigation.
Upton.....	Septic tanks and sand filters.....	No effluent.

^a Sewers for these camps were ready on arrival or very soon after the arrival, of troops in fall of 1917.

TABLE 18.—*Methods of sewage disposal^a at the 16 original National Guard camps¹⁹*

Camp	Sewage treatment	Disposal of effluent
Beauregard.....	Septic tank.....	Flaggon Bayou; small stream. Minimum flow estimated to be 1,000,000 gallons daily.
Bowie.....	No treatment.....	Trinity River via Fort Worth sewers; large stream, but with small minimum flow.
Cody.....	Septic tank.....	Mimbres River; stream dry most of the time.
Doniphan.....	No sewers provided.....	San Francisco Bay.
Fremont.....	No treatment.....	Berry Hill Branch, Stewarts Creek; small streams. Drainage area 3.8 miles above outlet.
Greene.....	Septic tank.....	Savannah River via Augusta sewers; large stream.
Hancock.....	No treatment.....	Dry bed of Rose Canon.
Kearny.....	Septic tank.....	Discharged to Black Bayou via Houston sewers, after treatment by "activated sludge."
Logan.....	No treatment.....	Brazos River via Waco sewers; large stream.
MacArthur.....	.....do.....	Little Mountain and Brush Creeks; small streams. Drainage area 2 square miles each, above outlets.
Mills ^b	No sewers while used as a National Guard camp.	Wedy Creek (3 miles) to Leaf River; large river.
Sevier.....	Septic tanks and chlorination.....	Connelly Creek; thence to Alabama River; large river.
Shelby.....	No treatment.....	Fair Forest Creek; small stream. Drainage area 11 square miles above sewer outlet.
Sheridan.....	.....do.....	Swift Creek, thence to Ocmulgee River; large river.
Wadsworth.....	Septic tank.....	
Wheeler.....	No treatment.....	

^a Sewers constructed for 14 of these camps during 1918.

^b Ceased to be National Guard camp late in 1917. The site subsequently became a cantonment. See Camp Mills, Table 19.

TABLE 19.—Methods of sewage disposal at miscellaneous Army stations which were developed during the war ¹⁹

Station	Sewage treatment	Disposal of effluent
Aberdeen Proving Ground.	Septic tank	Canal Creek (tidal stream).
Camps:		
Alexander	Septic tank and chlorination	James River; large stream.
Bragg	No treatment	Lower Little River; dilution adequate.
Charleston Port Terminal.	do	Cooper River (tidal stream).
Camps:		
Colt	Chlorination	Gettysburg Creek.
Curtis Bay Ordnance Depot.	No treatment Septic tank	Sewage discharged to an abandoned mine. Curtis Creek (tidal stream).
Edgewood Arsenal.	Septic tanks	Gunpowder River (tidal stream).
Camps:		
Eustis	Septic tank and chlorination	James River; large stream.
Forrest	Septic tank	Chickamauga Creek; small stream.
Greenleaf	Septic tank, trickling filters	Black branch 6 miles, thence to Chickamauga Creek; small streams.
Hill	Septic tank and chlorination	James River; large stream.
Holabird	Septic tank	Colgate Creek (tidal stream).
Humphreys	No treatment	Potomac River; large river.
Johnston	do	St. Johns River; large tidal stream.
Kendrick	Septic tank	Ridgeway branch, thence to Toms River.
Knox	No treatment	Mill Creek; small stream.
Merritt	Septic tank and chlorination	Hackensack River (tidal stream).
Mills	Septic tank and sand filtration	Filters not underdrained.
Morrison	Septic tank and chlorination	James River; large stream.
Norfolk Supply Base.	No treatment	Elizabeth River (tidal stream).
Raritan Arsenal.	do	Raritan River; large stream.
Camps:		
Stanley	Septic tank and trickling filters	Dry ravine.
Stuart	Septic tank and chlorination	Hampton Roads.

TABLE 20.—Methods of sewage disposal at aviation stations ¹⁹

Field	Sewage treatment	Disposal of effluent
Barron	Detritus chamber; 2 Imhoff tanks; sludge drying beds; intermittent sand filters; chlorination.	Small watercourse; sufficient dilution.
Bolling	Connected with District of Columbia sewer system.	Potomac River; large dilution.
Brooks	1 Imhoff tank with sand sludge drying bed; sprinkling filter; chlorination.	Small stream; sufficient dilution.
Call	2 Imhoff tanks with sludge beds; 11 intermittent sand filters; chlorination.	Small stream; minimum discharge 0.03 cubic foot per second; satisfactory dilution.
Carlstrom	Pumped to Imhoff tank equipped with sand sludge drying beds, followed by sand filters and chlorination.	Open drainage ditch leading to Prairie Creek, a wet-weather stream.
Carruthers	2 Imhoff tanks with sludge beds; 8 intermittent sand filters; chlorination.	Open drainage ditch leading to Clear Fork of Trinity River; dilution satisfactory.
Chapman	No treatment	Discharged into Biscayne Bay; disposal satisfactory.
Chanute	5 septic tanks; sludge pumped to sludge drying beds; chlorination.	Open ditch leading along public highway to storm sewer discharging into Vermillion River; dilution satisfactory.
Dorr	Pumped to 2 Imhoff tanks; sludge hauled away.	Effluent into drainage ditch; dilution sufficient.
Eberts	Bar screens; grit chamber; pumped to 2 septic tanks; chlorination.	Dilution variable; sometimes no dilution.
Ellington	Pumped to Imhoff tank; sludge drying beds; sprinkling filters; chlorination.	Ditch leading to Horse Pen Bayou; dilution satisfactory.
Gerstner	Bar screen; pumped to Imhoff tank; sprinkling filter; chlorination.	Canal leading to Black Bayou, which discharges into Gulf of Mexico; dilution sufficient.
Hazelhurst	4 septic tanks; 12 absorption pits; 6 intermittent sand filters; sludge drying beds.	No discharge into stream; sewage absorbed by sandy soil.
Kelly No. 1	Grit chamber; 2 Imhoff tanks, 2 sprinkling filters; chlorination.	Leon Creek; dilution satisfactory.
Kelly No. 2	2 Imhoff tanks; sludge drying beds; 2 sprinkling filters; chlorination.	Do.
Langley	2 septic tanks	Discharge into Back River; dilution sufficient; danger of oyster contamination.
Love	Bar screens; 2 Imhoff tanks; sludge drying bed; Imhoff effluent pumped to sprinkling filters; intermittent sand filters as emergency unit; chlorination.	Knights Branch of the Trinity River; dilution satisfactory.
March	Pumped to equalizing chamber; by gravity to Imhoff tank; sludge beds; irrigation ditches.	Irrigation ditches.

TABLE 20.—*Methods of sewage disposal at aviation stations—Continued*

Field	Sewage treatment	Disposal of effluent
Mather.....	Pumped into 2 Imhoff tanks; sludge drying bed; 9 sand filters.	Evaporation and percolation in shallow ditches.
McCook.....	Pumped to city sewer.....	Discharged into Ohio River.
Mitchell.....	4 septic tanks; 2 sludge drying beds; 6 sand filters; 12 absorption pits.	Plant effluent absorbed by sandy soil.
Park.....	Septic tank; sludge drying bed; tank effluent and sludge are pumped by Shone ejectors.	Effluent into Big Creek, to Hatchie River, to Mississippi River; dilution satisfactory.
Payne.....	2 Imhoff tanks; 1 sludge bed; primary contact filter of 4 units; secondary contact filter of 4 units; chlorination.	In open ditch 3,000 feet to McGee Creek; dilution satisfactory.
Post.....	Screens; 3 two-compartment septic tanks; sludge drying bed; 3 two-compartment contact filters; chlorination.	Open ditch to Cache Creek; dilution satisfactory.
Rich.....	Camp sewage system connected with city of Waco sewers.	Discharged into Brazos River; dilution satisfactory.
Rockwell.....	No treatment.....	Discharged into Pacific Ocean.
Scott.....	2 Imhoff tanks; 2 aeration tanks; 1 sedimentation tank; sludge drying bed.	Ditch leading 3 miles to Silver Creek; dilution satisfactory.
Selfridge.....	Pumped to septic tank; sludge drying beds; contact beds; drainage pumps to lake; chlorination.	Lake St. Clair; sufficient dilution.
Souther.....	2 Imhoff tanks; sludge drying beds; 4 contact filters; chlorination.	Open trench leading through cultivated fields to Sweet-water Creek; dilution sufficient.
Taliaferro.....	2 Imhoff tanks; sludge drying bed; 7 intermittent sand filters; chlorination.	Small stream leading to West Fork of Trinity River; dilution satisfactory.
Taylor.....	2 septic tanks; sludge drying beds; contact filter; chlorination.	2,300-foot ditch conveyed sewage to wet-weather stream leading to the Alabama River; sufficient dilution.
Wilbur Wright.....	2 septic tanks; 2 sludge beds; 2 intermittent sand filters.	Open-drainage ditch leading to Mad River; no nuisance.
BALLOON SCHOOLS		
Arcadia, Calif.....	Screen chamber; 2 septic tanks of Doten pattern; sludge drying beds.	Effluent discharged into the bed of the San Gabriel River, which carries water only in wet weather; disposal unsatisfactory.
Lee Hall.....	Detritus chamber; septic tank; sludge beds; chlorination.	James River; dilution satisfactory.
Camp John Wise.....	2 treatment plants, each consisting of 1 Imhoff tank; sludge drying bed; 1 sprinkling filter; chlorination.	From each plant through an open ditch to Olmus Creek, leading to the San Antonio road 1 mile above Brackenridge Park swimming pool; disposal satisfactory.

TABLE 21.—*Methods of sewage disposal at certain general hospitals*^{19 a}

Hospital	Sewage treatment	Disposal of effluent
Fort Bayard.....	Septic tank and filter beds; inefficient plant.	Cameron Creek; small stream; part used for irrigation.
No. 3, Colonia, N. J.	Septic tank, trickling filter, and chlorination.	Small branch of Rahway River.
No. 8, Otisville, N. Y.	.....do.....	Shawangunk Kill; small stream.
No. 18, Waynesville, N. C.	Septic tank and chlorination.....	Richland Creek; small stream.
No. 25, Fort Benjamin Harrison, Ind.	Septic tank and contact beds.....	Fall Creek; small stream.
No. 26, Fort Des Moines, Iowa.	.....do.....	North River; small creek.

^a Only those are shown where sewage disposal plants were constructed by the War Department.

SEWAGE TREATMENT

All except one of the sewage treatment plants designed for large stations by the cantonment construction division and its successor, the construction division, consisted of septic tanks, the effluent receiving secondary treatment by chlorination or filtration where such additional purification was deemed essential, and funds for the necessary installation were provided. The one exception noted was at Camp Devens, Mass., where there are coarse screens and sand filters.¹⁹

Screens, detritus tanks, and sludge-drying beds were not originally provided except in a few instances, but following a study of the character of camp sewage and of the operation of a typical sewage disposal plant at Fort Myer, Va., which was carried out by officers of the sanitary engineering section of the Surgeon General's Office, these forms of preliminary treatment were found to be essential for the successful operation of the type of settling tank which had been adopted,²⁰ and in 1918 funds were authorized for the construction of a combined screen, detritus tank, and grease trap at many of the plants.²¹

A special type of septic tank, commonly known as the "construction division tank," was adopted for use at all stations where disposal plants were installed under the jurisdiction of the construction division.²² The design of the original unit of this type, which was built for Fort Myer, Va., is described in an article in the *Engineering News-Record* as "somewhat similar to that of several tanks which had previously been designed by the writer for military post purposes * * *."²³ The construction at Fort Myer was completed May 14, 1917, about the time the committee on preliminary planning, sanitation, and engineering relative to cantonment construction was deliberating in Washington.

The tank is a horizontal flow, multiple compartment type. Each compartment has a pyramidal bottom and is provided with a sludge withdrawal pipe. Compartments are separated by cross walls which extend upward to within 1 or 2 feet of the surface of the liquid in the tank, and a baffle hangs 1.25 feet in front of the cross wall in each compartment. The baffles extend progressively deeper into the liquid at each succeeding compartment, from a minimum depth of 3 feet 9 inches in the first compartment, to within a few inches of the bottom of the "settling" compartment (which is the top of the pyramidal sludge hopper), in the last compartment. Thus, each compartment virtually becomes a separate small tank and is so arranged that the liquid must pass downward the depth of the baffle in order to flow out into the next compartment.²³

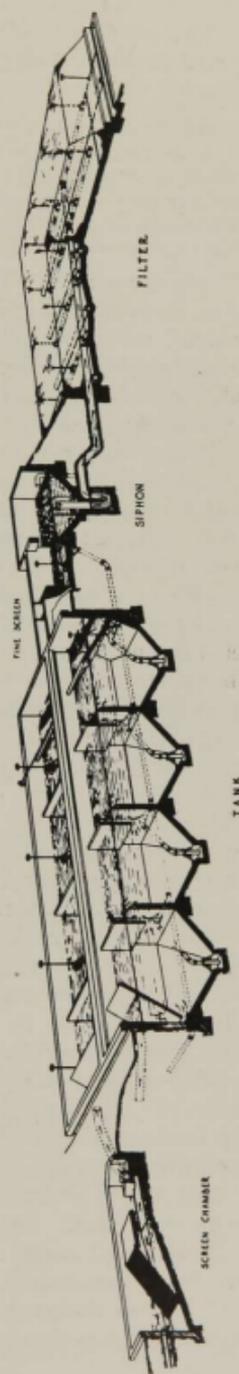


Fig. 39.—Longitudinal isometric view of typical Construction Division type of sewage-treatment plant

The action of this tank was described by the designer, in the article referred to above, and termed by him as one of "division and transfer," as follows:

Scum forms in a heavy mass in the first compartment, also of considerable depth in the second, and very lightly in the third. The partially disintegrated matter in the first compartment is carried into the second compartment by the velocity resulting from the limited space between the scum and the sludge, and in the second compartment is again split up into a more finely divided condition. The finer particles are carried into the third compartment, where further division and sedimentation take place.

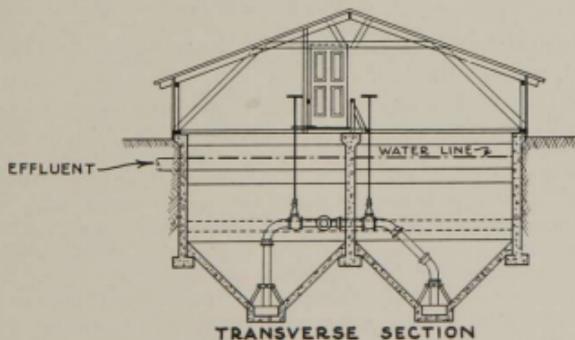
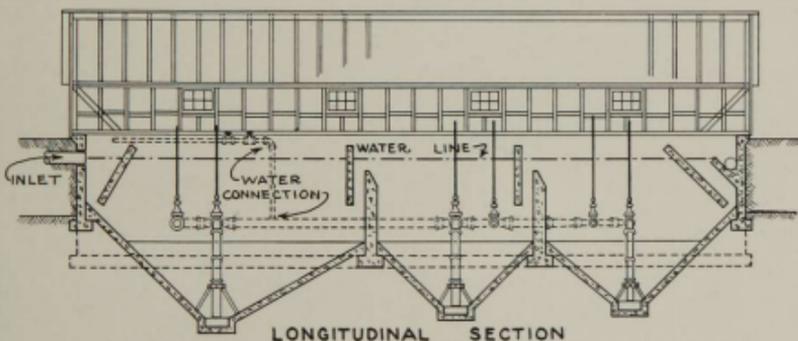
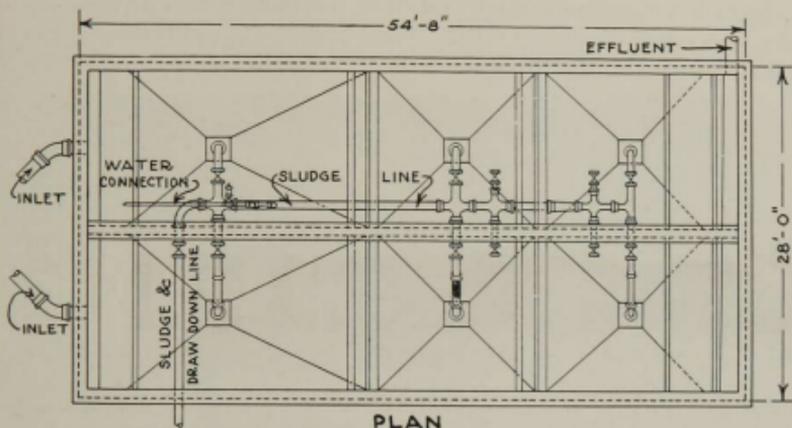
The capacity of the tanks as first designed was based on 10 gallons per capita contributing sewage, which theoretically would provide a "flowing through" period (with the tank clean and a sewage flow averaging 42 gallons per capita daily) of about five and three-fourths hours, with a minimum at peak loads of less than two hours.²⁴ On account of the strength and character of the sewage, and the design of the tank which caused it to act as a grease trap, there was a rapid accumulation of scum and sludge, particularly in the first compartment, greatly diminishing the capacity of the tank and consequently reducing the already too short "flowing through" or sedimentation period. The alarmingly rapid formation of both scum and sludge, neither of which appeared to be easily digestible, necessitated their frequent removal from the tank while still in an offensive undigested state.

Reports of unsatisfactory conditions at the Fort Myer plant, which had then been operating about four months, resulted in a preliminary investigation by officers from the Surgeon General's Office during the period from September 20 to October 4, 1917.²⁵ Certain recommendations relative to the enlargement of the tank and the addition of coarse screening equipment were made. In the spring of 1918 complaints were received from Camps Dix, Meade, Gordon, Pike, and Greenleaf, where larger tanks of the same design had been completed.²⁶ A second and more complete investigation of the typical plant at Fort Myer was made, followed by a study of the tank at Camp Meade during April and May, 1918, both investigations being carried out by officers of the sanitary engineering section of the Surgeon General's Office.²⁷ These studies resulted in three recommendations: (1) That the design of new tanks be based on double the original capacity; i. e., 20 in place of 10 gallons per capita. (2) That improved arrangements for the preliminary grease removal, screens, and detritus tanks be provided. (3) That competent operation of plants under trained supervision be arranged for.

Experiments on grease traps were being carried out in the meantime by officers of the Medical Department and of the construction division, and soon funds were authorized for a large and improved type of kitchen trap in practically all camps.²⁸ Funds also were made available for the enlargement of most of the sewage treatment plants which had been constructed during the previous year. Early in 1918 sewer systems were initiated for 14 of the National Guard camps and for many of the miscellaneous stations which then were being established. All the new disposal plants connected with these systems were designed on a much more generous allowance of volume per capita than were those constructed in 1917.²⁹

MODIFIED "CONSTRUCTION DIVISION" TYPE OF SEPTIC TANK

NOTE SHALLOW BAFFLES AND LARGE FIRST COMPARTMENT



The organization in August, 1918, of the maintenance and repair branch of the construction division, which took over the operation of sewage treatment plants,³⁰ was followed by an investigation of the settling tank at Camp Custer, Mich., including experiments on the methods of operation necessary for securing the best results.³¹ This investigation was conducted by officers from the maintenance and repair branch of the construction division, assisted by officers from the Sanitary Corps. Table 22 contains a summary of the data collected during this investigation.

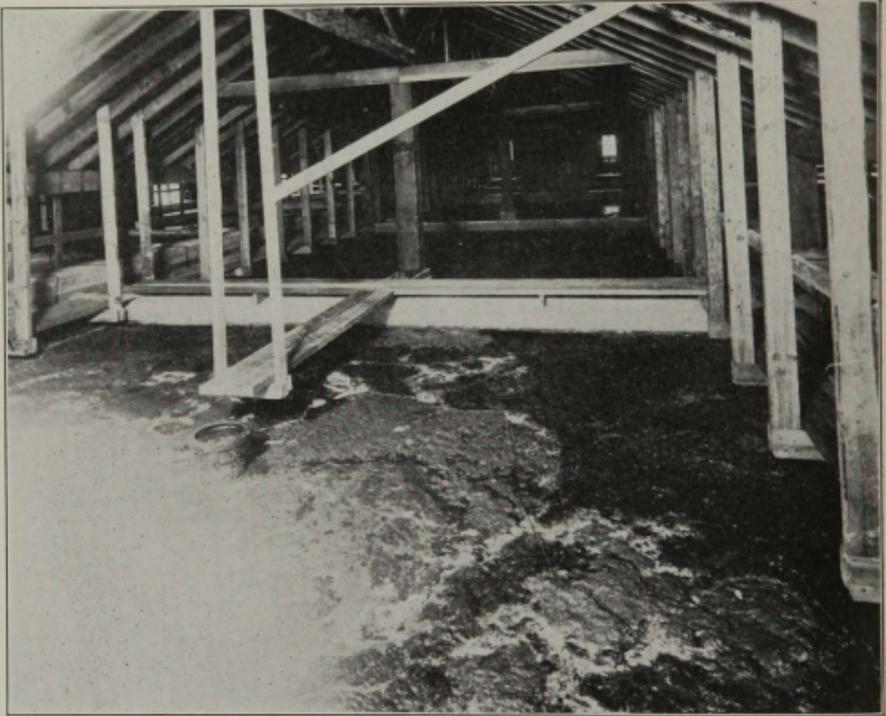


FIG. 41.—First compartment of typical Construction Division septic tank, showing scum formation, Camp Meade, Md.

The conclusions of the officer who conducted the work for the Construction Division are quoted, as follows:³¹

Satisfactory clarification may be obtained from this type of tank by proper operation, and the greatest usefulness of the tank is realized when it is operated to secure maximum clarification, making the digestion of the sludge an incidental proposition * * *. The scum is made up of fecal particles, paper, grease, and other light or gas-charged material. The accumulation in the first compartment is rapid. A marked accumulation in the first compartment results in an increased velocity and the scum-forming material is carried to the second compartment, and scum formation then proceeds more rapidly there. In time and in this manner there is an excessive accumulation throughout the tank. If the accumulation is regularly removed from the first compartment as soon as it reaches a depth of 5 feet or less, the accumulation of scum in the other compartments will not reach objectionable proportions. * * * The scum and sludge which are removed from the inlet compartment are apt to be quite offensive, and this material can be best disposed of by discharging it into a trench and back filling as soon as possible.

TABLE 22.—Summary of data collected at investigation of septic tank, Camp Custer, Mich.³¹

	Test No.*					
	A	B	C	D	E	F
Rate of flow, in gallons:						
8 a. m.-5 p. m.		803, 000	679, 000	1, 505, 000	274, 700	635, 000
Entire 24 hours	1, 056, 000	602, 000	509, 000	1, 129, 000	206, 000	476, 000
Population tributary, 42 gallons per capita daily	25, 140	14, 330	12, 125	26, 880	4, 900	11, 333
Total tank capacity:						
Gallons	165, 000	165, 000	165, 000	165, 000	165, 000	165, 000
Gallons per capita	6.4	11.7	13.6	6.1	33.7	14.6
Suspended matter, parts per million, total:						
Raw		555	534	597	617	
Tank effluent		284	152	333	204	
Per cent removal		49	71.6	44	67	
Settleable:						
Raw		309	292	283	332	
Tank effluent		69	3	64	0	
Per cent removal		78	99	77	100	
Dissolved oxygen consumed, parts per million:						
Raw		441	468	502	524	451
Tank effluent		357	306	417	342	341
Per cent reduction		19	35	17	35	24
Analysis of suspended matter in raw sewage:						
Per cent settleable		55.7	54.7	47.4	53.8	
Per cent volatile		78	80	77	82	
Per cent fixed		22	20	23	18	

* Series A results were secured on a tank that had large accumulations of scum and sludge; average values for 8-day run. Series B results were secured on the same tank; average results for 7-day run. Series C results were secured on a tank that was entirely free of scum and sludge when placed in service; average results for 9-day run. Series D results were secured on the tank that was used for the series C test without having scum and sludge removed; average results for 13-day run. Series E results were secured on the tank that was used for the C and D tests with a part of the scum and all of the sludge removed; average results for 21-day run. Series F results were secured on a tank after the scum and sludge were removed; average results for 18-day run.

COMBINED GREASE TRAP, SCREEN, AND DETRITUS CHAMBER

Because grease traps of standard patterns originally were installed on the house connection running to kitchens, they proved a continual source of trouble. The rapid velocities through the traps attained by the waste water during or following meal hours washed large quantities of the floating grease out into the sewer. This action was assisted materially by the high temperature of the trap liquor due to the use of much hot water in the kitchens.² As a result of experiments made by officers of the Sanitary Corps and of the construction division, a new type of grease trap, with a holding capacity of two-thirds of a gallon per capita, was adopted.³³ It has a steep-sided pyramidal bottom, a large surface area for the collection of grease, and a small diameter outlet pipe extending from near the bottom of the trap and so designed as to facilitate the scouring out of the sediment or sludge which collects there.

Several traps of this new type were tested carefully and it was found their efficiency under ordinary operating conditions ranged from 90 to 95 per cent. Grease was recovered from the waste kitchen water in amounts averaging 22 pounds per capita annually.⁴ During the fall and winter of 1918 funds were authorized for the construction of these traps in practically all camps, and their installation was largely completed in the spring of 1919.³³ The reduction in the grease content of the sewage had a decidedly beneficial effect on the operation of the sewage disposal plants, and incidentally a considerable revenue was obtained at some stations from the sale of the easily rendered grease which was recovered.

During the spring of 1918 the policy had been adopted of constructing a large combined grease trap, bar-screening equipment, and detritus chamber on the main sewer for the purpose of removing grease, paper, rags, detritus, and other slowly digesting material from the raw sewage with the hope of thus lightening the load on the sewage disposal plant.²¹ Prior to this, provisions had been made in only a few camps for detritus tanks and coarse screens. It appears that this plan did not prove as satisfactory as might be expected, in so far as grease removal was concerned, on account of the large quantity of fecal and other putrescible organic material which floated and mixed with the grease, thus making grease recovery impracticable.⁵ The bar screens

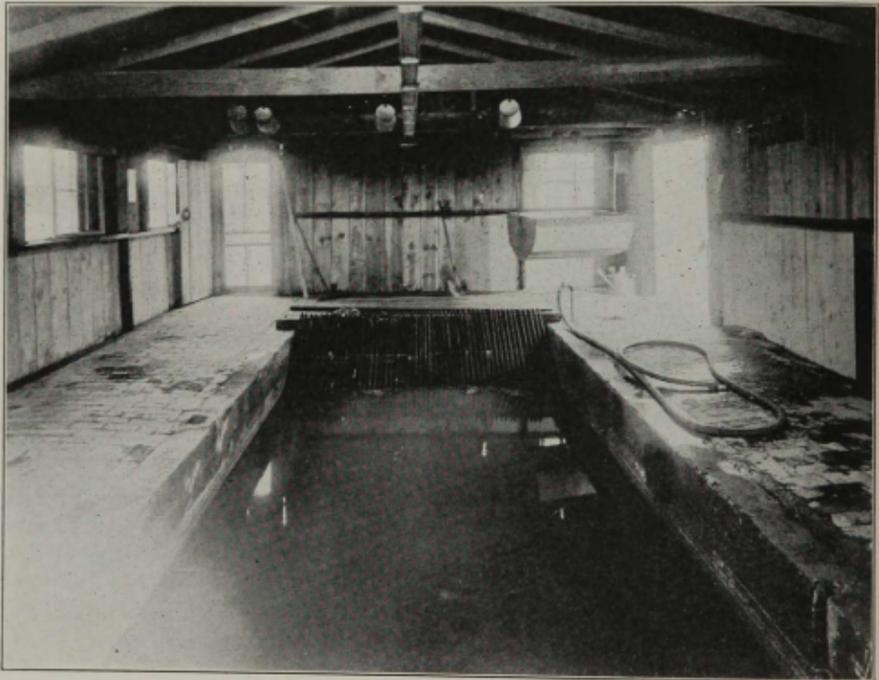


FIG. 42.—Grit and screen chamber, Camp Meade sewage-treatment plant

with clear space of 1 to 1½ inches were beneficial, however, and large quantities of paper, rags, and other débris were removed, ranging in amount from 6 to 10 cubic feet per million gallons of sewage. Detritus, consisting of sand and gravel mixed with heavy masses of putrescible organic matter, which was difficult to dispose of in the tanks, collected in the detritus chamber in average amounts of about 6 or 8 cubic feet per million gallons.

A description of the typical operation of a combined chamber of this type is contained in the following extract from the report of the camp sanitary engineer of Camp Meade, for September, 1918:³⁶

The series of grit and grease chambers at the sewage treatment plant was placed in operation on September 14.

The bar screens collected such large amounts of paper and fecal matter that it was desirable to make them coarser, and accordingly every second bar was removed, with the result that they are now much less rapidly clogged and do not cause such extreme difficulty and unpleasantness of operation. (Originally three-fourths inch clear space between bars.)

The grit chamber is of such design and capacity that, when both halves are in operation, the retention period is nominally about 266 seconds with the present general average flow of sewage, estimated at 80 per cent of the mean water consumption. The interior length of this chamber is 22.5 feet and the mean rate of forward travel, with the assumed mean sewage flow, is only 0.08 foot per second, or only about one-twelfth of what it should be. The velocity would, of course, be doubled and the conditions improved to that extent if one half of the grit chamber only was in service. Both halves are now in operation. The maximum hourly rate of flow of sewage would give a mean forward rate of travel of 0.15 foot per second



FIG. 43.—Sludge-drying beds, Camp Meade sewage-treatment plant

and the minimum only 0.015 foot per second when the entire chamber, both halves, are in service. The velocity at the upper end of the grit chamber, assuming no deposit therein, would be perhaps only 0.6 of the mean rate of flow through it. These low velocities have produced very unsatisfactory results. Sewage sludge, as well as sand, is deposited in the chamber. On September 30, this had attained a depth of, roughly, 5 feet at the upstream end leaving a water depth of from 20 to 24 inches. The sludge was decomposing rapidly and when disturbed released great quantities of gas. Grease balls were collecting in the upstream end behind the baffles. Some of these measured 7 to 8 inches in diameter. The usefulness of this chamber as a grit-removal device is therefore entirely offset and is negative rather than positive.

In the first grease chamber a scum of gas-lifted balls of fecal matter formed rapidly and produced a most obnoxious condition. A depth of from 6 to 8 inches of such material was

removed on September 19, and again on September 26. On September 30, the depth of this scum was 14 to 16 inches, requiring immediate removal. The dense fecal scum removed from this chamber must be buried in pits. The protection of these pits against fly breeding is bound to become a difficult matter.

In the second grease chamber, to date only a thin greasy scum containing more or less gas-lifted fecal matter has been formed.

It is evident that these chambers are not operating properly and should not be utilized. Better results would obtain without their use. The amount of sand reaching the sewers will be much reduced when the new manhole covers, now being installed, are completely in place. Thereafter the grit reaching the sewers will come mainly from the flushing of latrine floors to which sand is carried on shoes. A suitable grit chamber could be designed to remove the major part of this material.

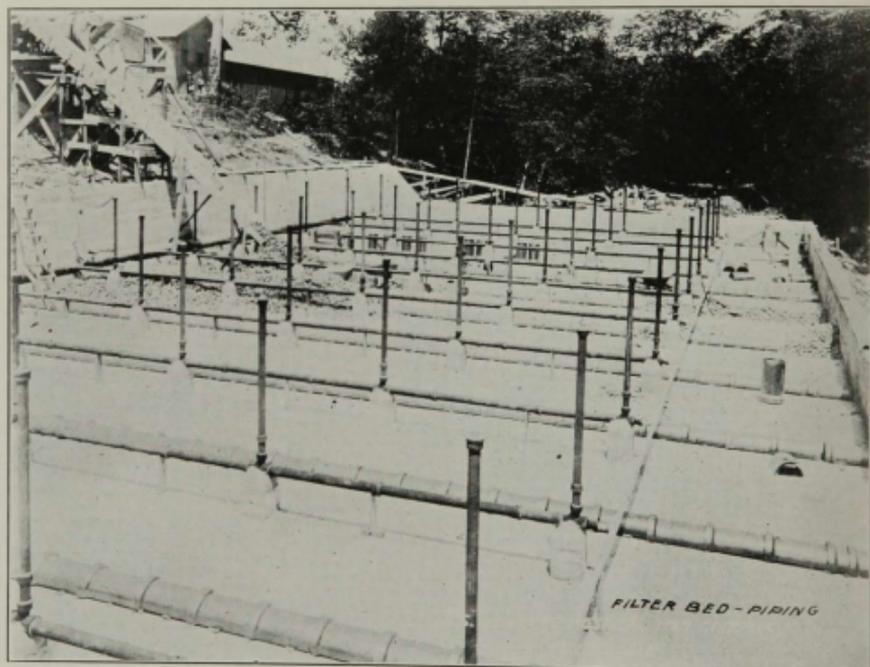


FIG. 44.—Trickling-filter piping before placing crushed rock

SLUDGE BEDS

In accordance with paragraph 4, "General Specifications for Sewerage and Sewage Disposal" sent to constructing quartermasters (quoted above, pp. 12 and 13), sludge beds were not generally provided with the original installation of sewage-disposal plants.³⁷ The accumulation of an unusually large volume of scum and sludge necessitated some method for its disposal, however, and in 1918 typical sludge beds, with an area usually of 0.5 square foot per capita, were provided at many plants.³⁷ The quantity of sludge to be handled was great, and it contained a large proportion of undigested material. Also it was of such a greasy nature that it did not dry readily, and consequently the method of burial in trenches was favored at many places.³⁷

TRICKLING FILTERS AND INTERMITTENT SAND FILTERS

A standard type of trickling filter with fixed nozzles was designed by the construction division and built at a number of the camps.³⁸ The size was based usually upon a capacity of 30,000 persons per acre. They had a standard depth of 5 feet, although beds 6 and 8 feet deep were used for some of the earlier small installations. The specifications called for a filtering material of hard, durable crushed rock or slag, to pass a screen with 2½-inch openings. No radical departure from standard practice was observed, other than the shallow depth of the filters and a short dosing cycle. The results obtained from these filters, when properly attended to and kept free from clogging by particles of greasy scum and other suspended matter, was quite satisfactory, a high degree of nitrification being obtained.³⁹ Resettling tanks were provided in only a few instances. The results of the operation of a typical filter of this type are presented in Table 23, which is a summary of chemical data obtained in the test of the plant at Fort Myer, Va., previously referred to.

TABLE 23.—A summary of analytical data obtained during investigation of Fort Myer sewage disposal plant, April 18–25, 1918⁴⁰—Typical "construction division" septic tank and sprinkling filters—Average values for one week

[Results in parts per million]

	Crude sewage	Tank effluent	Filter effluent	Total reduction
Total solids.....	1,169	739	707	.....
Per cent reduction.....		36.8	4.3	39.5
Dissolved solids.....	598	573	487	.....
Per cent reduction.....		4.2	15	18.5
Suspended solids.....	571	166	220	.....
Per cent reduction.....		71	32.5	61.5
Nitrogen as free ammonia.....	51	52	39	.....
Per cent reduction.....		-2.0	25	23.5
Total organic nitrogen.....	34	28	19	.....
Per cent reduction.....		17.7	32.2	44.1
Dissolved.....	15	15	9	.....
Per cent reduction.....		0.0	40	40
Oxygen consumed.....	140	97	63	.....
Per cent reduction.....		30.7	35	55
Dissolved.....	77	65	25	.....
Per cent reduction.....		15.6	61.6	67.5
Ether soluble:				
(a) Without acid.....	114	33	10	.....
Per cent reduction.....		71	69.7	91.2
(b) With acid.....	115	46	17	.....
Per cent reduction.....		60	63	85
Biochemical oxygen consumed.....	238	246	52	.....
Per cent reduction.....		-3.4	78.9	78.1

Intermittent sand filters were utilized for the treatment of the sewage from only three of the large stations, viz, Camps Devens, Mills, and Upton.³⁹ At Camp Devens the sewage passed coarse bar screens, and was pumped to 20 natural sand beds with an area of 1 acre each, formed by throwing up embankments and leveling off the area. No underdrains for the filters were provided and consequently no visible effluent was produced. The process was satisfactory except for the clogging of the filters in October, 1918, as a result of the excessive amounts of grease in the sewage.

About 22 acres of natural sand deposits were utilized at Camp Upton to treat the effluent from septic tanks. This area was divided into beds 0.87 acre in extent and 4½ feet deep, but the fineness of the sand (effective size 0.13 mm.) resulted in an unsatisfactory operation. Trickling filters were authorized for this camp in 1918 to replace the intermittent sand filters.

Fourteen acres of sand beds without underdraining were completed in January, 1919, at Camp Mills, to receive the effluent from the septic tanks. Their operation has been satisfactory. Due to the rapid demobilization of troops, they were never loaded to capacity. There were also some few filters of this type constructed for small installations, base hospitals, for example, which proved uniformly satisfactory.

CHLORINATION

Disinfection by chlorination of septic tank effluents was employed in a number of camps.¹⁹ Liquid chlorine dosing apparatus, both automatic and manual control, was used with varying degrees of success. An attempt was made to provide a dosage of from 6 to 10 parts per million, depending upon the degree of disinfection desired, but on account of the unreliability of the equipment, due in a large measure to the lack of attention afforded it, the disinfection secured was only intermittent at the best.

The indiscriminate use of disinfection for septic tank effluents, where the protection of water supplies or similar features is not involved, is a radical departure from standard practice. Apparently this method was employed by the Army in some cases as a substitute for other more expensive forms of secondary treatment. The partial disinfection employed did not sterilize the sewage, although when properly operated it destroyed the greater number of the bacteria. Disinfection does not reduce the quantity of organic matter in the sewage, but does serve to prevent its putrefaction in the immediate vicinity of the plant; the organic matter, however, later comes in contact with putrefractive organisms and when conditions are such that little or no dilution is furnished by the body of water which receives the effluent, a nuisance is apt to occur at some point farther down the stream.

SEWAGE TREATMENT AT AVIATION STATIONS

Since the sewage disposal plants at the aviation fields were designed by civilian engineers in the field, there resulted a wide variation in the methods of treatment employed. As a rule, screens and grit chambers were not provided for preliminary treatment, except some bar and wire basket screens preceding pumps, which removed only a trifling part of the suspended matter.¹⁹

In contrast with the policy of the construction division, as indicated by the adoption of a standard type of septic tank for all camps, the aviation fields were equipped either with Imhoff tanks or with some design of septic tank conforming closely with standard practice.¹⁹ At only one station (the Arcadia Balloon School) was a "construction division" type installed.²⁰ Of the 30 aviation fields which had some form of settling tank, 18 were equipped with Imhoff tanks, which usually proved highly efficient and gave little operating trouble. The tanks as a rule were inclosed with screens for the prevention of fly breeding, but were seldom housed in or otherwise covered. Sludge beds were constructed at many of the plants, but in some instances sludge was trenched or buried in other ways. The sludge obtained from the Imhoff tanks was apparently well digested, inoffensive, and capable of drying readily.¹⁹

A number of trickling filters were installed, all being of standard design, usually 6 or 8 feet in depth. Intermittent sand filters and contact beds of standard design were used to some extent and accomplished their purpose in a satisfactory manner. The importance of careful inspection during the construction of sewage-disposal plants both for aviation fields and for larger camps was emphasized by Army experience, as shown by the number of instances in which trickling filters had to be torn up and the media washed, regraded, and replaced.⁴¹

Eighteen of the 30 aviation stations having sewage-disposal plants were provided with chlorinating equipment for the disinfection of the final effluent.¹⁹ In no case was raw sewage chlorinated, and in only one instance, Eberts Field, was a septic tank effluent chlorinated without other secondary treatment.¹⁹ The use of automatic chlorinators was not satisfactory in general because of the inability of the equipment to follow the rapid and extreme variations in flow from the filters, and manually controlled machines, set for the maximum flow at all times, thus overtreating the effluent during the intervals between the siphon discharges to the filters, were favored.

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- (3) Report of the Chief of Construction Division, 1919, 30.
- (4) Manual of the Construction Division of the U. S. Army, Section C, Engineering Division, 1918, 40.
- (5) Report of the Chief of Construction Division, 1919, 35.
- (6) Memorandum from Captain Ashley, April 5, 1918, to Captain Deacon. Subject: Conference between officers representing Sanitary Corps and engineering section, building and grounds section, Signal Corps. On file, General Files, Air Service, 672 A.
- (7) Letter from officer in charge of construction division, July 17, 1918, to Department of Military Aeronautics. Subject: Sewage disposal plants. On file, Air Service, 672 (General Files).
- (8) Manual of the Construction Division of the U. S. Army, Section C, Engineering Division, 1918, 41 and 42.
- (9) *Ibid.*, 43 and 44. Also: Report of the Chief of Construction Division, U. S. Army, 1919, 31.
- (10) Report of the Chief of Construction Division, U. S. Army, 1919, 32.
- (11) *Ibid.*, 1918, 22; 1919, 31.
- (12) Based on Monthly report upon the water supply and water purification, sewerage and sewage disposal, etc., at Camp Meade, August, 1918. On file, Record Room, S. G. O., 671 (Camp Meade) (D).
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- (20) Letter from First Lieut. Joseph J. Newman, Sanitary Corps, May 1, 1918, to Capt. E. J. Tucker, Sanitary Corps. Subject: Investigation and recommendations re sewage disposal plant. Fort Myer, Va., 720.6 (Fort Myer, Va.) (N).
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- (23) Doten, Maj. L. S., Q. M. C., U. S. Army: Design and operation Fort Myer Sewage Treatment Plant: *The Engineering News Record*, 1917, lxxxii, No. 5.
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- (27) Recommendations of Sanitary Engineering Section, S. G. O. following investigation at Fort Myer, May 1, 1918. See letter from First Lieut. Joseph J. Newman, Sanitary Corps, May 1, 1918, to Capt. E. J. Tucker, Sanitary Corps. Subject: Investigation of sewage disposal plant, Fort Myer, Va. On file, Record Room, S. G. O., Correspondence File, 720.6 (Fort Myer, Va.) (N).
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- (30) General Orders No. 72, W. D., August 6, 1918.
- (31) Monthly Reports of Camp Sanitary Engineer, Camp Custer, Mich. On file, Record Room, S. G. O. Correspondence File, 671 (Camp Custer) (D).
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- (35) Report of Water Supply and Water Purification, Sewerage and Sewage Disposal, etc., December, 1918, 8. On file, Record Room, S. G. O., Correspondence File, 671 (Camp Meade) (D).
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CHAPTER XII

DISPOSAL OF GARBAGE AND WASTE

SYSTEM ADOPTED

The Quartermaster Corps was responsible by regulations for the collection and disposal of camp wastes,¹ but, as pointed out in preceding chapters, the Medical Department was charged with the duty of advising with reference to the adoption of waste disposal systems, and with the supervision of their operation, its responsibility being the same as in the case of the other utilities affecting the health of troops such as water supply and sewerage.² The Medical Department was consulted with reference to the adoption of the original system of garbage disposal, and following the occupation of the camps it assumed sanitary supervision over its operation.

That there is value in the garbage at an Army camp was recognized early when this country was preparing for mobilization.³ This value was greatly increased under the conditions then existing, due to the considerable amounts of fats, grease, alcohol, glycerin, nitrogen, potash, and other substances contained in garbage, all of which were commanding abnormally high prices as a result of the war. The assembling of large numbers of soldiers in the camps also guaranteed a sufficient quantity of garbage to justify a considerable investment for the establishment of adequate works for its conservation, and the concentration of these men in relatively small areas, under military discipline, simplified and reduced the cost of collection and delivery of the waste to an extent seldom possible in civilian communities. Therefore, disposal by incineration, which had long been practiced by our Army in camp, was not considered the best means for troops at the big mobilization points, and the attention of the authorities turned to methods by which the valuable components might be recovered, or at least conserved to some extent. The establishment of reduction plants was considered at first, but this plan was finally rejected on account of the high cost of equipment and the probably slow deliveries of the material necessary for their construction. At the National Army camps and at some other large camps the plan finally adopted consisted in the separation of the garbage at kitchens into various classes and its collection and delivery by military labor to contractors at a central transfer station within the camp area, this station being owned and operated by the Government.⁴ There was no emptying of garbage cans except at this central station. The contractors were required to transport practically all organic waste materials from the transfer station to a point so far beyond the limits of the Government reservation as to avoid any possibility of nuisance or menace to the health of the troops, and the ultimate methods of disposal were left to them. At the National Guard camps the contractors usually removed the garbage directly from the kitchens to a point outside camp limits without the use of an intermediate transfer station. The full cans were collected at the kitchen and were not emptied until they reached the contractor's establishment, where they were then cleansed by him.⁵

Near the large camps many piggeries were established by the purchasers or contractors, and the portions of the garbage suitable for hog feeding were thus utilized.⁶ Trap grease, raw meat, fats, and other substances of a similar nature, as well as dead animals, were rendered, either in plants erected and operated by the contractors or in existing municipal or private establishments.⁴ Bones were sold to fertilizer manufacturers, dry bread was made into poultry feed, and the remaining refuse, consisting of coffee grounds, tea leaves, fish waste, citrus rinds, and other valueless materials, was incinerated, usually in plants constructed and operated at the transfer station by the Government.⁴ Paper, tin cans, and bottles were baled and sold when the opportunity offered.⁴ Manure, as stated in the special chapter on that subject, was usually hauled away to a safe distance from camp and spread on land; usually this was done by train. When the supply was greater than the demand, it was occasionally burned in windrows or ripened in compost piles for future use.⁴ Other wastes, which did not have a salable value, were burned on the camp dump by Government labor.

Kitchen slops in the sewerred camps were disposed of by discharge, through grease traps, into the sewers. In the National Guard and other tent camps, prior to the installation of sewer systems late in 1918, slops were evaporated in shallow pans placed over a brick incinerator built in close proximity to each company kitchen.⁴ While this process was laborious and wasteful of fuel, its results were entirely satisfactory from a sanitary point of view. Figures 45 and 46 are detailed drawings of a brick incinerator, and of a rock-pile crematory, respectively, such as had been used prior to the war in temporary camps, for burning garbage and evaporating slops.

During several years prior to the World War the Medical Department had carried out many experiments and observations regarding the proper disposal of kitchen refuse, which in camp forms one of the ready means of attracting and propagating flies. These studies had shown that immediate incineration of kitchen waste (garbage and slops) in close proximity to the kitchen, and without use of garbage cans, best served the ends of sanitation. Removal of the waste from kitchens to a central camp incinerator was less satisfactory because it involved the use of garbage cans and the certainty of spilling some material while emptying these receptacles and while hauling the contents to the central point. The expense of operating incinerators in our vast new camps and the importance of conserving garbage were fundamental reasons for adopting the new policy which already has been described. The steps which led to this change as well as some of the difficulties encountered, are in part shown in the following correspondence:

WAR DEPARTMENT,
OFFICE OF THE QUARTERMASTER GENERAL OF THE ARMY,
Washington, July 21, 1917.

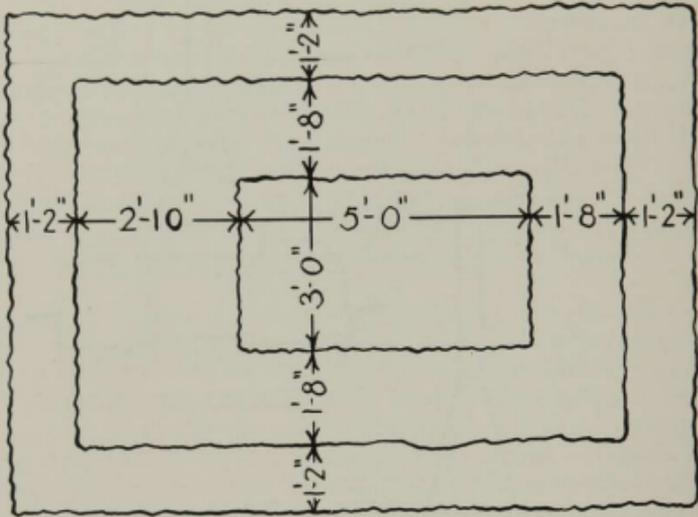
400.74 (Genl.)

Memorandum for the Secretary of War:

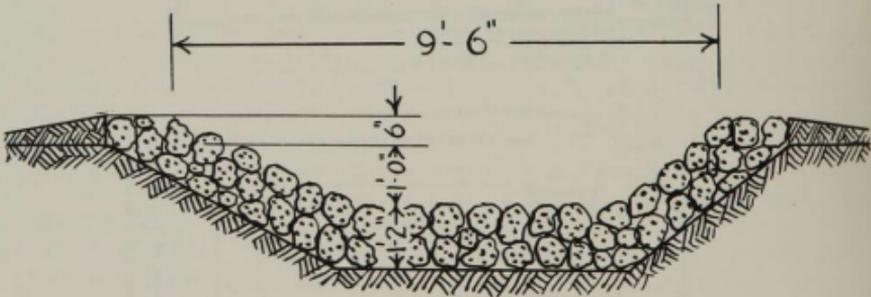
While the saving of even garbage is desirable, it is not believed practicable to get anyone to take it away fast enough to prevent accumulation sufficient to attract flies, which are the greatest menace to the health of the command.

Sanitary inspectors require the garbage to be burned as fast as it accumulates. It is suggested that the matter be referred to the Surgeon General for an opinion as to the effect it might have on the health of the command to try and collect it in closed receptacles.

HENRY C. SHARPE,
Quartermaster General.



PLAN



SECTION

FIG. 46.—Detailed drawing of a rock-pile crematory for use by a battalion, regiment, or larger organization

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, August 16, 1917.

From: The Surgeon General of the Army.
To: Camp sanitary officer, Camp Custer, Battle Creek, Mich.
Subject: Removal of garbage from military camps.

1. I am directed by the Surgeon General to quote a communication from this office, dated June 21, 1917, addressed to the Quartermaster General of the Army:

The following telegram, having been approved by the Acting Chief of Staff, has been sent to the department surgeons of all departments in the United States:

This office sees no objection arrangement with responsible civilians to remove garbage from camps and cantonments provided such removal is prompt and carried out under regulations which will insure that no insanitary conditions result. Garbage to be removed in the can. No dumping into wagons permitted. Returned can to be thoroughly cleansed, sterilization by steam desirable. Firms representing considerable capital have applied this office permission to do work. Garbage from cantonments evidently has considerable money value. Believe contractors should give bond.

F. P. REYNOLDS,
Colonel, Medical Corps.

[First indorsement]

SANITARY INSPECTOR, CAMP CUSTER,
Battle Creek, Mich., August 18, 1917.

To the SURGEON GENERAL, U. S. ARMY,
Washington, D. C.

1. Our proposed arrangement at this cantonment, as indicated in the inclosed circulars is identical with the one recommended.

2. Request that these circulars be forwarded to the firms referred to in the letter as having applied for permission to remove garbage.

W. W. WOOD,
Captain, Medical Corps, U. S. Army.

Four inclosures.

WAR DEPARTMENT,
THE ADJUTANT GENERAL'S OFFICE,
Washington, August 20, 1917.

From: The Adjutant General of the Army.
To: The Surgeon General.
Subject: Disposal of garbage at camps.

You are informed that the Secretary of War now has on his desk under consideration the matter of the disposal of garbage at camps, and no action will be taken with reference to the disposal of garbage which will bind the Secretary of War until he has communicated his desires on the previous papers.

By order of the Secretary of War:

EDWARD T. DONNELLY,
Adjutant General.

[Western Union special]

CHARLESTON, S. C., *August 28-17.*

To SURGEON GENERAL, ARMY,
Washington, D. C.

Incinerators being denied cantonments the conservation scheme advocated by Defense Council and to put in operation by Quartermaster Corps not yet announced many complaints are received and demands for relief from nuisance period. Conservation should begin in kitchen and not in garbage can period. Local commanders informed question of disposal now in their hands as efforts these headquarters to handle through bids to contractors stopped by higher authority period. If something not done promptly local papers will denounce nuisance.

STARK, *Department Surgeon.*

SGO 179811-I

DEPARTMENT SURGEON,

Charleston, S. C.

fpr-hgp

AUGUST 28, 1917.

Understand that plan of conservation is being put into effect by Quartermaster General under instructions Secretary of War, and that contracts are about to be let for disposal garbage in this manner at all National Army cantonments. Am informed by officer in charge cantonment construction that disposal of garbage in National Guard cantonments will be by incineration and that incinerators are to be put in by his department.

GORGAS.

[Western Union telegram]

AMERICAN LAKE, WASH., August 30, 1917—*a. m. 43.*

SURGEON GENERAL ARMY,

Washington.

Reference contract garbage etc. General Greene commanding directs me state, quote In the awarding of these contracts the economy reasons seem to have entirely outweighed sanitary considerations and the training time of troops." He also wishes you informed his telegram Adjutant General August twenty-eighth. "The Adjutant General, Washington, D. C., constructing quartermaster has received notification of letting of contract for removal of garbage, etc., from this camp under certain conditions one of which involves the collection and removal to a point at least half mile distant from cantonment. This involves labor of troops and supplying specially constructed tank cars which the Government does not possess and which cannot be obtained within the limited time at our disposal. I consider this very objectionable and recommend in lieu thereof that contract be let for this purpose to reputable parties who have every facility for performance this duty in a systematic and thoroughly sanitary manner. Party is reputable and prepared to furnish adequate bond for the proper performance of this duty, all methods of collecting and disposal to be under the immediate supervision of my sanitary officers. I strongly urge authority be given me to make the contract indicated. Double can system not possible as the cans cannot be obtained, every possible source of supply on this coast having been consulted and the cans not available nor can they be supplied with reasonable time. On account of different conditions climatic and otherwise no hard and fast general rule is advisable and it is believed that better results will follow leaving this question to local commanders. The officers of the medical and quartermaster corps at my camp are unanimously strongly in favor of the contract system of disposal of garbage. Greene. Terms contract furnished by contractor objectionable to undersigned in allowing disposal garbage, manure, etc., outside cantonment but within reservation. Hog farms and storage manure opposed. System segregation requires five covered iron cans each kitchen. First supply cans to come from depot quartermaster Seattle not available as supposed. No method available cleansing cans per letter your office August, sixteen except kitchen police. Cans, transportation and steam sterilizing plant necessary to carry out scheme present population camp thirteen thousand, first increment National Army ordered Sept. five. This telegram result agreement with construction and camp quartermaster.

FIELD, SMITH, and NORTINGTON.

WAR DEPARTMENT,

OFFICE OF THE SURGEON GENERAL,

Washington, August 31, 1917.

From: The Surgeon General of the Army.

To: The Adjutant General of the Army.

Subject: Disposal of garbage in National Army cantonments.

1. Inclose herewith copy of telegram received in this office from the division surgeon and division sanitary inspector, 91st Division, Camp Lewis, American Lake, Washington, in regard to disposal of garbage at that camp. (Telegram is reproduced above.)

2. This office has not been informed of the plan of disposal which is referred to as having been ordered by the office of the constructing quartermaster. Communications have been received similar to the inclosed, indicating that much confusion has resulted because of the change in the original plan, which left arrangements for garbage disposal at National Army cantonments in the hands of the local commanders.

3. Copy of instructions sent by this office to camp sanitary officers is enclosed.

For the Surgeon General.

F. P. REYNOLDS,
Colonel, Medical Corps.

[1st indorsement]

485.2 (Misc.)

WAR DEPARTMENT, A. G. O.,
September 5, 1917.

To the SURGEON GENERAL:

Inviting attention to the inclosed copy of telegram sent to all divisional commanders on September 3, 1917, outlining the approved method of collecting garbage at divisional camps. (Telegram follows.)

By order of the Secretary of War:

L. A. DEWEY,
Adjutant General.

[Night message]

720.7 (Misc. Divn.)

CAMP DONIPHAN,
Fort Sill, Okla., September 3, 1917.COMMANDING GENERAL, CAMP DONIPHAN,
Fort Sill, Okla.

Approved method of collecting garbage at divisional camps, is the can system period. The filled cans, replaced by empty cans, are to be transported, without removing covers, from mess kitchens to a point two or three miles from cantonment buildings by Government trucks period. At this point the cans are to be emptied into contractors trucks. The cans will then be rinsed, sterilized and returned to kitchens when the next collection trip is made period.

McCain.

The following extract from a Quartermaster Corps circular of proposals indicates the sanitary safeguards which were thrown around the handling of manure⁶ and garbage by contractors.⁷ Unfortunately it was not always possible to hold contractors to a strict compliance, as is shown by reports of inspectors, some of which are quoted at the end of this chapter:

Scaled proposals, in duplicate, subject to the usual conditions, will be received at this office until 2 p. m. August 31, 1917, at which time and place they will be opened in the presence of bidders who attend, for the sale of the garbage and manure accumulating daily at this camp, estimated at 150,000 pounds of manure daily and 30,000 gallons garbage daily, subject to the following conditions:

Conditions as to manure.—The contractor to furnish a sufficient number of flat cars on the sidings at the cantonment daily with enough laborers to clean the ground of all litter about these cars, and to be bound by the sum of \$1,000 to cover the regular daily performance of the details of this contract under such sanitary regulations as the sanitary inspector of the camp may designate, the manure to be removed at least 2 miles from any margin of the camp, and the Government agreeing to transfer the manure to the sidings and to load the cars with the same.

Conditions as to garbage.—The contractor to remove daily all garbage in the cans which are furnished by the camp quartermaster, these cans and their contained garbage to be taken and removed at least 2 miles from any margin of the camp; the cans then thoroughly cleansed, externally and internally, by scrubbing in limewater and sterilized by directing a spray jet of live steam into the cans, the covers of the cans to be treated similarly; the contractors to avoid the spilling of garbage about or slopping it on the garbage stand or elsewhere on the cantonment grounds; the collection of the garbage to be supervised by the sanitary inspector or his assistants, whose orders will be final. The camp authorities agree to strain from the garbage all liquids and to keep it free from foreign substances, such as bottles, papers, etc., and to investigate and adjust all just complaints on the part of the contractor; the contractor to be bound in the sum of \$1,000 for the daily removal of the garbage and the faithful performance of his duties under this contract.

⁶ Manure is treated in greater detail in the following chapter.

THE COLLECTION OF GARBAGE

Rules for the collection and disposal of kitchen waste, garbage, manure, and dead animals were changed from time to time by War Department orders and by local instructions, but the most comprehensive set of regulations on the subject is contained in Section X of Special Regulations No. 77, War Department, October 11, 1918, as follows:

COLLECTION AND DISPOSAL OF KITCHEN WASTE, GARBAGE, MANURE, AND DEAD ANIMALS

120. Arrangements for the disposal of kitchen waste, garbage, manure, and dead animals will be made by the salvage officer through the subdepot quartermaster in each cantonment, camp, or station. No quartermaster will enter into any contract or arrangement for disposal of kitchen garbage or kitchen waste except upon written authority from the Quartermaster General. The commanding officer will make necessary arrangements for the collection and delivery to the salvage depots or such other point as the salvage officer may instruct.

121. With the object of reducing waste as far as possible, and to insure that all by-products are utilized to the best advantage, each organization conducting a mess will make the following separations of kitchen waste produced in the preparation and serving of each meal.

a. Bread, which will include all bread unfit for human consumption, after each meal will be dried and sacked for delivery.

b. Cooked meat will include all scraps of meat collected from plates after meals.

c. Raw fats and meats will include the trimmings and raw scraps rejected for use as food, and meat condemned by health authorities as unfit for human consumption.

d. Bones shall include all bones discarded in the preparation and use of human food.

e. Cooked grease shall include all grease discarded as being of no future value as human food.

f. Other garbage shall include all unusable portions of food not otherwise classified, and shall include coffee grounds, glass, and other substances injurious for use as food for animals. Such substances shall be disposed of in the same manner as ashes.

122. To insure that the separation of all kitchen waste is made in accordance with the above, the commanding officer of each company, battery, etc., will make the necessary arrangements for the collection of all waste immediately after the conclusion of each meal, and before same is disposed of it will be inspected by an officer. The company commander will be responsible that all food fit for further use is preserved. Bread, meat, fat, bones, tea leaves, coffee, coffee grounds, or water will under no consideration be placed in receptacles with other garbage.

123. Each of the above named classified articles will be weighed and a statement of the quantities of each will be forwarded at the time of collection to the salvage officer, and on or before the 5th day of each month a full statement on forms to be obtained from the salvage officer of the total quantities for the previous month of each classification will be forwarded to him by each unit. In the event of excessive quantities of waste or bad separation or grading of same by any unit, the salvage officer will immediately report same to the commanding officer to inspect the material complained of, which will be retained for such inspection. Periodically, as directed, the salvage officer will forward, through the camp commander to the Quartermaster General, a statement of any excessive waste or bad grading of by-products by any unit. The Quartermaster General will, where considered necessary, report same to The Adjutant General for necessary disciplinary action to prevent a recurrence of same.

124. Receptacles for waste shall be provided as follows:

a. All bread shall, after drying, be placed in salvaged bags provided for the purpose.

b. All cooked meat, raw fats and meats, and cooked grease, after being weighed separately, shall be placed in one receptacle.

c. Bones will be kept in a separate receptacle.

d. Other garbage, suitable for animal food, will be placed in one receptacle.

e. Waste not suitable for animal foods, such as coffee grounds, broken glass, tea leaves, egg shells, citron rinds, banana peel, banana stalks, fish heads, and fish scales, shall be placed with ashes in a separate receptacle.

f. Tin cans, after being washed and rinsed, shall be placed in separate receptacles.

g. All waste paper from mess halls and barracks shall be placed in bags provided by the camp quartermaster for this purpose.

h. Empty unbroken glass bottles and other glass containers, after being washed and rinsed, will be kept in packing boxes salvaged by the organizations and will be turned in once a week to the salvage officer.

125. The receptacles for garbage will be placed in a convenient location for removal by the contractor, the organization, or salvage service and will be kept in a clean and sanitary condition by the organization using them.

126. Manure from corrals and stables will be delivered daily by remount or organization teams to contractor at point designated in contract. When the contract calls for it, manure will be weighed, either in wagons or cars, and the records of these weights and the enforcing of the contract shall be the duty of the salvage officer.

127. It will be the duty of the organization commander to see that manure is kept free from excessive quantities of straw or other foreign matter, and that the manure is delivered as specified in paragraph 126.

128. Where excessive quantities of straw or foreign material is found in the manure, the salvage officer will immediately report the fact to the commanding officer of the unit concerned who will direct an officer to inspect same. Periodically the salvage officer will forward through the camp commander to the Quartermaster General a statement of the bad condition of manure of any unit. The Quartermaster General will, where considered necessary, report same to The Adjutant General for necessary disciplinary action to prevent a recurrence of the same.

129. Firms or individuals purchasing manure under contract at camps, cantonments, or posts will be required to provide at their own expense a site of not less than 5 acres for a manure dump, to be used as such when railroad or other transportation is not obtainable to remove the daily accumulation of manure. The location of the site will be within 3 miles of the station of the troops, and will be approved by the camp sanitary officer.

130. If it be necessary to stack manure it should be dumped in piles about 3 feet high and 5 feet wide at the base, and then covered with earth to a depth of about 6 inches. All should be beaten down firmly, care being taken to ramp up the sides, where fly maggots chiefly lodge. The edges of the heap, as an extra precaution, should be sprayed with borax solution (4 ounces to the gallon), using about a quart of solution for every square foot sprayed. The ground at the edge of the heap should be sprayed for a width of a foot.

131. Packing the manure tightly develops heat enough to kill the larvae, and covering it with a layer of soil prevents the deposit of eggs by flies, at the same time preserving the value of the manure by preventing rain washing out the soluble ingredients.

132. If borax be not available, prepare the ground where the dump is to be made with heavy oil and leave a margin of a foot of such ground around the edge of the dump.

133. One neglected heap of horse manure or other suitable breeding ground is enough to provide a plague of flies for a whole camp.

134. Ashes of all kinds will be delivered by organization teams to such places as the salvage officer may direct.

135. Dead animals from remount depots or organizations will be delivered by them to such places as may be designated by the salvage officer. They shall be placed on skids; not dragged over the ground.

The garbage was separated in or just outside the mess hall, the mess sergeant being held immediately responsible not only for properly segregating the various components into the allotted cans but also for preventing wastage of edible foods.⁶ The separation was usually in part accomplished by requiring the soldiers after each meal to file past a row of properly labeled galvanized-iron

garbage cans, and to scrape the food remaining on their plates or mess kits directly into the appropriate receptacle. When not opened to receive material, orders required that cans be kept tightly covered.⁶

The full garbage cans were collected each day on wagons or trucks, manned usually by enlisted men from the Quartermaster Corps or by military prisoners, and were delivered to the central transfer station.⁸ Clean cans were left in the place of the full cans which were removed. Suitable regulations were promulgated covering the collection and hauling of the material from camp. Care was necessary in handling cans to prevent the spilling of the contents on the ground. Covering by tight lids or by tarpaulins during transit was required.⁸

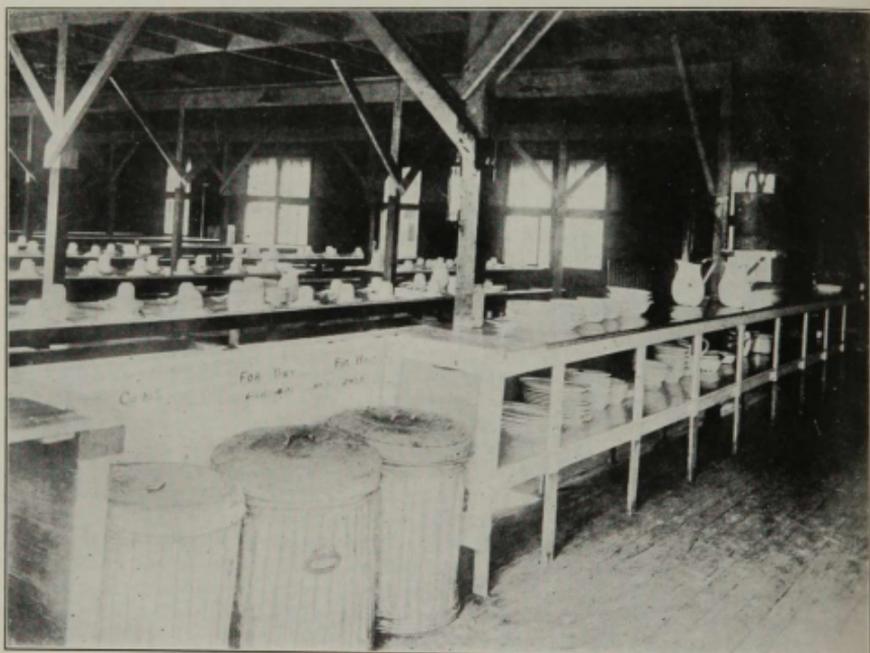


FIG. 47.—One method of arranging garbage cans when these were kept in the company kitchen

The garbage cans usually were kept on platforms just outside the kitchen door, and near a company street for the convenience of the details engaged in their collection and delivery.⁶ These stands were raised a few feet off the ground and in some instances a screened shelter was provided to prevent access of flies. (See Chap. XIV.) Orders required that flytraps be kept near each such platform during warm weather. The ground around was carefully policed to prevent fly breeding; occasionally it was necessary to keep a small area soaked with crude oil. In many instances no screens over the garbage cans appeared to be necessary, cleanliness alone being relied upon for preventing insect nuisances. Originally it was required that all cans containing material other than ashes or undecomposable refuse be kept inside the kitchen,⁹ as under this plan

the use of dirty cans or the holding of decaying garbage would not be tolerated. The practice of keeping the cans in the kitchen was not long maintained, however, because of lack of space and widespread distaste for this procedure.

The central transfer station, as originally planned, consisted of a platform 20 feet wide and 100 feet long, constructed of lumber and raised above the ground to a height about level with the floor of a wagon. A storeroom was provided at one end for cans, bottles, paper, etc., and a can-washing room was located at the other end of the platform.⁶ There was usually an incinerator in connection with the station.⁴ The wagons or trucks from the camp delivered their full cans at one side of the platform and immediately drove to one end for a load of clean cans to take back to the kitchens. The full cans containing useful material were emptied into the appropriate tank trucks or wagons of the contractor standing on the opposite side of the platform, or sometimes

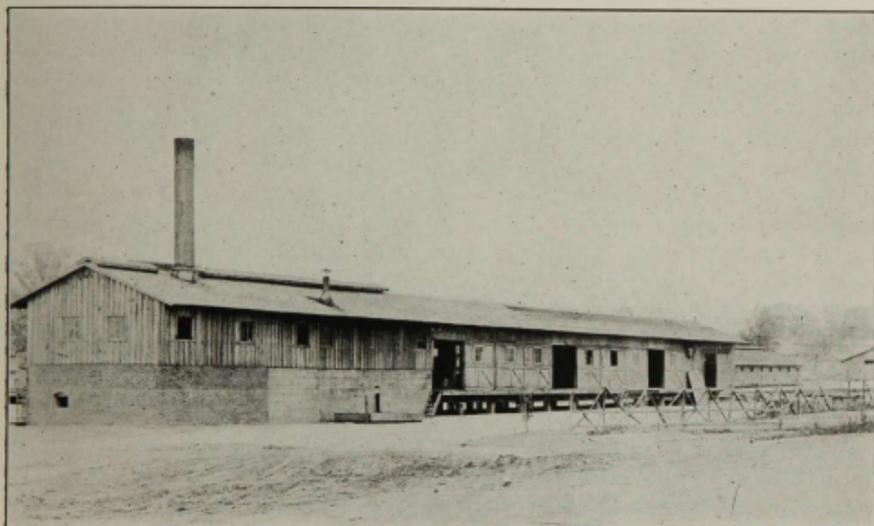


FIG. 48.—Garbage-transfer station, Camp Meade, Md.

into railway cars. Useless matter was deposited in the charging room of the incinerator, later to be shoveled into the fire. Paper, bottles, and tin cans were placed in the storeroom and all garbage cans after emptying were delivered to the can-washing room. After cleansing, the cans were stacked at one end of the platform ready for return to camp.

Inspectors were stationed on the platform to weigh the garbage and note any wastage of food as indicated by the contents of the cans when they were unloaded; a record was kept and when undue waste was apparent the proper officers were notified, so that disciplinary action could be taken with a view to preventing a recurrence.⁶

After the transfer stations had been in operation a short time, it became necessary to pave the roadway and space around and under them to facilitate the cleaning up of the premises, which was required each evening after the

deliveries for the day had ceased. In some camps a concrete pavement beneath the unloading platform had been provided in the original plans.⁴ In other instances it took months of effort on the part of the sanitary authorities to obtain pavement under and around the stations. Waste water from the hosing of the premises and from the washing of garbage cans was collected and discharged through a large grease trap, whence it either entered a sewer or was disposed of by cesspools or in some other satisfactory manner. Large quantities of valuable grease were recovered from these grease traps.⁴

The platforms were of wood and two types of construction were employed; in one tongued-and-grooved lumber was used, with no intentional open spaces in the floor; in the other an open space of about 1 inch was left between each two planks.⁶ This latter type was believed by some to be the better because it prevented collections of filth which soon formed in the narrow cracks between the matched planks of the first type.⁴ On the other hand, the cleaning of the spaces 2 inches deep and ranging from $\frac{1}{2}$ inch to 1 inch wide was a very difficult matter and was seldom satisfactorily accomplished. In several camps, platforms of wood were entirely abolished and concrete was substituted therefor.⁴ These were satisfactory in all instances, and it is obvious that a concrete platform should have been provided for all transfer stations at the outset. Even with the greatest cleanliness the keeping down of flies was a difficult matter, and they would frequently follow the wagons back to camp. Orders required that flytraps in large numbers be kept in use at transfer stations.¹⁰

At times much difficulty attended the handling of garbage in winter because of its freezing to the cans. This, however, was of no sanitary importance.

The method of can washing usually consisted of soaking the cans in large wooden tanks filled with hot water, to which lye or other cleansing material had been added, after which they were scrubbed with stiff brushes.¹¹ Pipe coils were originally placed in the incinerators to furnish hot water for filling the tanks, but proved insufficient and were soon burned out. Subsequently small steam boilers or heaters were installed. This method of cleaning cans was unsatisfactory on account of the frequently deficient supply of hot water and also because of the justifiable dislike of laborers for the wet, filthy work; both factors resulted in a lack of thoroughness. A few camps were provided with mechanical can-washing equipment, which consisted of brushes revolving in tanks of hot water and so arranged that both the inside and outside surfaces of the cans were cleansed.¹¹ These machines proved fairly satisfactory as regards results, but were expensive to operate and maintain.

After the original transfer stations were built, a new design for can-washing equipment was developed by the construction division.¹² The cans were first soaked in long vats containing hot water in which a special cleansing compound had been dissolved for the purpose of loosening the greasy materials from their surface; they were then placed in small compartments and subjected to strong sprays of hot water both inside and out. This removed the bits of garbage which cling to the metal and also the greasy film which is characteristic of poorly washed garbage cans. Several installations of this equipment were made in 1919.¹²

The incinerators originally constructed were of commercial types, and usually were provided in duplicate units having nominal capacities of 10 to 20 tons per day. They were used for burning only the unsalable garbage. They consumed a great deal of fuel and were generally inefficient and unsatisfactory, practically none of them remaining in use for more than a few months.⁴ Notwithstanding the coal shortage and the high price of fuel during the war, many tons of coal were consumed in these incinerators, while immense quantities of combustible refuse were being burned on the near-by camp dumps merely to get rid of it.⁴

During 1918 a new type of incinerator was developed by the construction division,¹¹ which is described by the designer as having "a grate surface for natural draft to burn 35 pounds per square foot per hour, and for forced draft, 60 pounds per square foot per hour; a drying hearth to facilitate the cremation

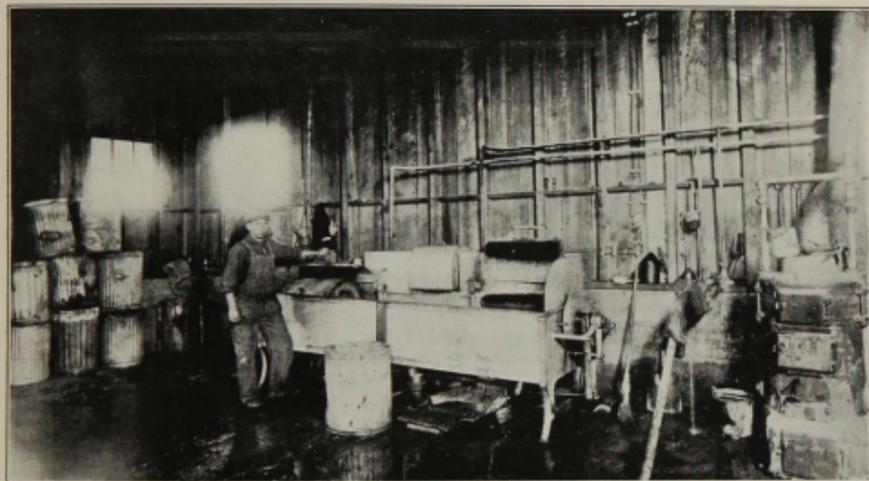


FIG. 49.—Can-washing apparatus in garbage-transfer station, Camp Meade, Md.

and to prevent the liquids from reaching the grates; dampers to control the draft; and an ample stack area and height to prevent back-firing and to produce an average velocity of gases approximately 20 feet per second." The incinerators of this new type were not constructed early enough to be in general use during the war, but their performance under severe tests at some camps where they were installed later promised efficient and satisfactory service.

At many stations, particularly the National Guard camps, no garbage transfer stations were originally built and all the refuse was gathered up directly from the kitchens by the contractor, who was responsible for its regular collection, for its proper disposal, and for the cleansing of the cans.⁵ Usually this work was done in an unsatisfactory manner, since adequate equipment was seldom available, and, as a result, a system of collection by the camp authorities was ultimately instituted at practically all points.⁴ In many aviation fields it was planned to incinerate all garbage, and one or more brick incinerators were

built for this purpose on the outskirts of the reservation. As observed by sanitary inspectors from the Surgeon General's Office, these incinerators were generally of poor design and with only a very limited period of usefulness.⁴ Ultimately many aviation fields disposed of garbage by sale.⁴

QUANTITY OF GARBAGE

The quantity of garbage produced per capita at the camps was approximately twice that encountered in municipal practice.^{13, 14} Table 24 has been prepared to show the total average amounts, by months, of certain constituents, and the total yearly production of all garbage per person, at three National Army camps.

TABLE 24.—Quantities of certain constituents and the total weights of garbage produced per month at Camps Devens, Dix, and Meade¹³

Month	Population			Dried bread, tons			Fats, tons			Total garbage, tons			Pounds of garbage annually, per man		
	Camp Devens	Camp Dix	Camp Meade	Camp Devens	Camp Dix	Camp Meade	Camp Devens	Camp Dix	Camp Meade	Camp Devens	Camp Dix	Camp Meade	Camp Devens	Camp Dix	Camp Meade
1918															
August.....	38,790	57,730	46,110	2.75	1.72	2.35	0.94	9.6	1.7	551	653	533	342	273	287
September.....	45,400	50,880	45,210	3.70	1.15	1.20	7.90	16.7	.6	508	549	469	269	259	264
October.....	43,240	42,380	44,090	5.82	1.73	1.20	21.51	14.5	2.45	484	396	463	269	224	271
November.....	39,250	34,400	44,810	5.96	.68	2.10	24.74	5.56	1.70	435	331	514	266	231	292
December.....	27,820	20,630	42,010	9.40	1.72	3.20	18.40	3.6	.95	370	351	542	319	408	325
1919															
January.....	21,780	21,510	29,820	8.20	1.82	2.75	16.70	3.7	1.4	327	333	465	361	372	389
February.....	8,330	20,240	14,430	5.90	.94	1.0	6.10	3.9	1.5	152	303	239	438	359	410
March.....	8,770	16,990	13,310	5.85	1.23	.18	5.58	4.3	.85	151	301	157	413	426	294
April.....	23,000	13,830	11,410	7.41	.99	-----	10.04	4.0	.1	299	288	132	312	499	286
May.....	23,160	12,420	-----	1.23	-----	-----	-----	2.2	-----	430	151	-----	446	300	-----
Total pounds.....													2,989	3,497	3,118
Average pounds.....													332	349	312
Average pounds per capita per day.....													0.91	0.956	0.85

These figures, which were obtained direct by daily weighing of all camp garbage, coincide very closely with each other and also with those obtained by the division of food and nutrition, Surgeon General's Office, in a nutritional survey of 427 camp messes, in which the average total waste per man per day was found to be 0.80 pound.¹⁵ Of this the edible waste amounted to 0.38 pound and its cost averaged 3.2 cents per capita daily.

The prices paid by the purchasers for the camp wastes under the original contracts usually were based on the population, and ranged from 3 to 9 cents monthly for each soldier, with an average of 5 cents. There were some exceptions, however; at Camp Devens a lump sum of \$2,160 per month was paid for all camp wastes; at Camp Travis the materials were sold separately, bones bringing \$11, garbage \$1.90, and waste paper \$4 per ton.¹⁶ On July 1, 1918, new contracts were made for all camps, usually based on the weights of the materials.¹⁷ Table 25 shows the variations in prices received for the different constituents of the garbage at two camps.

TABLE 25.—Prices bid per ton for various constituents of garbage at Camps Dix and Jackson, July 1, 1918¹⁸

	Dry bread	Bones	Fats and meats	Grease	Other garbage
Camp Dix, N. J.	\$86.60	\$19.00	\$99.20	\$99.20	\$1.65
Camp Jackson, S. C.	30.00	18.00	65.00	65.00	2.00

If not properly disposed of, the only influence which garbage was likely to have on the health of commands was through fly breeding. As is mentioned elsewhere, generally speaking, fly breeding was kept at the minimum in the



FIG. 50.—A well-kept camp dump. Combustible and noncombustible material were thrown over the edge of the dump, where a more or less constant fire was maintained by the former, consuming such small amounts of organic matter as accidentally were mingled with the materials hauled to the dump

home camps. This does not mean, however, that many difficulties did not occur in getting rid of the garbage. Doubtless the simplest method was direct sale of all garbage to a contractor for disposal at a point so remote from camp as not to involve a nuisance so far as the troops were concerned. It goes without saying that simple methods recommend themselves particularly under war conditions. It was noted by sanitary inspectors very generally that contractors often had poor equipment, especially leaky wagons, which through the dripping of the contents were objectionable to camps and near-by communities alike. With proper equipment the usual municipal practice in garbage disposal could have been used in these large camps as well as in a city.

At the time the saving to be made in valuable materials through garbage conservation looked very large. Whether a saving was really effected is quite another question, however, if we take into account the true cost of this elaborate transfer station, the labor involved, and the transportation.

At some places the hauling of garbage through the streets of near-by towns caused considerable dissatisfaction among the residents, and the establishment of piggeries, with their rank odors and swarms of flies, near occupied districts, sometimes resulted in grave nuisances, even extending to the camps themselves, as at Camp Pike, where flies were traced directly from the piggery to camp.¹³

The following extracts of reports made by sanitary inspectors from the Surgeon General's Office indicate some of the difficulties attending garbage



FIG. 51.—Burning refuse on camp dump. Apparently this dump was not maintained in as good condition as the one shown in preceding figure

disposal which were met with at times in certain camps and the necessity for constant oversight by the Medical Department.⁴ It is necessary to explain that every effort was made to correct the bad conditions reported.

Selfridge Field, Mount Clemens, Mich., October 10, 1917.—The garbage is now being burned in two small incinerators of the standard type which have been built at many aviation fields. These incinerators are not working well; although they have been in use only a week, some of the arches have already fallen down. The plant seems to be unequal to the needs of the post, having to be kept in operation almost constantly. The incinerators are badly arranged, the top through which the garbage has to be thrown being 6½ feet above the level of the ground. It is impossible to put garbage cans on the top of the incinerators directly from the wagons. The cans have to be carried up a ladder.

Camp Greene, N. C., October 12, 1917.—Garbage disposed of by burning in Guthrie and rock-pile incinerators. An expensive method.

Camp Grant, Ill., October 26, 1917.—Condition of transfer station very unsatisfactory. A wide area covered with rubbish; near-by was a large half-burned pile of organic rubbish. Much garbage had been spilled and trodden in the soil. There was insufficient hot water for can washing.

Camp Funston, Fort Riley, Kans., October 26, 1917.—The garbage station has been established for a short time and is working very well, except that they do not have a sufficient amount of hot water. Owing to the garbage being very carefully separated, there is nothing to burn in the incinerators except a small amount of refuse, which consists mostly of sweepings. It is, therefore, necessary to burn a large quantity of coal in the incinerators in order to heat the coils for hot water.

All garbage stations have a concrete base underneath the receiving platform. It appears to me that it would have been a great deal better to have the platform made of concrete rather than boards.

Camp Sheridan, Ala., November 5, 1917.—Unsatisfactory. Contractor does not clean cans well and returns them with tops missing.

Camp Custer, Mich., November 20, 1917.—Garbage transfer station poorly policed.

Camp Grant, Ill., December 12, 1917.—Transfer platform and grounds around it covered with rubbish, tin cans, and garbage. Large piles of cans and rubbish scattered about the vicinity.

Camp Sherman, Ohio, December 17, 1917.—At the transfer station the waste water resulting from washing of the cans flows into a near-by gully. Recommend that a grease trap be installed and a pipe line leading direct to the river.

Filling Plant, Powderneck, Md., December 26, 1917.—No means of garbage disposal. Garbage thrown on ground and under the buildings. No incinerators.

Camp Beauregard, La., January 13, 1918.—Only fair. No transfer station. No supervision over cleaning and sterilizing cans.

Camp Merritt, N. J., January 6, 1918.—Disposal of garbage is on plan of hauling out in cans to transfer platform outside camp and subsequent removal by contract. Cans on hand were all filled and garbage overrunning the ground at kitchen doors. Cans could not be emptied because frozen solidly, nor replaced because none was available. Transfer platform was overflowing with frozen garbage. The system broke down under the strain of excessively cold weather.

Camp Wheeler, Ga., January 15, 1918.—Contractor is not complying with the provisions of his contract, which require him to clean and sterilize garbage cans. Practically all cans are whitewashed. Many are without lids. Some wooden barrels are in use.

Camp Taylor, Ky., January 16, 1918.—On account of the heavy snows, the contractor has been unable to move his garbage even with motor trucks. It has been dumped in piles near the transfer station.

Camp Hancock, Ga., February 7, 1918.—Unsatisfactory; a portion is carried away by farmers and the remainder incinerated. No regular contract. Farmers very uncertain in calling for garbage.

Aviation Camp, Garden City, Long Island, February 8, 1918.—Unsatisfactory. Contractor does not remove garbage regularly and makes no attempt to clean the cans. Ground in vicinity of garbage stands very poorly policed.

Gerstner Field, La., February 14, 1918.—Unsatisfactory; garbage spilled on the ground by contractor, who empties the contents of the cans into his barrels without furnishing clean cans; no provision being made for washing cans after they are emptied.

Kelly Field, February 25, 1918.—Contract working unsatisfactorily. Can tops are frequently lost and garbage spilled on the ground. Contractor's agents refuse to take all the garbage agreed to in the contract.

Cavalry Division, El Paso, Tex., March 17, 1918.—Contractor has failed to comply with the provisions of his contract in that he has not provided a metal-lined wagon body for collecting garbage. Present wagon of wood permits garbage to leak through upon the ground.

Camp Pike, Ark., March 22, 1918.—Satisfactory at present, except that the contractor's wagons leak. At the transfer station the outflow pipe for the wash water empties into a small creek which will become a nuisance in warm weather. This should be connected with the sewer.

Base Hospital, Camp Beauregard, La., March 31, 1918.—Unsatisfactory. Contractor overworked.

Camp Lee, Va., April 10, 1918.—Disposal plant in a very unsanitary condition. Garbage contract recently broken, necessitating bringing of all garbage in galvanized-iron cans and incinerating at the garbage station; hundreds of cans without tops; on account of rain no incineration had been carried on for two days, resulting in a large accumulation of garbage.

Camp Sheridan, Ala., April 14, 1918.—Contract working only fairly well. Liquid garbage hauled to the river. Solid garbage hauled by quartermaster 4 miles to a piggery. Cleaning of cans not satisfactory to the division surgeon.

Camp Wadsworth, S. C., April 20, 1918.—There is no systematic arrangement for garbage stands or for caring for garbage cans. A garbage transfer station with proper facilities for can washing is recommended. At present garbage is disposed of to farmers who call for it. This is under the supervision of the camp sanitary squads and is only fairly satisfactory.

Camp Dodge, Iowa, May 1, 1918.—Garbage contractor's cans and carts not clean.

American University, D. C. (Camp Leach), May 4, 1918.—Garbage cans not well kept. Covers missing or ill fitting.

Carlstrom Field, Fla., May 14, 1918.—Collected only every second day, resulting in overflowing of cans.

Dorr Field, Fla., May 14, 1918.—Unsatisfactory. Contractor calls for cans only every other day, thus causing cans to be filled to overflowing.

Camp Jackson, S. C., May 15, 1918.—No can-washing machine. Contractor's garbage carts are not all water-tight. No concrete road about the unloading platform. Many flies at the transfer station. Many unburned cans lying about this place.

Camp Dix, N. J., June 23, 1918.—Cans not properly cleaned at the transfer station.

Camp Upton, N. Y., June 25, 1918.—Cans are not well cleaned owing to the fact that the garbage transfer station, which was destroyed by fire, has not been rebuilt.

Camp Dix, N. J., July 1, 1918.—Cans not sufficiently cleaned owing to lack of hot water; also garbage incinerator is out of order. Garbage successfully removed by truck to Philadelphia.

Ellington Field, Tex., July 1, 1918.—Garbage contract not satisfactory; not removed frequently enough. Contractor will not remove cans unless they are filled, resulting in garbage sometimes remaining in cans for days.

Camp Jackson, S. C., July 20, 1918.—Garbage cans carried through camp to the transfer station uncovered. Transfer station in a condition of extreme filth. Unemptied, uncovered garbage cans were seen on the platform late in the afternoon. The platform, area beneath, and roadway adjacent were filthy. Around the tin-can baling machine the ground was covered with liquid organic filth which had gravitated from the unwashed tin cans. Very few flytraps were in evidence. Organization of the personnel of this plant is evidently very poor.

Camp Lewis, Wash., July 24, 1918.—Flies numerous at the transfer station and but few traps in use. Concrete road around the transfer station is needed.

Camp Grant, Ill., August 5, 1918.—Garbage contract working fairly well. Urgent need of concrete platform at transfer station.

Camp Dodge, Des Moines, Iowa, August 12, 1918.—The garbage transfer station is very badly managed. Ordinary box cars are used. All liquids drain through the bottom to the ground. This has been going on for some months and has resulted in an accumulation of organic filth, which covers a large area at least 6 inches deep. This filth is almost a solid mass of fly larvae (maggots), millions of flies breeding there daily. The garbage in the box car, as well as on the sides of the car and in the garbage station, is covered with a black mass of flies. I have no hesitancy in stating that this is the most unsanitary place I have ever seen in any of our Army camps. In order to correct these conditions, the following improvements are recommended: (a) A concrete platform should be constructed under the cars and drained to a near-by sewer. (b) The contractor should be compelled to remove

the garbage in water-tight cars or receptacles. (c) The camp surgeon should have entire control of the sanitation of this place, and if the contractor will not carry out the necessary instructions in regard to keeping the place sanitary it should, in my opinion, be done by the camp authorities.

Camp Denens, Mass., October 12, 1918.—Cans not properly washed; also no provisions for properly disposing of the waste water.

Camp Upton, N. Y., October 16, 1918.—The new transfer station nearly complete. It should have a concrete base covering the entire surface of the ground beneath the transfer platform; also a concrete floor about the entire building should be constructed.

Camp Dix, N. J., October 19, 1918.—Cans not sufficiently washed. A new can-washing machine urgently recommended.

Camp Funston, Kans., November 3, 1918.—Transfer station poorly policed, swarms of flies, and no flytraps in use. Concreting of the can-washing platform recommended.

Camp Lee, Va., January 6, 1919.—Many fly-proof containers for garbage cans are in need of repair.

Edgewood Arsenal, Md., January 18, 1919.—Garbage-disposal plant in an unsatisfactory condition; erection of a new incinerator with facilities for heating water for washing cans recommended; also construction of new road to garbage plant urgently needed.

Camp Funston, Kans., January 22, 1919.—Cans poorly washed.

Camp Beauregard, La., January 23, 1919.—Becoming unsatisfactory on account of nearly impassable roads.

General Hospital No. 39, Long Beach, Long Island, February 15, 1919.—The garbage is removed by contract once daily. The garbage station was very poorly policed and there were no arrangements of any kind for washing cans; also an inspection of the filled cans showed quite a large quantity of foodstuffs, which indicated that there was some waste from the kitchen.

Camp Humphreys, Va., February 25, 1919.—Garbage-transfer station filthy. Ground around littered with bones and decaying organic refuse. Can-washing station is a small uncovered platform entirely inadequate. Cans washed by hand and in an indifferent manner. Nonedible garbage is burned in a rail incinerator, which is entirely unprotected from the weather. There was a pile of tin cans sufficient to fill four freight cars dumped upon the ground; many were not washed. The entire plant was a disgrace.

Camp Dix, N. J., April 3, 1919.—Cans not properly washed.

Camp Pike, Ark., April 15, 1919.—At the transfer station there was a large pile of old garbage cans partly filled with water and breeding mosquitoes; also a pit latrine uncovered and unscreened and filled to the top with feces.

Camp Funston, Kans., April 18, 1919.—Flies beginning to appear at the transfer station. No flytraps in use. Disused pit latrine near transfer station open and accessible to flies.

Camp Sherman, Ohio, April 21, 1919.—Many flies at the transfer station and no flytraps in use.

General Hospital No. 5, Fort Ontario, N. Y., April 26, 1919.—Incinerator not in repair. No suitable place for washing garbage cans.

Aberdeen Proving Ground, Md., May 16, 1919.—Kitchen garbage cans are kept in screened inclosures. The screening is universally rusty and broken and needs replacement before the fly season is here. All garbage has been incinerated heretofore. On the day of the inspection, however, a garbage contract commenced. The contractor's wagon was leaking very badly and scattering liquid slop through the camp.

The garbage incinerator was poorly policed. Can cleaning was done by prisoners. A few boards laid on the ground constituted the garbage cleaning station. The dirty water after cleaning the cans was thrown on the surrounding ground, thus creating a nuisance and making an attractive place for flies. A concrete can-washing platform with proper drainage and facilities for steaming out cans was recommended.

Aberdeen Ordnance Proving Grounds, Md., May 16, 1919.—Unsatisfactory. Contractor's wagon leaks. Incinerator dirty. Tin cans furnish breeding places for mosquitoes. Provisions for washing cans insufficient.

Camp Holabird, Md., June 2, 1919.—Concrete platform underneath the garbage transfer station urgently recommended.

Camp Lee, Va., June 19, 1919.—Transfer station poorly constructed. Made of wood instead of cement, and provided with tubs and washing cans instead of the approved steaming apparatus; also there is no cement road around the platform, hence soil pollution can not be prevented. Platform is screened, but the doors are very defective, being of light wood and poorly braced and forming cracks through shrinkage, which admit many flies. No power press for baling tin cans.

Camp Lewis, Wash., July 9, 1919.—No fly paper at the garbage plant. Sergeant in charge states that request for some had been disapproved by quartermaster.

Ellington Field, Tex., August 5, 1919.—Cans not properly cleaned. Only one fly-proof garbage station in camp.

General Hospital No. 41, Fox Hills, N. Y., September 26, 1919.—No suitable means at hand for washing cans.

Camp Dix, N. J., November 14, 1919.—Some of the garbage is hauled to a piggery 6 miles from camp. This piggery was in a filthy condition, and the odor from it could be detected 500 yards away. It is located on the watershed of the Pemberton water supply and, as many soldiers live in this village, analysis of the water supply should be made for evidence of contamination from this piggery.

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- (2) A. R., 1387, 1913.
- (3) Circular Letter from the Surgeon General, August 16, 1917.
- (4) Report of the Chief of Construction Division, 1919, 36.
- (5) Telegram from the Surgeon General to department surgeons, all departments, June 20, 1917. Subject: Removal garbage from camps and cantonments. On file, Record Room, S. G. O., Correspondence File, 179811 B (Old Files). Also: Telegram from The Adjutant General to commanding general, Camp Doniphan, Fort Sill, Okla., October 3, 1917. Subject: Approved method collecting garbage at divisional camps. On file, Record Room, S. G. O., Correspondence File, 179811 G. (Old Files).
- (6) Based on reports from sanitary inspectors to the Surgeon General. On file, Sanitation Division, S. G. O., 721 (Camp Jackson, N. C.; Camp Lee, Va., and Camp Lewis, Wash.)
- (7) Garbage and manure disposal, circular of proposal, advertisement. On file, Record Room, S. G. O., Correspondence File, 179811 C (Old Files).
- (8) Report of the Chief of the Construction Division, 1918, 29.
- (9) Night letter from The Adjutant General to the Commanding General of Fort Sill, Okla., dated September 3, 1917. Subject: Collecting of garbage at divisional camps. On file, Record Room, S. G. O., Correspondence File, 720.7 (Misc. Div.).
- (10) Circular No. 133, W. D., March 18, 1919.
- (11) Report of the Chief of the Construction Division, 1919, 37.
- (12) Manual of the Construction Division, Section C, Engineering Division, 49.
- (13) Based on monthly reports from camp sanitary engineers. On file, Record Room, S. G. O., Correspondence File, 671 (Camp Pike) (D).
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- (15) Based on condensed summaries of nutritional survey report. On file, Record Room, S. G. O., Correspondence File, 720.1 (General); also, Preliminary results of Nutritional Survey in U. S. Army Camps, by Lieut. Col. John R. Murlin, M. C., and Major Gasper W. Miller, M. C., *America Journal of Public Health*, Concord, N. H., 1919, ix, No. 6, 401.
- (16) Report of the Chief of Construction Division, 1918, 30.
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- (18) Based on monthly report from camp sanitary engineer on garbage disposal at Camp Jackson, August, 1918. On file, Record Room, S. G. O., Correspondence File, 720.7 (Camp Jackson) (D); and monthly report from camp sanitary engineer, Camp Dix. On file, Record Room, S. G. O., Correspondence File, 671 (Camp Dix) (D).
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CHAPTER XIII

DISPOSAL OF MANURE

In so far as the question of sanitation is concerned, disposal of manure, as is well known, is of practical interest only in the prevention of fly breeding. While masses of manure may be objectionable to the eye, and under certain conditions may produce a disagreeable odor, the general health of a body of troops would in no way be affected by them were it not for the swarm of flies bred in every manure pile which is allowed to remain uncared for.

In the years immediately preceding the declaration of war with Germany the disposal of manure at Army posts and camps had been on a satisfactory basis. The efficient results obtained were largely due to the comparatively small number of animals at any one place and to the well-trained officer personnel, both medical and line, on which devolved fly prevention. Probably the methods then most frequently employed in disposing of manure were by sale or gift to neighboring farmers for use as fertilizer on their lands, or by retention in compost heaps on a distant part of the military reservation, whence it was carried to be applied to the post gardens when necessary. The large size of many reservations made it possible for these manure heaps to be maintained at so great a distance from the inhabited buildings as to prevent the flies which were bred in them from becoming a nuisance in the garrison proper. In some permanent stations, and with troops in permanent or semipermanent camps, the manure was burned.¹ For several years prior to the World War camps were for the most part situated near the Mexican border, and the dry climate of this locality greatly facilitated proper disposition by incineration. The usual procedure was to place the manure in windrows, covering it if necessary with straw and crude oil and then to keep the mass constantly burning. A detail of men remained on duty to see that particles of manure which fell off the pile were raked back into the fire.² After a windrow was started burning, this continued for a long period of time. When the windrows were completely consumed, the resultant débris was scattered over the ground or was removed to the post dump. Orders were in force regarding the police of stables, picket lines, and corrals, cleanliness of these places being required.³ Sometimes stable orderlies were detailed on duty during the day to see that all droppings were immediately raked up and placed on the manure pile. If this was not done, manure was removed night and morning to the stable pile and thence was carried away daily by wagons to the site of ultimate disposal. When necessary to prevent fly breeding at the places where animals were kept, the picket lines were burned over or sprinkled with crude oil at frequent intervals.

At certain posts experiments were conducted having as their object prevention of fly breeding by treating the mass of manure with solutions of borax or other larvacides, or by keeping it tightly packed in compost heaps. With such methods the manure could be retained near the stables until it was desired

for use as a fertilizer, but as a matter of fact in the great majority of Army stations disposition was either by incineration, as described, or by hauling away to a sufficient distance from habitations.

After our declaration of war with Germany, the manure problem in the United States increased in equal proportion to all others falling to the lot of the Army—not, however, that there was ever much fly-borne disease at home. Just as the strength of the Army was multiplied fortyfold so did the number of animals increase, and in place of trained officers to oversee manure disposal, personnel with no previous experience along military or sanitary lines had to be depended on. While there was no increase in the Cavalry strength of the Army, the number of Field Artillery units was greatly augmented.⁴ The animals authorized for each division numbered approximately 6,000,⁵ and provision also had to be made for replacing those lost through injury or disease. The large camps and cantonments now established throughout the country covered usually several square miles, and throughout these areas stabling accommodations had to be provided for the animals attached to the various military units.⁶ Therefore the manure which accumulated was not localized in any one part of a camp, but was widely distributed. At nearly all of the camps large remount depots were established to supply organizations with the authorized mounts and draft animals and with replacements.⁷ At many stations the number of animals in these remount depots ranged from five to ten thousand.⁸ These depots necessarily covered large areas, and their sites were sometimes not the best as regards terrain or character of soil.⁹ In some instances remount depots were situated in locations where numerous depressions existed or on an impervious soil; the ground trampled by the hoofs of many animals after heavy rains was often converted into a veritable quagmire; the droppings in such places could not be collected, and after a short time a mixture of manure and mud accumulated which it was impossible to remove.⁹ Furthermore, some remount depots were located much too near to the inhabited portions of the camp; for example, at Camp Sherman, Ohio, where the depot was close to the bakery and inhabited buildings.^{9,10}

Methods for the collection and disposal of manure, as well as for garbage and other waste, were thoroughly considered by the War Department shortly after the declaration of war and before the large cantonments were ready for occupancy. Those which received the most consideration were (a) sale of manure to contractors who would remove it from the vicinity of the camp and dispose of it for use as fertilizer, and (b) its destruction by incineration. The latter method was clearly very difficult of accomplishment, owing to the large amount of manure which would necessarily accumulate daily from the great number of animals at each camp and to the climatic obstacles which would be encountered in many localities. In favor of disposal by sale to contractors was the urgent need for conservation along all lines and the great value of the manure as a fertilizer to aid in the intensive farming program which it was anticipated would be required because of the world shortage of food and the large number of farm workers in the military service.¹¹ Orders directing the disposal of manure by sale were therefore issued and circulars of proposal for

bids for the removal of manure were published during the summer of 1917.¹² Since the circular in question comprised also proposals for the removal of garbage, it has been quoted in Chapter XII, q. v.

In certain camps, however, owing to the agricultural situation, near-by manure could not be sold, or in fact given away.⁹ At such points incineration was necessary, and usually was carried out by Government labor. Though in at least one station the manure was burned by civilians without expense to the Government, in return for the potash which could be recovered from the ash.¹³

The disposal of all waste matter was at first under the jurisdiction of the cantonment division, subsequently termed the construction division, and the contracts for the disposal of manure for the first year of the war were let by that division.¹¹ Later, in 1918, control was transferred to the salvage division of the Quartermaster General's Office, where it remained.¹⁴ In the first contracts made for the sale of manure the transaction was on the basis of a fixed price per pound.¹⁵ This proved unsatisfactory on account of the delay connected with the weighing of each load and the differences in the quality of the manure which was turned over to the contractors, these differences being caused by the mixture of varying amounts of straw, earth, and other extraneous matter with the animal excreta. After the contracts for the first year were completed, all proposals for the purchase of manure were based on the mean number of animals per month at each camp. The average price received was approximately 75 cents monthly for each animal.¹⁶ The standard form of contract for the sale of manure, as finally adopted, contained the following paragraphs of interest in connection with the methods pursued and the steps taken to protect the health of commands:¹⁷

CONTRACT FOR SALE OF MANURE

* * * * *

Witnesseth: That the parties hereto, in consideration of the mutual agreements herein set forth, do hereby mutually covenant and agree to and with each other as follows:

1. The purchaser agrees to purchase and dispose of manure of public animals collected at ----- (including auxiliary remount depot) during the period beginning ----- and ending ----- at the price and in the manner herein provided.

2. The purchaser will pay for such manure at the rate of ----- cents per calendar month for each animal (horses and mules), to be determined in the following way: The average daily number of animals shall be determined at the end of each calendar month, and payment shall be made for each calendar month on the basis of this average to the camp quartermaster within five days from the date of delivery of bill to the purchaser or his or its representative.

3. The United States will deliver the manure hereby sold at the railroad siding at or near camp or auxiliary remount depot at a point selected by the commanding officer; or, at the option of the United States, to purchaser's vehicles at a suitable point either within or without camp or auxiliary remount depot selected by the commanding officer and approved by division sanitary officer, or other officer performing similar duties; or at the option of the United States, the said manure may be dumped on a compost pile at a point approved by the commanding officer and the division sanitary officer or other officer performing similar duties. When required the purchaser shall furnish at his own expense a suitable and adequate place where such compost pile will be located, within 2 miles of camp or auxiliary remount depot.

4. The purchaser shall provide and keep in working order a plant and equipment of sufficient capacity and with a sufficient number of employees to receive and dispose daily of all manure delivered as provided in the preceding paragraph.

5. All manure shall be handled and disposed of by the purchaser in such manner as not to cause conditions detrimental to the public health nor constitute a public nuisance; and the conditions and methods of disposal of manure shall be always subject to regulations prescribed by the commanding officer.

* * * * *

7. The purchaser shall not have the right to use Government equipment or labor of any kind whatsoever in the performance of this contract, except as herein specifically set forth.

8. If at any time the commanding officer shall be of the opinion, and so certify in writing, that the purchaser is violating any of the conditions or covenants of this contract, or is not executing the same in accordance with the terms hereof, the United States may cancel and terminate this contract by mailing a written notice, stating the fact of cancellation, to the purchaser.

9. In the event of such cancellation, pending completion of other arrangements for the disposal of manure hereby contracted for, the United States may make use of the plant and equipment for manure disposal employed by the purchaser or any subcontractor, in the performance of this agreement, and may use same until other adequate arrangements for manure disposal or removal have been completed, such arrangements to be completed as soon as is reasonably practicable by the United States.

* * * * *

13. The United States may retain such manure as it desires for use in development of gardens or farms within the camps or cantonments or operated for supplying same with food products; in such case purchaser shall be entitled to deduct from his payments hereunder a sum equal to the amount paid by contractors for every animal thus retained by the United States.

14. The purchaser shall furnish a bond with satisfactory surety or sureties in the sum of ----- dollars, conditioned that he will well and truly perform and comply with all the covenants and agreements of this contract and all the rules and regulations made by the commanding officer or the division sanitary officer or other officer performing similar duties under the provisions of this contract.

* * * * *

During the early part of the war, incident to the general confusion existing because of the rapid mobilization of untrained troops, considerable difficulty was experienced from a sanitary standpoint in the disposal of manure.⁹ Fortunately this was in the late fall and early winter, when fly breeding was not of great moment. Before the onset of hot weather in 1918 the situation at most camps had become fairly satisfactory and, considering the magnitude of the problem involved, was thereafter well handled. Extracts from the reports of the sanitary inspectors from the Surgeon General's Office are quoted at the end of this chapter. They indicate the defects found by these inspectors to exist at various stations, which in most instances noted were promptly corrected.⁹

Little or no provision was made for suitable loading platforms at the points where manure was placed upon railroad trains from the wagons in which it had been collected from the stables or remount stations.⁹ It therefore proved impossible to throw the manure onto the cars without a considerable quantity being spilled on the ground. If this manure was not promptly swept up, it mixed with the soil and offered an excellent breeding spot for flies. By far the most satisfactory loading platform for this purpose is one built of con-

crete and so constructed that the wagons can be driven upon it, their beds to be about on a level with floor of the railroad car. Space between and on the opposite side of the rails should be paved and drained. Any manure spilled can then be readily swept up and thrown upon the car, and such a loading point can also be thoroughly cleansed with a hose at any time.

The instructions issued in Special Regulations, No. 77, W. D., 1918, relative to the care of compost piles when for any reason it was impossible immediately to remove the manure by train, were carefully drawn, but contractors were at times negligent in fully complying therewith.⁹ (Special Regulations, No. 77, is quoted in Chap. XII, "The disposal of garbage and waste.") This is a condition which unfortunately is too often found in caring for quantities of manure and which the general public usually regards with equanimity.⁹

The great shortage of railroad cars during the war was another of the difficulties experienced.⁹ When the contractor, in perfect good faith, had made the necessary arrangements for the removal of manure, the essential railway transportation often was not available, and it then became necessary to permit accumulations of manure where facilities for the proper treatment of the resulting compost heaps had not been provided. In some cases ordinary box cars were furnished. The difficulties attending the loading of manure in cars of this type can readily be appreciated. It was found that gondola cars should be made available for this purpose whenever possible. Fly breeding sometimes occurred in railroad cars detained in the yards.⁹

Especially during the early part of the war, good roads were lacking in many camps and during rainy weather or after heavy showers the roadways were frequently almost impassable for heavy wagons and thus the removal of manure from the stables and remount stations was delayed or rendered impossible.⁹ The practice was to place under the direction of the organization commanders the transportation of the manure from organization stables to the place designated for the contractor to receive it. In certain instances proper supervision was not given here, with the result that large quantities of manure would accumulate around the stables before any of it was removed. Scarcity of men for this purpose often led to very incomplete cleaning of the corrals in remount stations, in spite of the mechanical appliances, such as scrapers and animal-drawn rotary sweepers, which were provided for use in removing droppings.⁹

At some of the smaller posts and camps where no contract for its sale could be made, the manure was given to neighboring farmers, who sent their wagons directly to the stables.⁹ This arrangement was usually satisfactory, providing the farm to which it was taken was sufficiently far away from the military station concerned. If too near, the local sanitary inspector frequently had difficulty in compelling the farmer to give the proper care to his compost heap or to plow in manure scattered on fields. At other small stations the manure was burned, various methods being adopted.⁹ Where the quantity was small and an incinerator was available this was used. The "Panama frame," built of steel rails, was tried at some places but did not prove an unqualified success.⁹ The usual method was burning in windrows, as previously described, and where proper supervision was given, and climatic conditions were not too unfavorable, satisfactory results were obtained.

In many instances officers responsible for the care of manure desired to treat it with chemicals in order to prevent the breeding of flies without the labor and expense of removal.⁹ While borax, formalin, and crude oil are known to be more or less effective in the prevention of fly propagation in and about compost heaps, nevertheless the Medical Department has always held to the principle that strict police was a better way to solve the problem. This attitude is illustrated by the following quotations:¹⁸

[Third indorsement]

WAR DEPARTMENT, S. G. O.,
July 11, 1919.

To the DIRECTOR OF PURCHASE (RAW MATERIALS DIVISION),
Munitions Building, Washington, D. C.

Returned.

1. The destruction of all breeding places and the maintenance of perfect sanitary police are prime requisites for a successful campaign against the common house fly. Attention is invited to paragraph 6, letter A. G. O., dated April 2, 1919, copy inclosed herewith. When stables, picket lines, corrals, waste dumps, and other breeding places are properly policed and all refuse promptly removed to a safe distance from camp, the fly pest can be prevented. The use of larvicides or other chemicals, as a general rule, is unnecessary, expensive, and undesirable.

2. Under certain conditions it may not be possible to promptly remove manure or other refuse in which flies breed. It then may become advisable to apply chemical treatment to stable areas and dumps. A cheap and efficacious remedy, to be used as a spray after the best possible police of areas has been obtained, is made by adding about 3 pounds of commercial borax to 50 gallons of water. This solution should be used freely under such circumstances. Formalin solution is used to kill adult flies, but its use is not often indicated.

3. The use of chemicals can not take the place of proper sanitary police, and the issue of chemicals for this purpose, under ordinary conditions, should be discouraged. Under exceptional conditions, as noted in the preceding paragraph, borax should be issued in sufficient quantities to meet the local needs.

After the signing of the armistice surplus animals were sold and the amounts of manure to be disposed of in military stations were thus greatly reduced.¹⁹ This rendered it impracticable to ship the manure away daily on railway cars, and it became necessary to establish compost piles near the loading stations and to permit accumulation until sufficient was available to warrant the contractor in securing the necessary railway equipment for its removal. In such a case constant attention had to be given the compost pile if the breeding of flies was to be prevented; the results obtained were dependent on the efficiency of the local sanitary inspector and the support which he received from the camp commander in enforcing his recommendations. The instructions given in paragraphs 130 to 132, Special Regulations, No. 77, and in paragraph 9, Special Regulations, No. 28, were amply sufficient if thoroughly carried out.

The following extracts from reports submitted by sanitary inspectors from the office of the Surgeon General indicate some of the difficulties encountered from time to time in connection with the disposal of manure:⁹

Camp Taylor, Ky., January 16, 1917.—On account of heavy snow, farmers have been unable to remove the manure and it is accumulating very rapidly.

Camp Meade, Md., August 26, 1917.—Manure thrown into piles near the stable and breeding enormous numbers of flies. Stables full of accumulated manure and in a most unsanitary condition.

Langley Field, Va., September 27, 1917.—Much manure left in piles and is breeding flies.

Camp Wadsworth, S. C., September 29, 1917.—Manure of Cavalry neither removed nor burned, but piled a short distance behind the picket lines.

Camp Grant, Ill., October 26, 1917.—Ground about the manure-loading platform soft, and manure is being trodden in. Various piles of manure scattered about the camp.

Camp Beauregard, La., October 30, 1917.—Manure not removed from paddocks.

Camp Jackson, S. C., November 30, 1917.—Unsatisfactory. Removed by contractor, who has an insufficient number of wagons to perform the work. Has 14, but needs 30.

Camp Lee, Va., January 23, 1918.—Unsatisfactory; large amount of manure in and about camp. Basic trouble is apparently a shortage of railway service.

Camp MacArthur, Tex., February 7, 1918.—Manure has been dumped into an arroyo 1 mile from camp and only a portion of it burned. Efforts are now being made to burn the remainder.

Gerstner Field, La., February 14, 1918.—That part of the camp formerly occupied by contractors is literally covered with manure.

Camp Sherman, Ohio, February 22, 1918.—Owing to the shortage of cars, an enormous amount of manure has collected in the remount station. A vast amount of labor would be required to remove it as it has become thoroughly mixed with mud.

Port of embarkation, Newport News, Va., March 1, 1918.—In parts of the animal embarkation corrals the mixture of manure and mud is from 6 inches to 1 foot deep. The corrals are still undrained and have some pools of water remaining in them.

Camp Devens, Mass., March 14, 1918.—Much manure on the ground. Great need of manure-loading platforms. Shortage of cars and labor prevents prompt disposal of manure.

Camp Dix, N. J., March 15, 1918.—No proper loading platforms. Much manure on grounds near railroad track.

Camp Taylor, Ky., March 20, 1918.—Much manure has collected during the winter months. Unless it is promptly removed a fly pest will result.

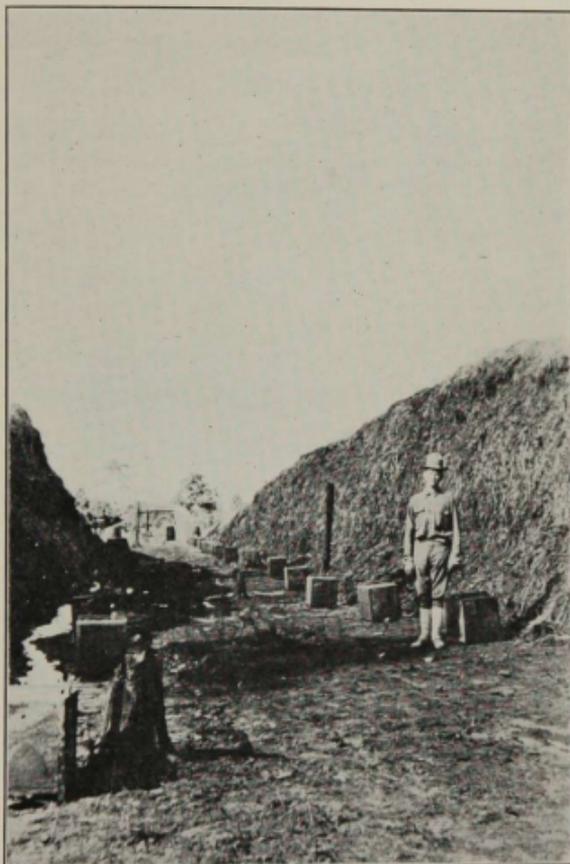


FIG. 52.—Manure compost-piles, showing lane between piles, with flytraps

Camp Upton, N. Y., March 26, 1918.—Unsatisfactory because of lack of transportation. There are several very large manure dumps on the reservation which, unless promptly removed, will be a fly menace.

Fort Douglas, Utah, April 3, 1918.—Manure allowed to collect during winter; placed in one pile on the reservation, to be used as fertilizer; liable to become a sanitary menace, and its immediate removal recommended.

Camp Sheridan, Ohio, April 14, 1918.—Much manure is present on all the roads in or near the camps and on the drill grounds and "no man's land." Unless it is removed much fly breeding will result.

Camp Wadsworth, S. C., April 20, 1918.—Much manure on the roads and in "no man's land."

Picatunny Arsenal, N. J., April 23, 1918.—Stables are not being cleaned, and manure is allowed to collect in stables. Its immediate removal and destruction recommended.

Camp Gordon, Ga., May 7, 1918.—Box cars used in removal very unsatisfactory. Gondola cars should be used.

Camp Johnston, Fla., May 10, 1918.—Concrete loading platform needed at the manure loading station.

Camp Wheeler, Ga., May 10, 1918.—Considerable manure being spilled on the ground between the railroad cars and the loading platform. Orders requiring the removal of this scattered manure are not being observed.

Camp Hancock, Ga., May 12, 1918.—Large piles of manure dumped on a farm just off the reservation.

Rockwell Field, Calif., May 24, 1918.—Manure carted to the dump. Neither treated nor burned.

Camp Hill, Va., June 11, 1918.—Large piles of manure in the animal embarkation corrals near the James River.

Langley Field, Va., June 11, 1918.—Collection of manure very poorly done. Stables are poorly policed, especially those of the contractor, which are in an extremely unsanitary condition and swarming with flies.

Camp Lee, Va., June 18, 1918.—There is considerable manure both in camp and at the remount station. Manure is hauled to a siding and loaded on cars, but the loading ramp is too small to admit anything but small carts, hence manure from wagons has to be transferred to cars by pitchforks, thus littering the surrounding car tracks, where intensive fly breeding is now going on.

Camp Gordon, Ga., July 17, 1918.—Owing to impassable condition of roads during the winter and spring, a large amount of manure was collected at the remount station. This is being removed as rapidly as possible.

Camp Lee, Va., August 11, 1918.—Great difficulty in disposing of manure owing to inability of railroad to furnish enough freight cars and to the fact that manure is not listed as a commodity.

Camp Custer, Mich., August 15, 1918.—Concrete manure loading platform recommended.

Camp Beauregard, La., August 22, 1918.—Manure loading platform unsatisfactory. Permits breeding of flies.

Camp Shelby, Miss., August 24, 1918.—Manure should be removed from camp by railway.

Camp Wheeler, Ga., August 28, 1918.—Manure loading platforms provide excellent places for fly breeding. Should be replaced by concrete or macadam platforms.

Camp Sevier, S. C., August 31, 1918.—Manure was formerly dumped without burning within half a mile of camp. At present, owing to the presence of glanders, it is being burned in windrows.

Camp Taylor, Ky., September 5, 1918.—A large collection of old manure in a compost heap was noted near the remount station. This contained fly larvæ. This accumulation was said to have occurred during the past winter when roads were blocked. It should be burned.

Camp Upton, N. Y., October 16, 1918.—A large amount of manure was spread about camp during the summer despite the protest of the sanitary inspectors, and this resulted in the breeding of a large number of flies.

Camp Shelby, Miss., November 16, 1918.—Corrals of remount station poorly policed and much manure left along the fences and in the hollows.

Rockwell Field, Calif., February 26, 1919.—Manure removed daily, but impossible to keep stables clean on account of the sandy condition of the soil. Floors should be cemented.

Camp Sherman, Ohio, April 21, 1919.—There is a large pile of manure and straw at the gravel bed near the remount station. This should be burned. No flytraps in use at the manure loading platform.

Camp Dodge, Iowa, June 4, 1919.—Remount station too near camp. Manure burned three-quarters mile from camp. This method inadequate, and there are 20 acres of manure in windrows not yet burned.

Camp Pike, Ark., July 18, 1919.—Manure at the remount station is placed in compost piles near the south edge of the corrals. This is done on account of its being too wet for burning, due to excessive rain and admixture of corral mud and also on account of alleged shortage of cars. It is treated with 5 per cent carbolic acid solution, but in spite of this is breeding large numbers of flies. This system of handling manure is in general very unsatisfactory, and an effort should be made to either burn it or secure cars and haul it away.

Fort Bliss, Tex., July 28, 1919.—Manure dump one-half mile from barracks. Breeding enormous numbers of flies. Manure in old railroad iron incinerators and in windrows not properly burned.

Camp Knox, Ky., July 28, 1919.—The manure at Camp Knox is sold to a contractor who previously hauled this waste to railroad cars and shipped it to Louisville. This arrangement was quite satisfactory. Recently, however, the contractor has been composting the manure at a distance of about 2 miles from camp, near the town of Tiptop. Exceedingly heavy fly breeding was found in this manure pile, which contained several hundred loads of manure. It was recommended that it be removed and the soiled area treated with a heavy sprinkling of crude oil, or that permission be obtained to burn the pile and discontinue further unloading. A second compost pile was contemplated northwest along the railroad right of way from the present site at Tiptop. This method of handling manure should be used only as a last resort, and the contractor should be compelled to haul it away on cars, if possible.

Camp Taylor, Ky., July 30, 1919.—During a period when it was impossible to remove the manure in the regular way some 2,500 loads were composted at the remount station. The manure was treated with a 3 per cent formaldehyde solution as piled, and at the inspection it was impossible to find any breeding. This manure has been sold and will be removed within 20 days, it is reported.

Camp Dix, N. J., August 23, 1919.—Large compost heap breeding flies; also flies breeding beneath the manure loading platform.

REFERENCES

- (1) Havard, Valery, Colonel, M. C.: Manual of Military Hygiene, Wm. Wood and Co., New York, 1914, 662.
- (2) *Ibid.*, 1917, 676.
- (3) G. O. No. 45, W. D., September 11, 1916.
- (4) Letter from The Adjutant General of the Army, to the Surgeon General, July 20, 1917. Subject: Provisional organization of Cavalry regiments as Field Artillery regiments. On file, Record Room, S. G. O., Correspondence File, 192222. (Old Files); also, Tables of Organization, U. S. Army, 1917.
- (5) Tables of Organization, No. 8, U. S. Army, 1917.
- (6) Plans for stables. On file, Mail Control Division, Construction Service, Quartermaster General's Office, 652 H.
- (7) G. O. No. 105, W. D., August 13, 1917, par. 1.
- (8) Annual Report of the Quartermaster General, U. S. Army, 1919, 44.
- (9) Reports of sanitary inspectors made to the Surgeon General. On file, Sanitation Division, S. G. O., 721 (General).
- (10) Report of special sanitary inspection of Camp Sherman, Ohio, August 9, 1918, by Col. Albert E. Truby, M. C. On file, Sanitation Division, S. G. O., 721.

- (11) Report of the Chief of the Construction Division, 1918, 29-30.
- (12) Circular of proposed advertisement. On file, Record Room, S. G. O., Correspondence File, 179811 C. (Old Files).
- (13) Report of sanitary inspection, Camp Dodge, Iowa, November 16, 1918, by Col. W. P. Chamberlain, M. C. On file, Record Room, S. G. O., Correspondence File, 721.-1 (Camp Dodge) (D).
- (14) Report of the Chief of Construction Division, 1919, 113-115.
- (15) Study of existing contracts covering the disposal of camp and stable waste at the cantonments of the National Army, by P. L. Baldensberger, November 27, 1917. On file, Storage Files, A. G. O., Miscellaneous Division, 400.74.
- (16) Monthly summaries of reports of the various activities of the Division of Conservation and Reclamation, Office of the Quartermaster General. On file, Salvage Division, Office of the Quartermaster General (Document File). Also: Monthly reports on collection and disposal of garbage, miscellaneous material and manure. On file, Salvage Division, Quartermaster General, 720.7.
- (17) Copy of this form on file, Record Room, S. G. O., Correspondence File, 720.7.
- (18) Third indorsement, War Department, S. G. O., July 11, 1919, to the Director of Purchase (Raw Material Division). On file, Record Room, S. G. O., Correspondence File, 436.-1.
- (19) Annual Report of the Quartermaster General, U. S. Army, 1919, 47.

CHAPTER XIV

FLY CONTROL

The typhoid epidemic in our troops during the Spanish-American War in 1898, with the studies thereof by Reed, Vaughan, and Shakespear, first brought prominently before sanitarians the importance of contact infection and the fly as an agent in the transmission of infectious intestinal diseases among armies in the field.¹ Prior to the World War much had been done by our medical officers to limit the danger from flies in camps, notably with respect to the more

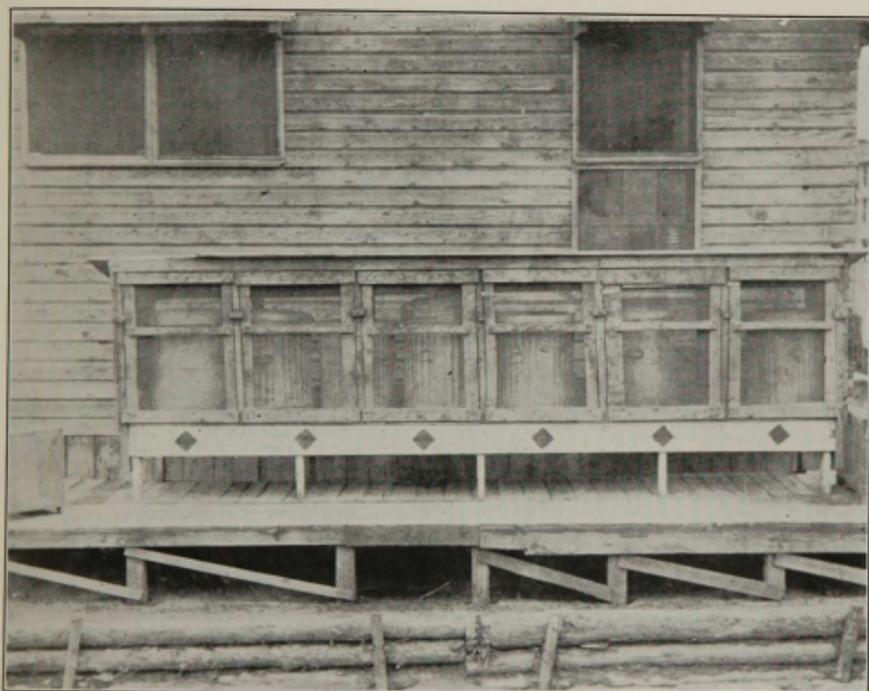


FIG. 53.—One method of protecting garbage cans from flies

efficient disposal of all human excreta; the screening of latrines; the disinfection of discharges infected with pathogenic organisms; the provision of wider space between kitchen and latrine in camp layouts; the protection of food from flies by means of screening; the prevention of fly breeding through better care of garbage, human excreta, manure, and other organic refuse; and the destruction of adult flies. Many of these matters are discussed in the preceding chapters dealing with the disposal of excreta, garbage, and manure. Screening will in part be treated in the next chapter. In the following pages will be described certain other phases of the fly-control problem.

The prevention of the fly nuisance had been so fully dwelt upon in works on military hygiene that officers of the Medical Corps, and also of the line, in the Regular Army were alive to the importance of the subject. Such was not the case, however, among the majority of the civilian physicians and new line officers who were to be called to the colors. In view of this situation, Special Regulations, No. 28, entitled "Sanitary Regulations and Control of Communicable Diseases," which was issued on August 10, 1917, dealt extensively with the problems of garbage, manure, and excreta disposal in their relation to fly breeding, and contained the following paragraphs specifically relating to flies:

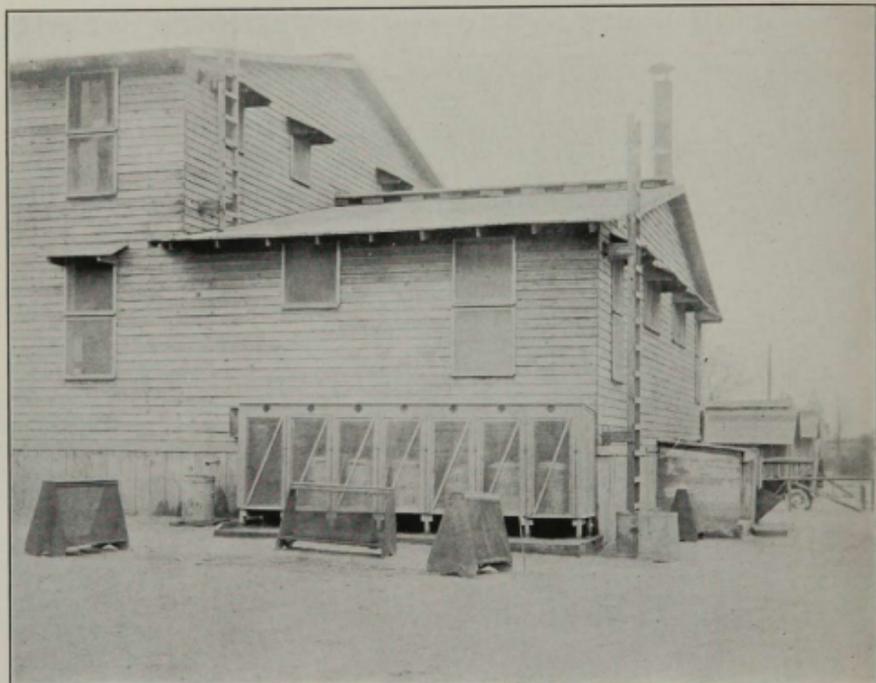


FIG. 54.—Another type of fly-proof shelter for garbage cans outside a company kitchen (located in the ell). Note also the flytraps required by War Department instructions

18. *Flies*.—All possible breeding places of flies should be destroyed, particular attention being given to manure and refuse from picket lines and stables. An energetic campaign must be begun at once against the mature flies.

* * * * *

Human excrement should be properly disposed of, breeding places of flies destroyed, food supplies protected, and persistent warfare against the fly unceasingly carried on.

Flies developed to a very marked extent during the early period at most of the camps under construction.² This was due mainly to the fact that large numbers of animals were used and the work was carried on by civilians who were not under military discipline and had little regard for sanitary requirements. Soon, however, camp surgeons were assigned to camps³ in process of construction, and under their direction sanitary squads were organized which, with other appropriate measures, materially abated the fly nuisance by the time

drafted men and National Guard troops began to arrive in camp in the first half of September, 1917.² The early onset of cold weather practically eliminated the fly menace for the remainder of that year.

Steps were taken at an early date by the Surgeon General's Office with a view to fly limitation during the ensuing year. The question of screening was discussed verbally with the Quartermaster Department, and on December 27, 1917, a memorandum was sent to the Quartermaster General recommending that kitchens, dining rooms, bakeries, and post exchanges be screened in all National Army and National Guard camps in the United States. The correspondence regarding screening will be found in the succeeding chapter on malaria control.

Difficulties were arising constantly as a result of the tearing or rusting of wire gauze, the loss or poor action of springs, and the improper fit or warping of the light, cheap doors which were provided.² The importance of keeping doors closed was also a subject which was very difficult to impress upon the inexperienced kitchen and dining-room personnel.²

The supervision of measures for the elimination of adult flies is vested in the Medical Department,⁴ but the providing of materials for the purpose is a function of the Quartermaster Corps,⁵ while the actual utilization of such appliances rests in the hands of organization commanders for the most part, though in some military stations during the World War sanitary squads were organized by the Medical Department to place, bait, and otherwise care for traps, fly paper, poisons, etc.² On February 26, 1918, the Surgeon General addressed a communication bearing on these matters to The Adjutant General. This letter, together with the indorsement referring it to the Quartermaster General, is as follows:⁶

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, February 26, 1918.

From: Surgeon General, U. S. Army.
To: The Adjutant General of the Army.
Subject: Flytraps and fly paper.

1. In view of the approach of the fly season, it is recommended that the Quartermaster Corps provide flytraps, fly paper, and fly "swatters" in the amounts shown below for every National Army cantonment, National Guard cantonment, Regular Army camp, special camp, port of embarkation, aviation field, recruiting depot, general hospital, and other military station.

2. Large flytraps, approximately 21 by 21 inches, should be provided in the following numbers for the points designated:

(a) At each stable or picket line of a regiment or other organization.....	10
(b) At each stable or corral in a remount station.....	20
(c) At each veterinary hospital.....	25
(d) At each cantonment garbage transfer station.....	25
(e) At each manure-loading platform.....	25

3. Medium-size flytraps, approximately 14 by 14 inches, should be provided in the following numbers for the points designated:

(a) For each garbage-can platform at each mess.....	4
(b) For each door of each kitchen and mess room of a company or other organization.....	2
(c) In each lavatory building or pit latrine shelter.....	2
(d) At each door of each bakery.....	2
(e) In and about each exchange of a regiment or other organization.....	12
(f) For each division, or other large cantonment, for replacements and for miscellaneous use, including contractors' camps.....	300

4. Small-sized flytraps of the usual balloon or cone-shaped type (about 6 inches in diameter), or similar small type, should be provided in the following numbers for the points designated:

(a) For use in the mess room and kitchen of each company or other organization.....	12
(b) For the kitchen, and mess room of each base hospital.....	25
(c) For the diet kitchen in each ward of each base hospital.....	2
(d) For each lavatory in base hospital wards.....	2
(e) For each bakery.....	20

5. Large and medium size traps of the general type of the Curry Champion portable, folding, all-metal trap are recommended.

6. Fly paper, preferably of the "Pyramid" ribbon type, should be provided in the following amounts for the points indicated:

	Rolls per week
(a) For each mess of a company or other organization.....	12
(b) For each bakery.....	36
(c) For each base hospital ward.....	12
(d) For the main kitchen of each base hospital.....	36
(e) For the exchange of each regiment or other organization.....	24
(f) For each lavatory building or pit latrine shelter.....	6
(g) For the laboratory of each base hospital.....	12
(h) For the morgue of each base hospital.....	6
(i) For each division for miscellaneous uses.....	200

7. Fly "swatters" should be provided at the rate of 12 for the mess room and kitchen of each company or other organization.

8. Early action in providing these articles is extremely important. The prevention of the fly nuisance is largely dependent upon action at the beginning of the fly season in order that the first flies appearing after their winter hibernation may as far as possible be destroyed before they have time to perpetuate the species.

9. If the above recommendations are approved, it is requested that general orders be issued, in substantially the following words:

General Orders, No. —.

I. Early and energetic measures must be taken with a view to reducing to a minimum the number of flies in all military camps and stations during the approaching warm season. These measures are to be directed along two distinct lines: First, the prevention of breeding; second, the destruction of adult flies. Early attention must be given to both lines of work if the best results are to be obtained. The prevention of the fly nuisance is largely dependent upon action at the beginning of the fly season in order that flies appearing after their winter hibernation may, as far as possible, be destroyed before they have time to perpetuate the species.

II. The prevention of fly breeding must be energetically carried out along the well-recognized lines. Particular care is necessary at remount stations.

III. Flytraps will be issued by the Quartermaster Corps in the numbers shown below. They will be maintained in the places and in the numbers indicated. Special attention will be given to the proper baiting of the traps. The use of several kinds of bait for the same trap at the same time is recommended.

- (a) Large flytraps, approximately 21 by 21 inches, square at the base:
 - 10 for each stable or picket line of a regiment or other organization.
 - 20 for each stable or corral at a remount depot.
 - 25 for each veterinary hospital.
 - 25 for each cantonment garbage transfer station.
 - 25 for each platform used for loading manure.
- (b) Medium-size flytraps, approximately 14 by 14 inches, square at the base:
 - 4 for the garbage can platform at each mess.
 - 2 outside each door of each kitchen and mess room of a company, or other organization.
 - 12 in and about each exchange of a regiment or other organization.
 - 2 at each door of each bakery.
 - 2 in each lavatory building or pit latrine shelter.
 - 300 for each division or other large camp or cantonment; for replacements, and for miscellaneous uses (including contractors' camps).

- (c) Small-size flytraps, approximately 6 inches in diameter:
 12 for use in the mess room and kitchen of each company or other organization.
 25 for the kitchen and mess room of each base hospital.
 2 for the diet kitchen in each ward of each base hospital.
 2 for each lavatory in each base hospital.
 20 for each bakery.

IV. Flypaper will be issued by the Quartermaster Corps in the amounts shown below. This paper will be maintained in the places indicated and renewed as circumstances demand:

- 20 rolls per week for the mess of each company or other organization.
 36 rolls per week for each bakery.
 12 rolls per week for each ward in a base hospital.
 36 rolls per week in the main kitchen and mess room of each base hospital.
 24 rolls per week for the exchange of each regiment or other organization.
 6 rolls per week for each lavatory building or pit latrine shelter.
 12 rolls per week in the laboratory of each base hospital.
 6 rolls per week in the morgue of each base hospital.

V. Fly "swatters" will be issued by the Quartermaster Corps and maintained at the rate of 12 for the mess room and kitchen of each company or other organization. When the action of flytraps and fly paper is inadequate to destroy the flies in a mess room, company commanders will detail sufficient men to kill off the remaining flies, before each meal, by the use of swatters.

[Fifth indorsement]

438.8 Fly paper (Misc. Div.).

WAR DEPARTMENT, A. G. O., April 2, 1918.

TO THE QUARTERMASTER GENERAL:

Who is directed to furnish the material necessary for the flytraps and fly swatters called for in letter of the Surgeon General; the traps and swatters to be made locally by the troops, unless local purchase of traps and swatters can be made to advantage. Outside flytraps to be of wire screening, inside traps of a suitable cotton material. The fly paper called for will also be supplied. A deficit of \$250,000 is authorized to cover this expenditure. This material will be supplied to all stations, camps, and cantonments at the earliest possible moment, without requisition.

With the understanding that the War Department soon would issue directions to commanding officers of camps, cantonments, and other stations to submit requisitions for the materials in the letter just quoted, the Surgeon General, on March 5, 1918, issued a memorandum to division and other surgeons with a view to securing early action because of the impending fly season.⁷ The memorandum repeated the data as to flytraps and fly paper included in the proposed general order thereon.

No general order was issued on the subject; however, the following letter of instructions, prescribing the measures necessary for fly prevention, was sent by The Adjutant General, under date of April 2, 1918, to divisional commanders, department commanders and commanding officers of excepted places:⁸

1. Early and energetic measures must be taken with a view of reducing to a minimum the number of flies in all military camps and stations during the approaching fly season. These measures must be directed toward the prevention of breeding and the destruction of the adult flies. Early attention must be given to both lines of work. The prevention of the fly nuisance is largely dependent upon action at the beginning of the fly season, in order to destroy flies appearing after their winter hibernation before they have time to perpetuate their species, and to provide for this an active campaign against adult flies must be undertaken along the following lines.

2. Flytraps of suitable size should be placed at each stable, picket line, and corral; at each veterinary hospital, garbage transfer station, platform for loading manure; at each lavatory, pit latrine shelter, and garbage can platform; at each kitchen, mess room, and bakery, and at any other place where flies congregate.

3. Flypaper should be hung in each mess, bakery, kitchen, hospital ward, exchange, lavatory, pit latrine shelter, laboratory, and morgue, being renewed as circumstances demand.

4. Fly swatters should be maintained in each mess room and kitchen, and used when the traps and fly paper are not sufficient to keep the flies down.

5. The Q. M. D. will furnish the initial allowance of fly paper and the materials for the manufacture of the traps and swatters without requisition. Outside traps will be made of wire screening material; inside traps of cotton material, if there is not sufficient wire screening. Improvised flytraps can be made of oil and gasoline cans.

6. Nothing in these instructions should be construed as diminishing the necessity for an energetic campaign against the breeding places. This should be carried out along the well-recognized lines, and is the main reliance in the prevention of the fly evil; the use of the traps, fly paper, and swatters is to supplement those efforts.



FIG. 55.—A type of improvised flytrap similar in shape to the Curry Champion trap

This communication, together with the memorandum from the Surgeon General's Office, which is quoted above, formed the basis for the campaign against the adult fly during the remainder of the war. In the following year, on request of the Surgeon General, the provisions of the above letter of April 2, 1918, were promulgated in essentially the same words by Circular No. 133, War Department, March 18, 1919, and the Surgeon General's memorandum of March 5, 1918, was replaced in a slightly amplified form by Circular Letter No. 148, S. G. O., March 22, 1919.

In order to impress upon medical officers the importance of fly prevention, especially when troops were sent abroad, the Surgeon General in May, 1918, circularized to all stations an order regarding sanitation which had been issued by the commanding general of the British Fourth Army during the preceding year. The following extracts therefrom are pertinent to the present discussion:

[Routine Orders, No. 61, by Gen. Sir H. S. Rawlinson, Bart., K. C. B., K. C. V. O., commanding Fourth Army. April 16, 1917. Adjutant General's Branch. 846—Sanitation]

GENERAL REMARKS

1. The approach of warmer weather makes it imperative that all ranks should appreciate the necessity for taking every possible precaution to safeguard the health of the troops during the coming summer.

It must be impressed upon all ranks that their comfort and immunity from preventable disease will depend upon the cleanliness of their surroundings, and more especially upon the destruction and nonaccumulation of all matter which can attract, or afford a breeding place for flies. Every man must do his share of this necessary work, and the responsibility for seeing that it is done must be extended down to the commanders of platoons and other small units.

2. During the offensive of last year certain epidemic diseases gained a considerable hold, and there is good reason to believe that most formations which took part in the battle of the Somme include men who are carriers of disease germs. The universal and conscientious observance of the rules of sanitation is, therefore, necessary, if an epidemic of a serious nature is to be warded off.

3. The diseases in question, the most prevalent of which is dysentery, all belong to the so-called "enteric" group. The germs which cause these diseases are spread through the feces and urine of patients—early cases, slight cases, convalescents, and "carriers." The diseases are literally caught by the swallowing of infected matter introduced into the mouth in water or in food contaminated by flies, dust, mud, or dirty hands. The sanitary measures detailed below all aim at the prevention of this swallowing of filth.

4. It is a breakdown of ordinary sanitation which is most to be feared and guarded against. When excreta lie exposed and are trodden about, when flies swarm from latrines to cookhouses and to uncovered food, or when shell-holes water is the only water available, then infection is inevitable.

5. If, on the other hand, the value and object of the sanitary measures and rules laid down in this order are correctly appreciated by all ranks, and if the sanitary organization of units is sound and efficient, preventable disease will be reduced to a minimum.

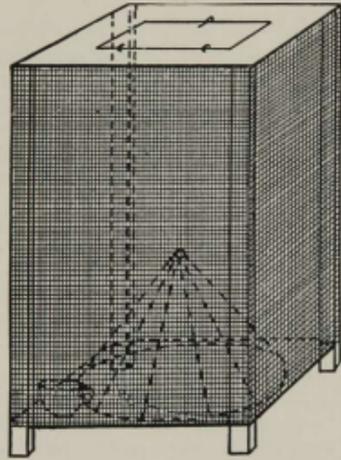


FIG. 56.—Flytrap, as made by company artificer

RESPONSIBILITY

6. The commander of every formation and unit is responsible for taking all measures necessary for the preservation of the health of those under him. He is responsible that each officer and soldier observes all sanitary orders, and that quarters and localities occupied by the troops under his command are kept and left in a clean and sanitary condition, no matter how short the period for which they may be occupied.

Commanding officers will be held responsible that:

(a) All officers and N. C. O.s are instructed in the principles of sanitation, and that they are acquainted with the orders bearing upon it.

(b) Sanitary personnel, as laid down by establishment for the units, are properly trained in sanitary duties, and are given every facility for, and assistance in, the execution of those duties.

* * * * *

FOOD

19. Food must be protected from dust and dirt, and stored as far as possible in fly proof cupboards or boxes. Gauze or butter muslin for the purpose will be obtained through ordnance officers. The indents will first be submitted to the administrative medical officer concerned, who will certify that the quantities demanded are not in excess of actual requirements.

* * * * *

24. Permanent latrines, on the public system, will be made as soon as possible directly movement ceases. They will be either:

(a) Deep trench latrines, 8 feet deep by 2 feet wide, with fly-proof covers provided with self-closing lids; or, if these are undesirable, owing to the danger of infecting water supplies, to low-lying ground, or to lack of space.

(b) Buckets, under fly-proof covers, with incineration of excreta.

* * * * *

FLIES

26. The diseases from which armies suffer most severely are largely spread by flies, which carry infectious filth from latrines, etc., and deposit it upon food.

This danger will be guarded against by:

(a) Destroying the flies themselves with flytraps, poisons, sprays, etc.

(b) Destroying their breeding places—fresh horse manure and food refuse.

(c) Preventing their access to excreta by making latrines fly proof.

(d) Covering all food.

27. Flytraps will be obtained through ordnance officers.

28. Fly papers will be obtained through supply officers.

HORSE MANURE

29. Ninety per cent of all flies lay their eggs in fresh horse manure. During the succeeding 48 hours the eggs hatch into maggots, from which flies eventually emerge. To prevent this, every effort will be made to dispose of all fresh manure. This can be effected by one or both of the following methods:

(a) *Burning the manure.*—This is the better method and can be carried out without great difficulty even when there are large numbers of horses, provided that the fires are carefully tended, that the fresh manure is spread evenly in a thin layer over the burning heaps, and that large amounts of wet mud and manure scraped from horse lines in rainy weather are carted away and not dumped on the fires.

(b) *Close packing the manure.*—The manure is carted away daily to a dump, where it is tightly stacked and firmly beaten down into regular heaps, 10 feet square and 5 feet high.

The ground upon which the heap is to be stacked is thoroughly treated with wood-preserving oil, and the heap, while fresh, is sprayed each evening with a solution—cresol, 1 volume; paraffin or wood-preserving oil, 20 volumes; water, 79 volumes.

30. Fresh manure belonging to civilians will, as far as possible, be removed and treated in a similar manner.

31. Old heaps of manure, both of military and civilian origin, should be left alone. Fresh manure is not to be added to them.

REFUSE

32. All waste food, empty tins, and refuse generally will be carefully collected and burned every day, except in the trenches, where refuse will be buried, special care being taken to insure that it is covered up before flies lay their eggs upon it.

33. Units will improvise incinerators in their billeting areas.

34. Covered receptacles or bags will be placed wherever refuse is likely to accumulate.

* * * * *

D. C. HOLMAN,
Major-General, D. A. and Q. M. G., Fourth Army.

The Curry "Champion" all-metal flytrap, referred to as a suitable type, was wedge shaped, the vertical height being about equal to one side of the square base. It was firmly set and unlikely to be blown over. These traps were made in two sizes, one about 21 and the other about 14 inches square at the bottom. It was a "knock-down" trap, coming packed in a flat box approximately the size of the base and a little over an inch thick; transportation, therefore, was easy.¹ Large numbers of these traps were bought by the Quartermaster Department. Many types of improved traps were built.² Some conformed to the Curry pattern, using solid wooden ends. Cuboidal forms with wooden frames were common and generally satisfactory. In some instances the height was too great for the base and these traps readily blew over. As an aftermath of cantonment construction, most stations had hundreds of empty nail kegs, which in many cases were converted into efficient traps by covering the top with gauze, whitewashing the inside, placing a gauze cone in the bottom, and nailing on three legs, which raised the bottom of the keg about an inch from the ground. The nail-keg traps had the drawback that they were overturned easily by the wind.²

The care of traps required constant supervision. Inexperienced or careless kitchen and dining-room forces frequently would fail to bait them or would use unsuitable bait, with the result that few if any flies were captured.² The question of the most valuable bait was carefully studied at the Medical Officers' Training Camp, Camp Greenleaf, Ga., and the following letter shows the conclusions from this work. In this connection it is noteworthy that, while molasses, water, and vinegar did not stand well as a bait in this series of experiments, experience in many other places showed that vinegar mixed with sugar or molasses resulted in large catches of flies.

CAMP GREENLEAF,

Chickamauga Park, Ga., November 12, 1918.

From: The camp sanitary officer.
To: Commanding officer, Camp Greenleaf.
Subject: Bait for flytraps.

1. In accordance with instructions August 2, 1918, an elaborate series of experiments have been made with baits for flytraps. The following is a summary of the results. Detailed report is, according to verbal instructions, on file at this office. The tests were made with careful control, and the total number of flies caught were 43,005. Of this, 82.8 per cent were house flies, 10.33 per cent were blue bottles, and 4.03 per cent were horseflies.

A fly bait should be (1) cheap; (2) always and everywhere available; (3) of such a nature as not to constitute a nuisance.

2. The baits in the order of their efficiency are:

	Per cent of total catch
Fish heads and fish scraps.....	21.34
Overripe banana and milk.....	21.30
Bran mixture No. 2.....	20.72
Canned salmon, perforated top.....	14.95
Fermented canned plums.....	7.52
Bran mixture No. 1.....	5.29
Garbage, fermented with yeast.....	2.25
Ripe banana, split longitudinally.....	1.83
Bevo, water, and bread.....	1.58
Milk, water, and bread.....	1.26
Molasses, water, and vinegar.....	.99
Fermented canned corn.....	.63
Sweet corn in can.....	.13
Mashed cheese and molasses.....	.10
Beef liver in cans.....	.05

NOTE.—Bran mixture No. 1: "Bran, 4 cups; cornmeal, 2 cups; sirup, $\frac{3}{4}$ pound; water 3 pints." Bran mixture No. 2: "Bran, 3 pounds; cornstarch, $1\frac{1}{2}$ pounds; sugar, 3 pounds; yeast, 4 cakes; water to 5 gallons."

Where the same bait was used in more than one test, the catches have been added together.

It is thus seen that of 15 different baits used, only 4 seem to be really efficient, viz: Fish heads and fish scraps; overripe banana with sour milk; bran mixture No. 2; canned salmon, perforated top.

All of these baits fulfill requirements Nos. 1 and 2 of an efficient bait, but the fish baits fall down on the third requirement, that the bait used shall not constitute a nuisance. The older the fish baits get and the more abhorrent the odor, the more efficient they seem to be.

The four most efficient baits included two of the putrefactive and two of the fermentative type. The odor given off from the latter is pleasant rather than otherwise. While the percentages given have all referred to the house fly, it may be stated that the two fermentative baits were the most efficient as far as the blue bottle and horseflies were concerned.

The following deductions and conclusions seem warranted from these tests:

1. It seems to be necessary for a bait to have either a fermentative or putrefactive odor in order to be efficient.

2. The same bait will vary in its catch from day to day.

3. More flies are caught near a mess hall than in other places.

4. Generally speaking, a warm day gives a larger catch than a cool one.

5. Rain, unless excessive, does not materially affect the catch.

6. Wind, unless very strong, has practically no bearing on the count.

CHARLES SPENCER WILLIAMSON,

Lieutenant Colonel, M. C.

Sticky fly paper was very extensively used during the war. While the ordinary "Tanglefoot" in flat sheets was valuable, the employment of ribbons of sticky paper suspended from rafters or ceilings seemed best adapted to the needs in cantonment buildings and in mess shacks of tented camps.² This was the type of paper advocated by the Surgeon General's Office.³ Improvised methods of catching flies by sticky substances were advocated in some instances. The following order describes one method:

General Orders No. 36.

HEADQUARTERS, MEDICAL OFFICERS' TRAINING CAMP,

Fort Riley, Kans., July 12, 1918.

1. To facilitate fly destruction, and in addition to all previous measures ordered, the following device will be installed at once. Two twisted wire rods, made according to sample furnished by the sanitary laboratory, will be hung in each stall according to following specifications: The rods are to be suspended vertically by the hook, the loop end down, at such a height in the stalls as to clear the animal's head. The rods are to be coated with a brush or paddle to within 5 inches of the loop end, then inverted, allowed to drain, and hung as directed. Each day the flies are to be removed by wiping the rod with a piece of sacking, and the rod is then to be recoated.

* * * * *

Poisons were not specifically recommended in the circulars from the Surgeon General's Office, but were frequently employed in camps, either in the various commercial types purchased from company funds, or in the form of weak formalin solutions in diluted milk or sweetened water.² The following information regarding improvised fly poisons appeared in Medical War Manual No. 1, "Sanitation for Medical Officers," 1917:

Fly poisons.—Are very efficient and safe when properly prepared. A good fly poison should be attractive to flies, for it may be assumed that there are alternative drinking places. Formaldehyde in a concentration of 0.5 to 1 per cent is attractive to flies, and is more effi-

cient than any other fly poison. Sodium salicylate in 1 per cent solution is almost as efficient, and is easier to keep and handle. A formaldehyde solution of 1 per cent corresponds to 2.5 per cent of the 40 per cent solution sold as formalin. If accurate solutions can not be obtained, use 3 teaspoonfuls of powdered sodium salicylate to the pint.

Directions for use.—Nearly fill a glass tumbler with the solution, place over this a piece of blotting paper, cut circular and somewhat larger than the tumbler, and over this place a saucer. Invert the whole device, and insert a match or toothpick under the edge of the tumbler to permit access of air. The blotting paper will remain in the proper moist condition until the entire contents of the tumbler have been used. A very little sugar sprinkled on the paper may increase the attractiveness of the poison for the flies, but care should be used not to use too much. These poisons kill flies in a few minutes after drinking. Flies drink best in the early morning, and the poison should be set at night so that it will be ready.

To the purchase by the Government of commercial poisons or of larvacides for preventing the development of flies the Surgeon General's Office has been opposed in principle and has usually recommended disapproval.

There was probably no other subject which received so much comment from sanitary inspectors of the Surgeon General's Office as did the fly situation in our military stations at home. The efforts of these officers to improve conditions in this respect were unremitting, as shown by the great number of references to the subject in their reports to the Surgeon General.² So numerous and so similar are the remarks relating to control of flies that they are not reproduced here. Even though the presence of flies was often noted in these reports, this should not be interpreted as an indication that the campaign against them was a failure; it simply means that the sanitary sense of the inspectors had been developed to a point where the presence of even a relatively few flies attracted attention and elicited adverse comment. The sanitary reports usually make no comment regarding the places and occasions characterized by a practical absence of flies, but it is known that freedom from this nuisance was the rule rather than the exception. In general, it may be said that flies were far less prevalent in the camps than in civil communities, and that even at the camps most severely criticised the conditions did not even remotely approximate those which were regarded with complacency during the Spanish-American War.

REFERENCES

- (1) Read, Vaughan, and Shakespeare: Report on the Origin and Spread of Typhoid Fever in U. S. Military Camps During the Spanish War of 1898. Government Printing Office, Washington, 1904.
- (2) Reports from sanitary inspectors to the Surgeon General. On file, Sanitation Division, S. G. O., Correspondence File, 721.1-1. General.
- (3) Special Orders No. 133, par. 90 and No. 143, par. 130, W. D., June 9, and June 21, 1917, respectively.
- (4) A. R. 1387, 1913.
- (5) A. R. 100, 1913.
- (6) Letter from the Surgeon General to The Adjutant General, February 26, 1918. Subject: Flytrap and fly paper. On file, Record Room, S. G. O., Correspondence File, 725.1; also, fifth indorsement, War Department, A. G. O., to the Quartermaster General, April 2, 1918. Subject: Fly paper. On file, Record Room, A. G. O., Correspondence File, 438.8 (Misc. Div.).

- (7) Memorandum from the Surgeon General to the Division Surgeons, Surgeons of Special Camps, Surgeons of Ports of Embarkation, Surgeons of Recruit Depots, Commanding Officers of General Hospitals, and Chief Surgeon, Aviation Section, March 5, 1918. On file, Record Room, S. G. O., Correspondence File, 725.1.
- (8) Letter from The Adjutant General to the commanding generals of all Regular Army, National Guard, and National Army divisions, all department commanders and commanding officers of all excepted places, April 2, 1918. Subject: Flytraps and fly paper. On file, Record Room, A. G. O., Correspondence File, 438.1 (Misc. Div.).
- (9) Letter from Curry Fly Trap Co., to the Surgeon General, March 6, 1918. On file, Record Room, S. G. O., Correspondence File, 438 (Flytraps).
- (10) Third indorsement, War Department, S. G. O., to the Quartermaster General of the Army, Depot Division, August 6, 1918. On file, Record Room, S. G. O., Correspondence File, 438 (Camp Wadsworth) (D); *also*, third indorsement, from the Surgeon General to the Quartermaster General, August 22, 1918. On file, Record Room, S. G. O., Correspondence File, 438.

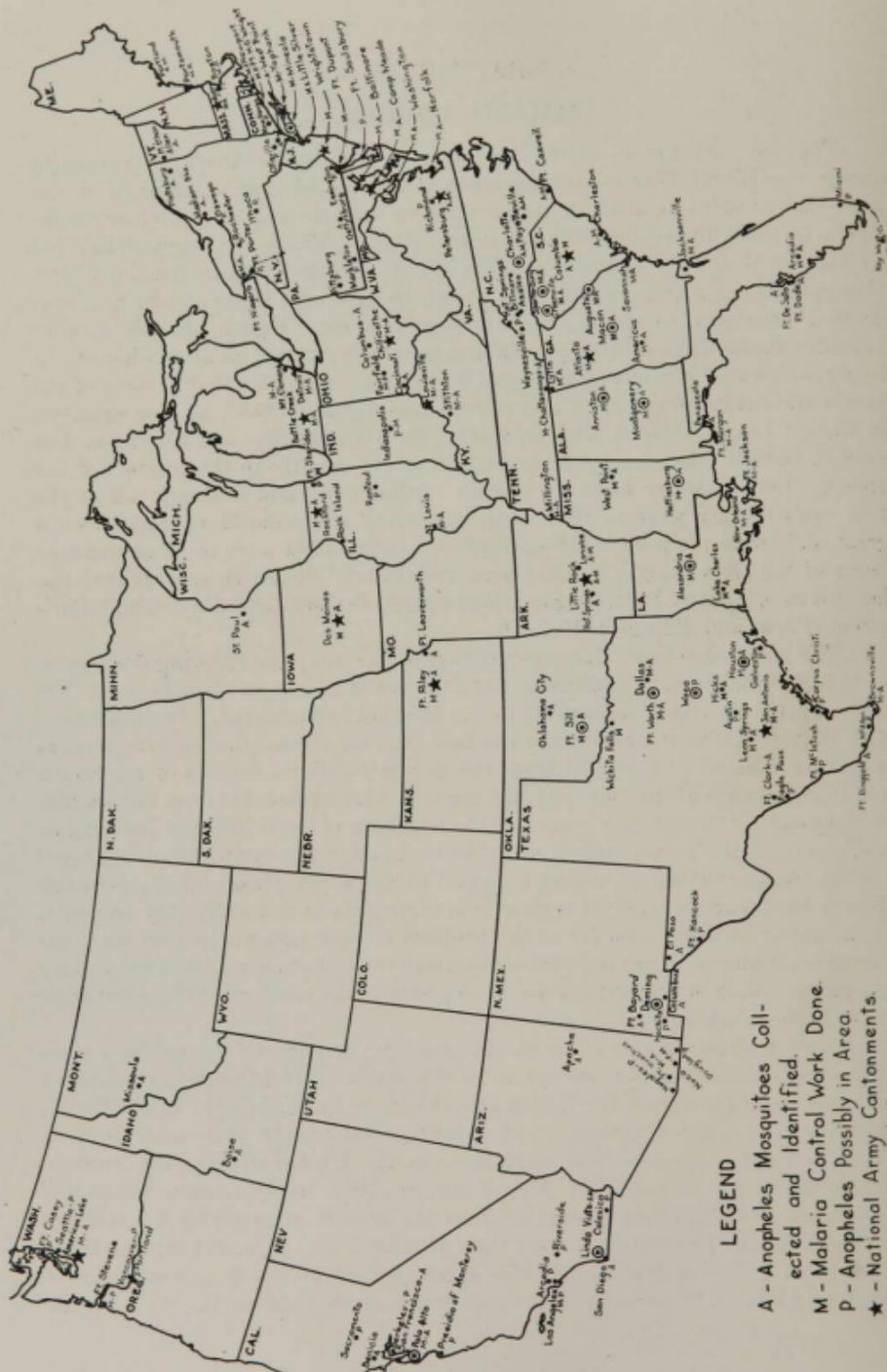
CHAPTER XV

MALARIA CONTROL

The necessity for an active campaign to protect the Army from malaria during the World War is obvious when it is recalled that a majority of the great camps were located in districts where malaria was endemic, or where anopheles mosquitoes were found to some extent.¹ This is strikingly illustrated by Figures 57 and 58, showing the military stations in which anophelines were identified, those where malaria was known to exist and those at which it was deemed necessary to carry on antimosquito work. Figure 59 still further indicates that there was need for malaria control work at a great number of the larger camps and in many of the smaller stations. It is true that in some of the camps the health problem in this respect was not important, as, for example, in Camps Lewis, Devens, Custer, Grant, Funston, Dodge, and Sherman, but even in these stations mosquito reduction added greatly to the comfort of the troops. On the other hand, in certain cantonments and in nearly all of the tent camps (they were in the South) intensive antimalarial operations on a great scale were required if serious outbreaks of malaria were to be prevented.² Some of the sites proved to have been very poorly chosen as regards malaria; for instance, Camps Pike, Logan, Beauregard, Jackson, and Eustis, and Carlstrom, Park, and Ellington Fields.³

The knowledge that a large percentage of the troops on entering the service were to be quartered in malarious districts was sufficient in itself to make the control problem vitally important to the Medical Department. In addition to this, that department had to face the fact that numerous plasmodium carriers would be enlisted or inducted from the endemic malaria centers of the South and that, because of the constant shifting of military personnel from one section of the country to another, considerable numbers of such infected individuals would repeatedly be introduced into practically all of the camps, thus endangering the troops of stations having a certain degree of anopheles infestation even though they were located in regions where malaria is not ordinarily endemic. It can safely be said, in so far as the problem of mosquito prevention was concerned, that almost every military station was in need of an active antimosquito campaign, either to prevent disease or to promote the comfort of the occupants, or for both purposes.

When mobilizing armies to meet a pressing emergency the military sanitarian necessarily considers the question of malaria control from one standpoint only, viz, its influence on the health and the immediate efficiency of the forces. However, the matter is worthy of attention on purely economic grounds. There is ample evidence that malaria costs the United States vast sums of money which are in excess of the amount required for systematic control of this disease. It has been estimated that the annual price which the country pays as a result of paludism is more than \$100,000,000.³ Careful surveys made prior to and during the World War have indicated certain communities in which as many as 70 per cent of the population carried plasmodia in the blood.⁴



LEGEND

- A - Anopheles Mosquitoes Collected and Identified
- M - Malaria Control Work Done
- P - Anopheles Possibly in Area.
- ★ - National Army Contonents
- ⊙ - National Guard Camps

FIG. 57.—Malaria-control activities at United States Army stations

In a large part of the area in which malaria is endemic the vital statistics are very incomplete, and it is probable that the disease exists to a far greater degree than is realized; this view is supported by numerous blood surveys. Indeed, in many districts the cases of malaria, and deaths therefrom, are either so poorly reported that the records are practically worthless for statistical purposes, or are not reported at all. In Shasta County, Calif., it has been estimated that the cost of malaria, as regards the three items of medicine, medical service, and labor loss, averaged \$7.66 per person annually in the entire area, and in the most intensely malarious section the cost was \$17.60 per person.⁵ This estimate does not cover such items as losses due to death, unemployment among casuals in the district, loss due to inability to handle

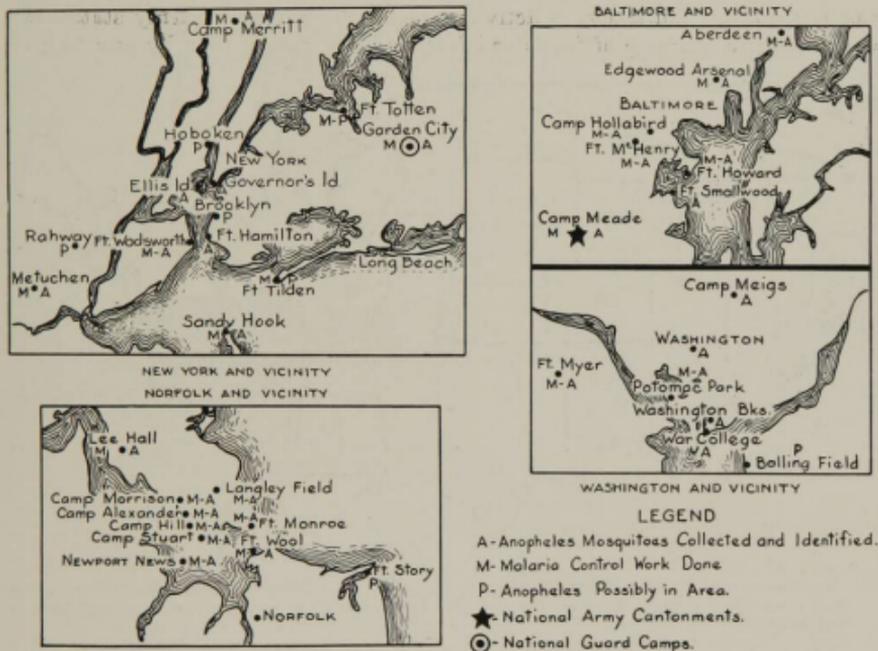


FIG. 58.—Detail maps showing malaria-control activities at certain United States Army stations

crops, loss from forced sale of property by people leaving malarial districts, and loss due to general depreciation of property values. Assuming that paludism costs the malarial section of the Southern States annually \$7 per capita, it can be appreciated that the War Department would be justified in spending \$7 per capita each year in the control of the disease among the troops harbored in southern stations, if the problem were put on a purely dollar and cent basis. The average strength of the Army during the year 1918 was approximately 2,500,000 men;⁶ of these, a mean strength of nearly 800,000 occupied camps in the areas where malaria is endemic. On this basis an expenditure of \$5,600,000 would have been economically justifiable, an amount in excess of that actually spent in this work. A far more important consideration, however, was the military necessity of maintaining physical efficiency among the troops, regardless of the economic aspects of the problem.

ORGANIZATION

The Medical Department for many years has supervised or carried out mosquito-control measures and other antimalaria work at and near Army stations, both within the continental limits of the United States and throughout its overseas possessions.⁷ This duty was considered a part of the general responsibility of that department for the prevention of disease as laid down in Army Regulations. In the Tropics, especially, extensive campaigns of this character had been undertaken, often including areas under civil jurisdiction, or even entire municipalities or districts. Many medical officers of the Regular Army thus had become thoroughly familiar with this sanitary problem and were competent to direct large-scale antimalaria procedures. Whenever there was any pre-war limitation of activities along these lines at Army stations it was caused by shortage of funds or labor, or both, rather than by any lack of

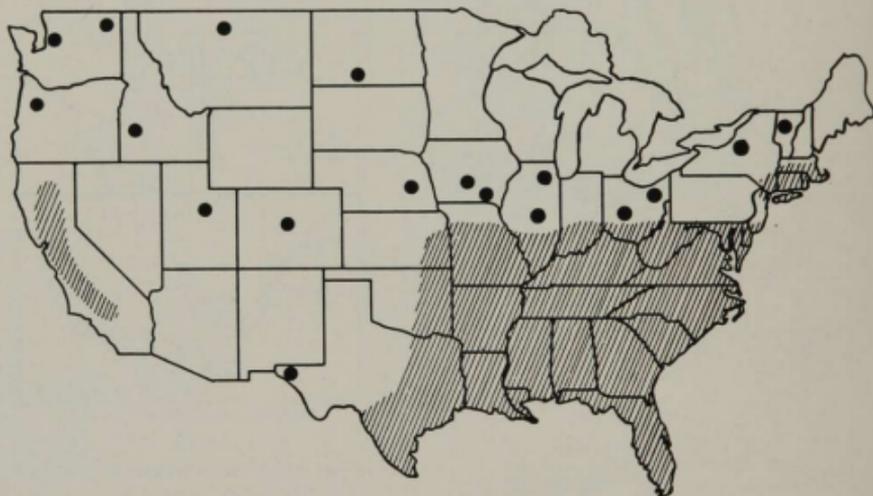


FIG. 59.—Endemic areas of malaria in United States indicated by shading. Circles represent localities where cases of malaria occasionally occurred, not necessarily contracted locally, and where anopheles mosquitoes were found in small numbers

interest or appreciation on the part of the medical officers concerned regarding the importance of mosquito control.

When war was declared steps were taken by the Surgeon General to organize an auxiliary force within the Medical Department for the purpose of assisting the medical officers in carrying out certain technical duties for the performance of which the members of the auxiliary force were fitted by reason of special training.⁸ This force was designated the "Sanitary Corps," and its commissioned personnel contained, among others, sanitary engineers and entomologists. To a section of this corps, consisting of specially qualified officers and a large enlisted force of laborers, was assigned the duty of assisting in the combat against the mosquito menace at camps.⁹ Funds and labor were available for the most important projects, and it was thus possible to carry out antimosquito campaigns in Army camps on a scale never before attempted in the United

States. The work of the section mentioned was coordinated and centrally supervised by the division of sanitation of the Surgeon General's Office, through its section of sanitary engineering, but the camp surgeon, or other senior medical officer of a station, in each case, was held responsible for activities within his jurisdiction. He was assisted in this particular work by the sanitary engineer, a member of his staff, who was in immediate charge of the field operations. While the officers of the Sanitary Corps selected for these duties were not medical graduates, they were, with few exceptions, technically trained sanitary engineers of the highest standing in their respective communities. The remainder of the officers on mosquito control duty were men with practical experience in public health work who had already demonstrated their worth in other fields; a few were eminent parasitologists. At the height of the war activities, there were on duty in various military stations in the United States about 180 officers of the Sanitary Corps engaged in malaria-control work. The status and duties of the sanitary engineer were set forth in letter from The Adjutant General's Office, dated July 5, 1918,¹⁰ and in Circular No. 67, War Department, November 15, 1918, as follows:

4. The sanitary engineers * * * are available for all of the duties to which such officers may be assigned and may be transferred from one of such duties to another as the needs of the service may require; for example, sanitary inspectors of camps and cantonments, inspectors of sewage and garbage disposal plants, and water purification plants, in charge of drainage, and other work for extermination of mosquitoes, flies, etc., and for general sanitary engineering work.

The foregoing clause covered in general terms the duties of sanitary engineers until after the armistice, when the following was issued:
Circular No. 67.

WAR DEPARTMENT,
Washington, D. C., November 15, 1918.

STATUS AND DUTIES OF THE SANITARY ENGINEER

1. An officer of the Sanitary Corps may be assigned as sanitary engineer to each camp or other large military station where water-purification or sewage and garbage disposal systems have been installed.

2. The sanitary engineer is an assistant to the camp surgeon and his duties ordinarily shall be:

a. To inspect and supervise the operation of water supply, or sewage and garbage disposal systems, and to advise the utilities officer and subdepot quartermaster with reference thereto; to recommend such suitable standards of performance of these systems as will properly conserve the interests of health and sanitation in the camp and its environment.

b. To have immediate charge, under the camp surgeon, of drainage, oiling, and other preventive measures for the extermination of mosquitoes and flies.

c. To act as consultant and advisor to the camp surgeon on all engineering or structural phases of the camp or station which bear a definite relation to health and sanitation.

d. To perform such other sanitary duties as may be designed by competent authority.

e. To render monthly report to the Surgeon General of the Army, through military channels, covering such subjects as may be prescribed by the Surgeon General of the Army.

(322.02) A. G. O.

By order of the Secretary of War:

PEYTON C. MARCH,
General, Chief of Staff.

OFFICIAL:

P. C. HARRIS,
The Adjutant General.

The sanitary engineer at most of the large camps was provided with a special organization known as the "sanitary detachment."¹⁰ These detachments consisted of colored men enlisted in the Sanitary Corps, and ranged in size from 50 to 300, depending upon the magnitude of the sanitary problem at the camp in question.¹⁰ At certain stations men from labor battalions or other organizations were detailed from time to time to supplement the permanent sanitary detachments, these details occasionally reaching large figures, as, for instance, 800 men at Camp Pike,¹¹ and over 2,000, at times, at Newport News.¹² In some cases, when there was no enlisted sanitary detachment, other soldier labor from the command was employed or civilians were hired for carrying out antimosquito procedures.¹³ White enlisted men from the Medical Department were detailed to assist the sanitary engineer in supervising the unskilled labor thus furnished. These supervisors usually were noncommissioned officers, many being students or graduates of engineering schools; frequently the most efficient were commissioned later in the Sanitary Corps. To these detachments were assigned, in many instances, additional officers of the Sanitary Corps to assist the sanitary engineer in the direction of the work. Sanitary detachments were organized and maintained at the following stations:¹⁴ Aberdeen Proving Grounds, Md.; Camp Beauregard, La.; Camp Benning, Ga.; Camp Bragg, N. C.; Brooks Field, Tex.; Call Field, Tex.; Carlstrom Field, Fla.; Charleston Port Terminal, S. C.; Camp Devens, Mass.; Camp Dix, N. J.; Camp Dodge, Iowa; Edgewood Arsenal, Md.; Ellington Field, Tex.; Camp Eustis, Va.; Camp Funston, Kans.; Gerstner Field, La.; Camp Gordon, Ga.; Camp Grant, Ill.; Camp Hancock, Ga.; Camp Holabird, Md.; Camp Humphreys, Va.; Camp Jackson, S. C.; Camp John Wise, Tex.; Camp Johnston, Fla.; Camp Kearny, Calif.; Kelly Field, Tex.; Camp Knox, Ky.; Langley Field, Va.; Camp Lee, Va.; Camp Lewis, Wash.; Camp Logan, Tex.; Camp McClellan, Ala.; Camp Meade, Md.; Camp Merritt, N. J.; Camp Mills, N. Y.; Fort Monroe, Va.; port of embarkation, Newport News, Va.; Fort Oglethorpe, Ga.; Park Field, Tenn.; Payne Field, Miss.; Camp Pike, Ark.; Raritan Arsenal, N. J.; Camp Sevier, S. C.; Camp Shelby, Miss.; Camp Sheridan, Ala.; Camp Sherman, Ohio; Fort Sill, Okla.; Taylor Field, Ala.; Camp Travis, Tex.; Camp Upton, N. Y.; Camp Wadsworth, S. C.; Camp Wheeler, Ga.

During the preliminary construction at the cantonments, camps, aviation fields, etc., a large amount of work was done by contractors' forces which was of direct benefit in the control of mosquitoes, although not primarily undertaken for that purpose. This included ditching designed to take care of storm water, draining or filling of depressions and subsurface drainage, the latter procedure being especially frequent at aviation fields.

At a number of stations extensive special drainage projects, which were of great assistance in the control of malaria, were carried out under the direction of the construction division of the War Department, upon recommendation of the Surgeon General.¹⁵ In some localities civilian laborers were employed to carry on the mosquito control work both before and during the armistice.^{15, 16} Before the armistice, it was difficult to secure good labor for this purpose, consequently the soldier in most instances gradually replaced the civilian. Upon demobilization, however, the members of the sanitary detachments,



FIG. 60.—One of the early ditches dug by the construction quartermaster, Camp Meade, Md.

and of other enlisted details engaged in malaria control, were discharged from the service and replaced by civilian employees in many of the camps. Due to the anxiety on the part of soldiers for discharge during the latter part of 1918 and the early months of 1919, better results were obtained by the employment of civilian labor, and this policy was then adopted.¹⁵

It was necessary for the sanitary detachments carrying on mosquito control work to be equipped with tools, such as shovels, axes, picks, crowbars, rock drills, explosives, oil sprays, automobile trucks, touring cars, motor cycles, scythes, plows, wagons, oil, larvacides, etc. All of this equipment pertained to the Quartermaster Department and in the main was furnished by the camp supply organizations. Much difficulty was sometimes experienced in securing

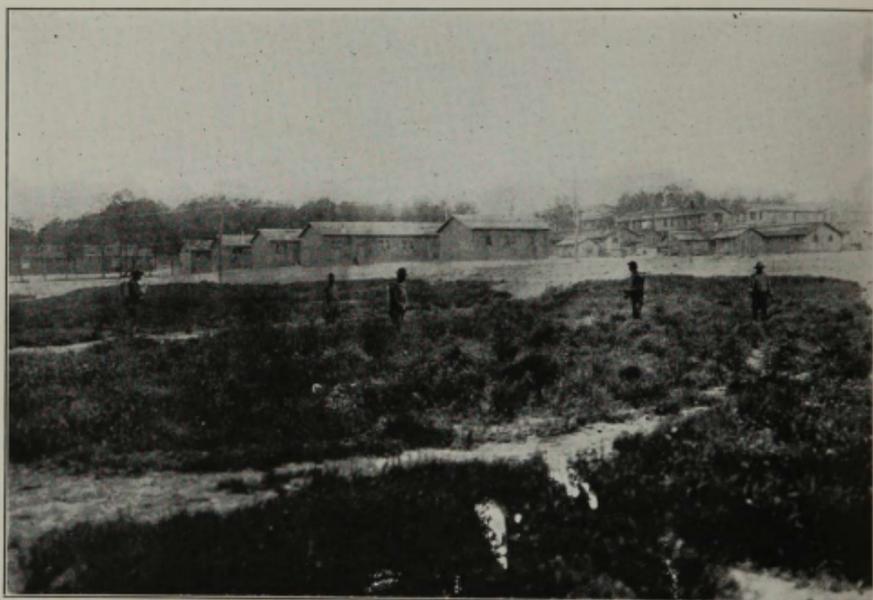


FIG. 61.—Oiling small pools with knapsack sprayers, Camp Meade, Md.

promptly the articles needed. In a majority of the camps, tools and like equipment finally were obtained in sufficient quantities, but, on the other hand, a certain number of the sanitary detachments went through the entire war period with insufficient equipment. Securing adequate motor transportation proved specially difficult.²

Besides what the Army did in malaria control, a certain number of outside agencies were actively occupied along similar lines. These had as their purpose direct benefit to the soldier. Such work was carried on in the areas adjacent to military reservations, the so-called "extra-cantonment zones." The greater part of this auxiliary effort was directed by the United States Public Health Service, whose trained antimalaria workers carried out control procedures in areas surrounding many military stations.¹⁷ In a number of instances extra-camp control was assisted by city, country, State, and other local health

boards and commissions, as, for example, in the programs carried on in the Love and Dick Field districts by the city of Dallas, and around the New Jersey camp sites by the State authorities.¹⁸

The organization for malaria control which has been described included only that concerned in the elimination of mosquitoes. The subject of the screening of buildings is referred to elsewhere in this chapter. The treatment of malaria in the Army was wholly in the hands of the medical officers and is not dealt with in this volume. Briefly, it may be said that suspected cases were examined by the blood-smear method, and, if the diagnosis was confirmed,



FIG. 62.—A typical oiling station, Camp Meade, Md.

were given the usual quinine treatment. The patient was admitted to the hospital, kept screened, and existing orders required that he be held under observation and treatment until the danger of infecting others was passed.¹⁹ This latter precaution was doubtless frequently neglected because of the rapid changes of station among the soldiers. That treatment had a marked effect in the limitation of malaria is quite evident, for in some cases, as, for example, at Camp Beauregard, where large numbers of infected recruits came into the camp and were well distributed throughout it, the extensive spreading of malaria was fairly effectively prevented, although this camp was never under complete mosquito control.²⁰

TABLE 26.—Malaria control situation at 70

Name of camp and location	Population			Kind of camp	Area of mosquito control (square miles)		Labor								
	Average	Maximum	Minimum		Army	Others	Sanitary Corps			Others					
							Average	Maximum	Minimum	Average	Maximum	Minimum			
Aberdeen Proving Grounds, Md.	2,000	10,000	600	Barracks	1		40								
Barron Field, Tex.	1,000	1,200	500	do.	½	1½					7	85	10		
Camp Beaufort, La.	15,000	30,000	10,000	Tents	9	* 57	96	100	78	57					
Camp Benning, Ga.	1,200	1,800	200	Tent and barracks	12	* 14.5	45	50	20						
Camp Bragg, N. C.	780	1,225	415	Barracks	10	* 28	10	25	4						
Camp Bowie, Tex.	25,000	28,000	2,500	Tents	15	* 38					50	200	6		
Brooks Field, Tex.	750	1,500	50	Housed	1	7	10								
Call Field, Tex.	839	1,015	547	Barracks	20		2								
Carlstrom Field, Fla.	1,400	2,000	200	Housed	9		2				1				
Carruthers Field, Tex.	1,000	1,200	500	do.	½	2				1	47	85	10		
Charleston Port Terminal, S. C.	7,700	10,000	5,000	Barracks	24	* 50	100	136	70						
Camp Cody, N. Mex.	20,000	28,000	2,000	Tents											
Camp Custer, Mich.	22,000	35,000	2,000	Barracks	20										
Camp Devens, Mass.	30,000	50,000	1,500	do.	16		20								
Camp Dix, N. J.	30,000	60,000	1,500	do.	10		30	50	10						
Camp Dodge, Iowa	28,000	55,000	10,000	do.	5	(^c)	6								
Eberts Field, Ark.	650	1,500	60	Housed	1½	12	3								
Edgewood Arsenal, Md.	4,500	11,900	67	do.			15	100							
Ellington Field, Tex.	3,500	5,569	300	Barracks	2		10	14	4						
Camp Eustis, Va.	10,000	16,000	1,300	do.	5½		46				25				
Camp Fremont, Calif.	16,000	25,000	4,000	Tents											
Camp Funston, Kans.	25,000	56,130	1,469	Barracks	8		50								
Gerstner Field, La.	2,000	2,500	60	Housed	1½	* 15	6								
Camp Gordon, Ga.	16,000	40,000	1,500	Barracks	20		35	100							
Camp Grant, Ill.	23,500	34,400	1,500	do.	5		50								
Camp Greene, N. C.	14,000	55,000	400	Tents	4	* 6									
Camp Hancock, Ga.	30,000	40,000	20,000	do.	7	* 25	61				20				
Hazlehurst Field, Long Island, N. Y.	1,400	2,000	200	Housed	None.	(^c)									
Camp Holabird, Md.	35,000	4,000	200	do.	½		6								
Camp Humphries, Va.	14,000	23,000	2,000	do.	5		100								
Camp Jackson, S. C.	26,000	50,000	2,000	Barracks	35	25	175	200	150						
Camp John Wise, Tex.	1,000	3,500	275	Tents and barracks	2	(^c)	4								
Camp Johnston, Fla.	20,000	30,000	6,000	do.	5	* 12	70	100	51						

* U. S. P. H. S. Report, 1919.

† Tile drain.

‡ Extracantment.

§ Questionable.

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Ditching (linear feet)	Cleaning and deep- ening (linear feet)	Clear- ing and brush- ing (acres)	Filling (cubic yards)	Oiling		Character of problem	Cases of malaria		Mosquitoes found	Remarks as to control
				Area (acres)	Oil used (gal- lons)		Total	Con- tracted at camp		
13, 000		150				Serious			Anopheles, Aedes, Culex.	Control unsatis- factory.
	8, 000					Average	(b) 0	0	Anopheles, Culex.	Control satisfac- tory.
25, 210	99, 642	75	9, 696		15, 750	Very seri- ous	(a) 554		Anopheles, Stegomyia, Culex.	Control unsatis- factory.
43, 500	23, 550	25			2, 400	Serious	(c) 10	1	Anopheles, Culex.	Control fair.
306, 240	26, 192	24	46, 161			Average			Anopheles, Psorophors, Culex.	Control just started.
4, 010	68, 704	65	91		323	Heavy: breeding malaria.	(a) 65	2	Anopheles, Culex.	Control fair.
19, 624			3, 000			Not serious	(b) 5		Anopheles, Aedes, Culex.	Control satisfac- tory.
					20	do	(b) 1		Culex.	Records incom- plete.
130, 000		640			8, 257	Heavy: breeding malaria.	(b) 2		Anopheles, Aedes, Culex, Psorophors.	Control satisfac- tory.
42, 240						Not serious	(b) 0	0	Anopheles, Culex.	
306, 240				2, 000	5, 000	Serious	(b) 13		Anopheles, Aedes, Culex, Psorophors.	Control fair.
						Not serious	(a) 19		Anopheles, Culex.	Control satisfac- tory.
						do	(a) 6		Anopheles, Mansonia, Aedes, Culex.	Do.
						do	(a) 23		Anopheles, Culex.	Do.
17, 776	110, 967	14		167	10, 887	Serious	(a) 52		Anopheles, Aedes, Culex, Mansonia, Culiseta.	Do.
21, 120		50				Not serious	(a) 24	9	Anopheles, Aedes, Culex.	Control poor.
328, 800	52, 800					Very seri- ous	(b) 33		Anopheles, Aedes, Culex, Psorophors.	Control fair.
26, 930		549			2, 500	Serious	(c) 2		Anopheles, Aedes, Culex, Mansonia, Psorophors.	Do.
						do	(b) 73	5	Anopheles, Aedes, Culex, Psorophors.	Control poor.
9, 000	10, 560	125	1, 670	90	4, 425	Very seri- ous	(a) 97	140	Anopheles, Aedes, Culex, Psorophors.	Do.
	3, 000					Not serious	(a) 44		Anopheles, Aedes, Theobaldia inc.	Control satisfac- tory.
	5, 200	1.2				do	(a) 76	48	Anopheles, Culex.	Control unsatis- factory.
15, 840	52, 400				4, 000	Serious	(b) 2		Anopheles, Culex, Aedes, Urano- taenia, Psorophors.	Control satisfac- tory.
5, 308	235, 490	493			10, 380	do	(a) 167		Anopheles, Culex.	Do.
						Not serious	(a) 17		Anopheles, Aedes, Culex, Mansonia.	Do.
						Serious	(a) 27		Anopheles, Aedes, Culex.	Do.
5, 280	52, 280		19, 626			do	(a) 85		Anopheles, Culex.	Do.
4, 000		2			75	Average	(c) 0		Anopheles, Aedes, Culex, Psorophors.	Do.
4, 765		1			4, 500	Not serious		1	Aedes, Psorophors, Culex.	Do.
9, 249	74, 484	30			2, 500	Serious	(a) 47	5	Anopheles, Aedes, Culex, Mansonia.	Control unsatis- factory.
132, 000	2, 111, 445	516		5	18, 187	do	(a) 247	2	Anopheles, Psorophors, Aedes, Culex.	Control satisfac- tory.
					300	Average			Anopheles, Aedes, Culex.	Records incom- plete.
330, 109	82, 490	284	23, 420		10, 269	Serious	(a) 131	50	Anopheles, Psorophors, Aedes, Culex.	Control poor.

TABLE 26.—Malaria control situation at 70

Name of camp and location	Population			Kind of camp	Area of mosquito control (square miles)		Labor								
	Average	Maximum	Minimum		Army	Others	Sanitary Corps			Others					
							Average	Maximum	Minimum	Average	Maximum	Minimum			
Camp Kearny, Calif.	15,000	32,000	600	Tents	19		10								
Kelly Field, Tex.	14,462	42,000	3,400	Housed	15		35	60	8						
Camp Knox, Ky.	10,000	20,000	3,000	Barracks	14½		36								
Las Casas, P. R.	12,500	13,200	850	Tents			Sanitary squad								
Langley Field, Va.	2,000	5,000	500	Housed	2	8	25								
Fort Leavenworth, Kans.	4,500		1,500	do.	10	30									
Camp Lee, Va.	30,000	52,000	2,500	Barracks	13	(*)	50	84	35	50				25	
Camp Lewis, Wash.	30,650	40,000	6,000	do.				200	6						
Love Field, Tex.	566	938	203	Housed	1										
Camp Logan, Tex.	24,250	36,000	259	Tents	9.3	30	14	37	2						
Camp McClellan, Ala.	30,000	60,000	5,000	do.	25		10								
Camp Meade, Md.	22,000	48,293	2,085	Barracks	11	* 18	100	269	15	30					
Camp Merritt, N. J.	20,628	44,373	5,683	do.	15		16	36							
Camp Mills, Long Island, N. Y.	11,500	23,000	1,200	Tents and barracks	1½		5	75							
Fort Monroe, Va.	800			do.	1	2.5	6								
Newport News, port of embarkation, Va.	40,000	18,000	2,000	Housed	7	(†)	200								
Fort Oglethorpe, Ga.	22,839	28,400	17,300	Tents and housed.	5	(*)	8							15	
Park Field, Tenn.	960	1,050	250	Housed	1	(*)	3								
Payne Field, Miss.	456	1,100	23	do.	1.5	(†)	4								
Camp Pike, Ark.	25,000	60,000	7,000	Tents and barracks	40	60	150	200	115						
Raritan Arsenal, N. J.	3,500	7,245	126	Barracks	4		39	49	10						
Fort Screven, Ga.	600	2,500		Housed	1	None.						2			
Selfridge Field, Mich.	1,100	1,343	860	do.											
Camp Sevier, S. C.	17,800	30,900	929	Tents	4	(†)	50								
Camp Shelby, Miss.	13,390	34,000	1,066	do.	10	20	30	100	10	100	200				
Camp Sheridan, Ala.	18,400	25,000	12,798	do.	9		50	93	48						
Camp Sherman, Ohio.	32,000	41,000	22,000	Barracks	6	30	6								
Fort Sill, Okla.	20,500	32,685	5,662	Housed	12		19	29	9						
Fort Snelling, Minn.				do.	4		10	15							
Souther Field, Ga.	508	1,038	77	do.	1.5	13.5						50			
Taliaferro Field, Tex.	1,800	2,200	800	do.	1	(†)						1	85	10	
Camp Taylor, Ky.	15,000	58,500	6,600	Barracks	6½	25						25			
Taylor Field, Ala.	186	806	9	Housed	2				2						
Camp Travis, Tex.	23,800	43,052	1,922	Tents	4		20	75	6						
Camp Upton, Long Island, N. Y.	28,000	47,000	4,200	Barracks	20		75	500	50						
Camp Wadsworth, S. C.	30,000	37,740	2,000	Tents	8		50	65	15	6					
Camp Wheeler, Ga.	14,950	29,500	495	do.	4	(†)	60	259							

* Extracantonment.

† Questionable.

* 5-mile zone.

† 1-mile zone.

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Ditching (linear feet)	Cleaning and deepening (linear feet)	Clearing and brushing (acres)	Filling (cubic yards)	Oiling		Character of problem	Cases of malaria		Mosquitoes found	Remarks as to control
				Area (acres)	Oil used (gallons)		Total	Contracted at camp		
6,000		80			1,200	Not serious.	(a) 20		Anopheles, Culex.	Control satisfactory.
24,000	292,300		14,900		4,933	Average.	(b) 24	5	Anopheles, Psorophora, Aedes, Culex.	Do.
5,700		150	17,850		3,675	do.			Anopheles, Culex.	Control fair.
53,970		500			14,000	Serious.	(c) 224		Anopheles, Stegomyia, Culex, Aedes.	Records incomplete.
1,500		2.5			500	do.	(b) 10		Anopheles, Culex.	Control poor.
273,440	398,880	4,000	386		3,750	Not serious.	(a) 32	10	Anopheles, Aedes, Culex.	Records incomplete.
35,588	7,320		1,911		250	Average.	(a) 38		Anopheles, Culex.	Control poor.
50,300		200				Not serious.	(b) 0	0	Anopheles, Aedes, Culex.	Control fair.
11,303	66,000				7,800	Average.	(b) 0	0	Anopheles, Aedes, Culex.	Control satisfactory.
184,800	295,680	800			215	Serious.	(a) 85	7	Anopheles, Psorophora, Culex, Aedes.	Control poor.
52,800	9,400	150			22,100	do.	(a) 72	59	Anopheles, Psorophora, Aedes, Culex.	Control unsatisfactory.
27,933	297,542	15	452		4,800	Average.	(a) 47		Anopheles, Psorophora, Aedes, Culex.	Control satisfactory.
4,000		2			75	do.			Anopheles, Aedes, Culex.	Do.
1,280		10			180	do.	(a) 50		Anopheles, Culex.	Do.
81,760	57,625	111	456		19,678	do.	(c) 32		do.	Control fair.
30,156	121,405	0.6	684		10,813	Serious.	(c) 172	44	do.	Control unsatisfactory.
	83,000	200			7,200	do.	(a) 3		do.	Control fair.
						do.	(b) 10		Anopheles, Psorophora, Culex, Aedes.	Do.
42,240	155,691		931		23,760	do.	(b) 5	5	Anopheles, Culex.	Control unsatisfactory.
111,000	20,000				2,000	do.	(a) 479	1	Anopheles, Psorophora, Aedes, Culex.	Control satisfactory.
6,375					2,710	Average.			Culex, Mansonia, Anopheles, Aedes.	Control fair.
22,000					500	do.	(b) 13	4	Sollicitans.	Control unsatisfactory.
71,988	5,280					Not serious.	(b) 0	0	Culex, Anopheles.	Control satisfactory.
1,324,000		28			19,000	Average.	(a) 167	3	Anopheles, Culex.	Control fair.
11,559	377,204	275	150	400	5,626	Serious.	(a) 288		Anopheles, Psorophora, Culex, Aedes.	Control satisfactory.
200,000					600	do.	(c) 49		Anopheles, Aedes, Culex.	Do.
42,240	42,240					Not serious.	(a) 22		Anopheles, Culex.	Do.
110,880		20			7,400	do.	(a) 45		do.	Do.
	23,000					Serious.	(a) 45		Anopheles.	Control poor.
3,400	306,355				8,000	do.	(b) 1		Anopheles, Culex.	Control satisfactory.
1,000		40			600	Not serious.	(b) 2		Anopheles, Culex.	Do.
24,000		30			1,500	Average.	(a) 114		do.	Do.
		400			28,850	do.	(b) 8		Culex.	Do.
						Serious.	(a) 190		Anopheles, Culex.	Do.
40,400	89,800					do.	(a) 19		Anopheles, Mansonia, Culex, Aedes.	Do.
161,398	54,014	192			2,700	do.	(a) 40		Anopheles, Psorophora, Culex, Aedes.	Do.
						do.	(a) 155		do.	Do.

SUMMARY OF WORK DONE

In Table 26 is shown in detail a summary of the malaria control situation at 70 of our largest and most active stations, within which were housed, during their mobilization and training period in this country, the majority of the 4,000,000 men called to the colors.²¹ It should be explained that the data in this table represent the best information obtainable after an exhaustive search; but, due to the preoccupation in military affairs, the frequent shifting of troops throughout the major portion of the war, and other causes, it has so come about that the records in many instances are incomplete. Therefore, it is probable that, as regards the amount of work done and the number of laborers



FIG. 63.—Type of oil tank and spray used about buildings of the camp where places to be oiled were readily accessible, Kelly Field, Tex.

used, the items set forth are somewhat smaller than actual facts would warrant. With reference to the incidence of malaria it should be said that, while the number of cases of malaria occurring at each station is accurately known, there is much uncertainty as to how many of these actually were contracted on the military reservation. Of course, many men who fell sick with malaria either were suffering from relapses or were infected before coming to camp or while temporarily absent from their stations after joining. Furthermore, it should be mentioned that the antimalaria work was not started in all the camps at the same time, nor carried on to as late a date in some as in others, so that just comparisons in regard to the results accomplished, camp by camp, can not be made.

The following is a summary of the mosquito control work which was carried out, as given in detail in Table 26:

TOTALS	
Ditching	linear feet.. 4, 836, 321
	miles..... 915
Cleaning and deepening streams.....	linear feet.. 5, 749, 890
	miles..... 1, 088
Clearing and brushing.....	acres..... 10, 250
Filling.....	cubic yards.. 141, 384
Area under control (average).....	square miles.. 541
Oil used.....	gallons..... 296, 079
Laborers employed (average).....	men..... 2, 584
Camp population (average).....	soldiers.. 941, 364

In arriving at the total of 541 square miles which has been listed as under control by the military authorities, attention should be called to the fact that this area was constantly changing. The maximum area supervised at certain periods was considerably in excess of 541 square miles, which represents an estimated average for the duration of the war. It will be noted in Table 26 that the actual areas under control at the individual stations ranged from half a square mile to a maximum of 40 square miles.

METHODS

The methods used in malaria control during the World War were those considered good practice at the time the conflict started. Some research work was carried on, and a few interesting new developments were recorded, but considering the program as a whole it may safely be said that the outcome confirmed in a big way the soundness of previous findings concerning the prevention of malaria and that no fundamentally new principles or procedures were involved.

Considerable discussion had taken place in the past regarding the best means of limiting malaria, and numerous statements have been made as to the relative preventive value of such measures as protection by screens, mosquito elimination, prophylactic doses of quinine, and adequate treatment of actual cases. A striking example of the comparative results attained by some of these methods was given in a report by Prof. Aldo Castellani, covering experiences in the Adriatic zone in 1916.²² In this district were four stations. In the first camp no antimalaria measures were taken, and practically 100 per cent of the military population was affected by the disease. In the second camp treatment with quinine was the only preventive measure relied on, and 45 per cent of the officers and men were affected. In the third camp antimosquito methods alone were employed, and 25 per cent of the officers and men suffered from paludism. In the fourth camp both quinine treatment and mosquito-control methods were used, and as a result, 94 per cent of the men and 97 per cent of the officers were protected from malaria.

The antimalaria program which was followed in the United States Army, both before and during the World War, contemplated mosquito elimination, careful screening of the healthy, and screened segregation, with prolonged

treatment for those suffering from malaria. It is clear that any of these procedures, if perfectly carried out, would ultimately be sufficient in itself to prevent the occurrence of malaria, but since none of them in practice ever reaches 100 per cent efficiency, it was deemed necessary in our Army to practice all three for satisfactory results. Prophylactic doses of quinine have not been advocated in our Army except under special and peculiar conditions when other preventive measures could not be carried out or proved insufficient.

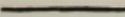
While similar observations had been made before the war, reports from the nonmilitary workers in the extracantonment zone about Ebert Field, Lonoke, Ark., actually demonstrate that a careful blood examination of the entire civilian population surrounding an Army station, with quinization of all the malarial cases found thereby, may sometimes be an effective aid to the other methods of combating malaria.¹⁸ The facilities for such a procedure, however, will rarely be available, so far as the Army at war is concerned, and it is generally conceded that this method is impracticable among the troops themselves, and that sufficient control for all practical purposes can be obtained by steps directed toward elimination of the mosquitoes, screening of the well, and adequate segregation and treatment of the ill. In other words, it is not considered feasible to make blood-smear examinations of entire commands, and experience has shown that malaria can be almost entirely suppressed in the Army in more or less permanent camps by antimosquito measures, which at the same time improve the general comfort of the troops.

That drainage constitutes the most important procedure in the control of mosquitoes, and the consequent prevention of malaria, has long been generally admitted, but during the war it was surprising to find that officers who had been making the elimination of mosquitoes a life work were either carrying on drainage projects in a very elementary manner, or were disregarding them to an extent that resulted in unnecessary expenditures for control by the use of oil. As a rule, however, the sanitary engineer approached the problem from an engineering viewpoint. He planned and executed his program after careful surveys, designing the drainage ditches not only with a view to a proper grade, but also with due regard to the shape of the cross section, in order that there might be a proper flow whether in dry weather or flood time, and also that the walls might not wash unduly. Wherever such methods were employed the ditches remained intact for practically the entire period of the war, except where the soil was unusually sandy and excessive flood washing was difficult to prevent. The experiences in drainage during the war show very conclusively that a great deal of attention should be paid to the laying out of the ditches and to the careful planning of the drainage, considering the area of control as a whole. There have been a few instances in which it was clearly demonstrated that the failure to use the surveyor's level before initiating a program actually made conditions in regard to stream flow worse than they were prior to undertaking the work. It was found that the practice of ditching along streams without the use of the level should be discouraged.

As a matter of first aid in mosquito elimination during the period when the drainage work was under way, carefully carried out oiling intelligently planned in advance of its execution proved essential. In addition there was,

CAMP JACKSON SOUTH CAROLINA

Survey by Sanitary Engineers, showing layout of drainage ditches.

-  Ditches dug by Detachment of Sanitary Corps.
-  Ditches dug by other agencies.
-  Oil drips.

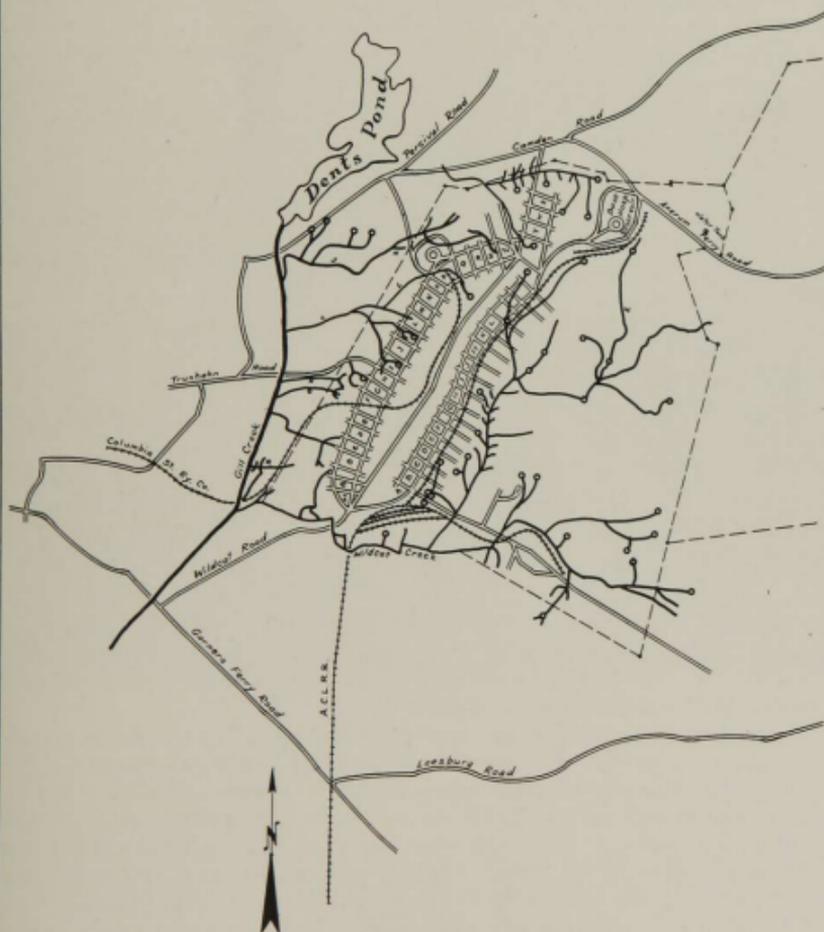


FIG. 64

in many localities, need for continued oiling.²¹ The oiling as executed in our military stations was quite uniformly well done. A mixture of crude oil and kerosene commonly was used. It was applied by a large number of devices, including knapsack sprayers, pressure sprayers mounted on vehicles, common garden sprinkling pots, stationary drip cans located at heads of streams and other places, submerged bottles containing oil so arranged that the oil escaped slowly until the water reached a level below the mouth of the bottle, sacks of sawdust soaked with oil, and oil-saturated sawdust sprinkled broadcast over swampy areas. The general scheme of oiling contemplated covering the entire area under control at weekly intervals unless the weather conditions were so unfavorable to mosquito development that the periods between applications could be lengthened. In some of the districts oil was spread only on the streams in which breeding was reported by the inspectors. This plan, when inspections were carefully executed, gave excellent results and eliminated the unnecessary

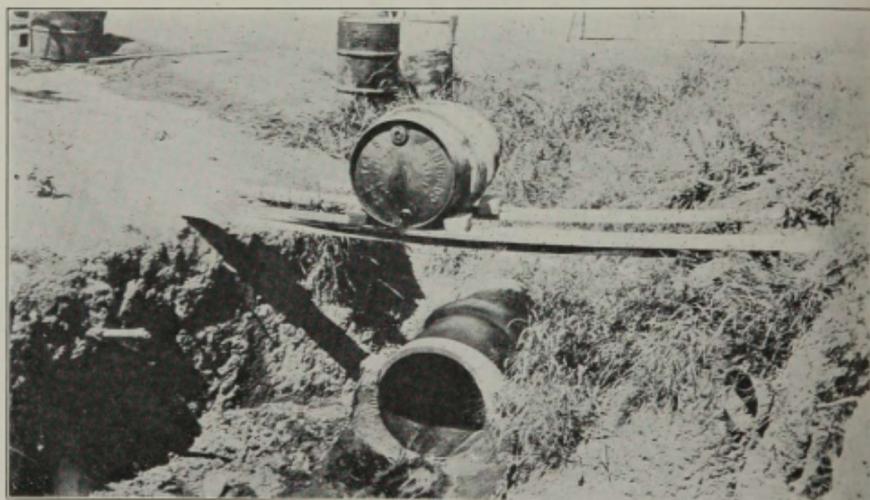


FIG. 65.—Oil drip at termination of storm sewer at Kelly Field, Tex.

expenditure of large quantities of petroleum. While available records show that about 300,000 gallons of oil were used by the Army during the war, it is probable that this does not represent by any means the total amount, since the reports in this regard are incomplete.²¹

The area under control at the various camps usually was divided into districts over which supervisor-inspectors were placed in general charge.² These were generally white noncommissioned officers; in some cases they were assisted by colored soldiers who had been trained to identify the various types of mosquitoes and larvae. Each inspector was held directly responsible for the amount of breeding in his area. Reports were made daily at control headquarters regarding the conditions in the several districts so that prompt action could be taken for correction when necessary. Large spot maps were used together with organization charts showing where the details of men were at work, so that the sanitary engineer in charge of the campaign could at any time visualize the activities for the day and also obtain a general picture of the conditions in the several districts.

Collections of mosquitoes were made regularly in most camps with a view to checking up the results of the local control work and also for scientific purposes. From the Surgeon General's Office to the various organizations in the field, instructions were sent covering the subject of collection and shipment of specimens to the Army Medical Museum where they were identified.²⁴ These instructions called for biweekly collections taken in the morning, at noon, and in the evening. This was sufficiently frequent in most camps to serve for checking up the adequacy of control. Weekly collections were required at 67 different stations, morning, noon, and night, making a total of 201 occasions on which collections were made each week. In addition to this, special collec-

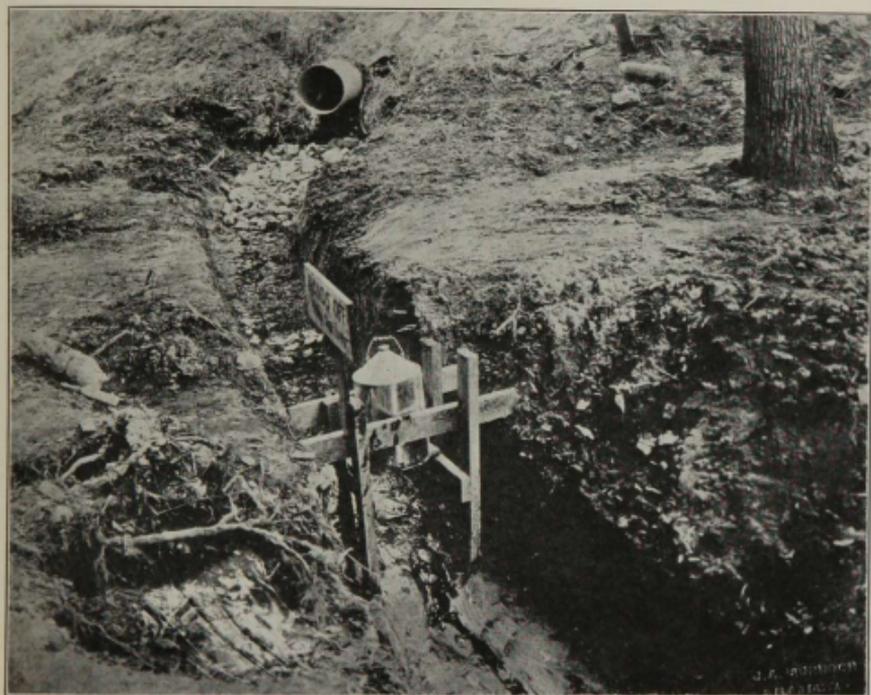


FIG. 66.—Crude-oil drip can installed at head of stream, Camp Gordon, Ga.

tions were made from time to time by the officers concerned at various times of the day and night. Mosquito traps were used for the collection extensively, and in certain places effectively, but this method was quite uniformly ineffective where mosquitoes were on the wing in small numbers only. So excellent was the control work in some southern camps that it became necessary to exercise great ingenuity and patience to collect mosquitoes, while, on the other hand, as at Camp Eustis for example, it was possible to gather with very little difficulty many hundreds of anopheles.²⁵ Figure 57 shows the more important stations where anopheles were discovered. A large number of other types of mosquitoes were collected and identified.



FIG. 67.—Big Creek Bottom, Park Field, Tenn. Type of thicket swamp

In a number of camp areas top-feeding minnows were very effectively used in the antimosquito campaign. On the other hand, in about 50 per cent of the areas they were not employed extensively, though possibly better results could have been attained if they had been. These minnows were some-



FIG. 68.—Fort Logan H. Roots drainage work; before draining



FIG. 69.—Same as Figure 68; after draining

times available locally, growing in large quantities in small lakes and pools. In other instances they were obtained from fish hatcheries. The *Gambusia affinis* commonly was relied on and was believed generally to be the most efficient minnow for destroying mosquito larvæ.²⁶



FIG. 70.—Drainage in swampy areas, Camp Meade, Md.

In certain places larvacides were used in addition to oil.¹ This was particularly true in some of the salt-marsh areas, but as a matter of fact larvacides were employed most extensively in the control of mosquito breeding in water containers. It was feared by some camp authorities that an oil film on the fire barrels might prove dangerous, and therefore a larvacide was employed; it was reported as effective in a number of cases. Several different types of larvacide were tried out, including common salt, niter cake, and Panama larvacide. Though there was little if any fire risk, the oiling of water barrels was done in the proper way, so as to avoid an undue amount of surface oil. However, the results from the use of salt, lime, niter cake, and some other



FIG. 71.—Large swampy area, southwest corner Camp Jackson, S. C. This illustrates very clearly the manner in which the ditches are filled with the fine sand after each rain

substances, demonstrated the fact that mosquito control without oil is not difficult in water containers of this type. As compared with the oil, however, the quantity of the larvacides used in the military antimalarial campaign was negligible.¹

In many camps it was necessary to do extensive clearing and brushing in order to hasten the drying of the soil by admitting sunshine, and also to prevent the harboring of mosquitoes within certain areas.¹ It was noted in a few instances that much unnecessary labor was expended in this regard because of clearing being done at the wrong season of the year. On the whole, clearing, brushing, and weed cutting proved of secondary importance in mosquito

control, and efforts were directed mainly to draining and oiling. In one or two places good results were reported from the use of goats for brushing and clearing.²⁷

In some streams it was found possible to construct temporary dams equipped with sluice gates, thus permitting a flushing of the channel at frequent intervals, perhaps on the average of once or twice a day.¹ This method was effectively used at Camp Pike, and elsewhere and eliminated the expense of oiling in several of the most difficult areas.

In all of the National Army cantonments the major portion of the commands were housed in two-story frame barracks which eventually were screened in most instances. In the National Guard camps, on the other hand, troops were sheltered in tents which usually were unscreened. In most of the tent camps where the troops were exposed to mosquitoes, bed nets were furnished



FIG. 72.—Dam for flushing purposes

and orders were issued requiring their use.²⁷ The screening of the cantonment buildings was in many instances delayed so that there was a period, which extended well into the 1918 season in some of the camps, during which the screening could not be said to be adequate.²⁸ Then again, during the latter part of the 1919 season, and occasionally, in the early part of 1919, reports came to the Surgeon General's Office stating that the screens were in bad repair, due to breakage, warping, and corrosion of gauze.² The providing of adequate screening was regarded as one of the most important features in the control of malaria, and it proved that close cooperation should be maintained between the agencies directly responsible for controlling malaria and those charged with the responsibility of furnishing and maintaining screens. The Surgeon General early took up the question of screening for purposes of both mosquito and fly exclusion. This is shown by the following correspondence:

DECEMBER 27, 1917.

Memorandum for the Quartermaster General:

(Attention Maj. Charles O. Zollars, Q. M. C.)

1. In accordance with verbal request, the following recommendations are submitted regarding the screening of buildings next year.
2. In all National Army and National Guard cantonments and other military stations in the United States the kitchens and dining rooms and the bakeries should be screened; also post exchanges.
 - b. At Camp Lee, Va., and at Camp Pike, Ark., and at all other camps and stations south of these points, all enlisted men's dormitories and officers' quarters should be screened.
 - c. All base hospitals, both National Army and National Guard, and all other hospitals, should be completely screened except the corridors. Pavilion wards should have screens on the windows on one side and on the entire porch on the other side.
 - d. All windows that are to be screened should be provided with full-length screens securely attached on the outside.
 - e. Every door in southern camps referred to above should be provided with a vestibule so arranged that two screen doors must be passed through in order to enter the building.
 - f. Special attention should be given to screening ventilators and other miscellaneous openings into buildings.
 - g. Netting having 18 meshes to the inch should be used at Camp Lee and Camp Pike and at all other stations south of these points.

(Signed)

F. P. REYNOLDS,
Colonel, Medical Corps.

FEBRUARY 28, 1918.

Memorandum for the Quartermaster General:

1. In view of information recently received by this office, it is recommended that paragraph 2 of memorandum for Quartermaster General dated December 27, 1917 (copy attached), be amended so as to read:

At Camp Meade, Md., and at Camp Taylor, Ky., and at all other camps and stations south of these points, all enlisted men's dormitories and officers' quarters should be screened. At camps north of these points screening is not deemed essential for sanitary reasons, but will add materially to the comfort of the occupants.

(Signed)

D. C. HOWARD,
Colonel, Medical Corps.

FEBRUARY 27, 1918.

Memorandum for the Quartermaster General of the Army:

(Attention Maj. Charles O. Zollars.)

1. With further reference to memorandum from this office dated December 27, 1917, regarding screening of barracks, it is recommended that paragraph 5 be so amplified as to provide that all screen doors shall open outward.
2. Experience has shown that screen doors which open inward offer much more favorable opportunities for the entrance of mosquitoes when individuals are passing through the door.

For the Surgeon General:

(Signed)

D. C. HOWARD,
Colonel, Medical Corps.

FEBRUARY 25, 1918.

From: The Surgeon General of the Army.

To: The officer in charge, cantonment construction, Quartermaster Department, Washington, D. C. Attention Capt. A. S. Dorsey.

Subject: Screening of cantonments.

1. With further reference to memorandum from this office of December 27, 1917, in which certain recommendations were submitted regarding the screening of cantonment buildings.

2. While this office prefers and recommended screen cloth, 18-mesh, the 16-mesh will be acceptable if the finer mesh can not be obtained in sufficient quantities.

3. It is understood that the manufacturer will not be able to produce sufficient of the 16-mesh for wiring all buildings. If this is true, it is better that certain of the northern camps be screened with the 14-mesh than that no screening should be done due to the delay in getting materials.

4. The 18-mesh should be used at our most malarial posts, and should also be used in the screening of all hospitals.

5. It will be understood that the 14-mesh is not entirely satisfactory to this office, but is believed to be better to get these buildings screened without delay than to wait for the production of the finer mesh material which may be delayed until later in the summer.

For the Surgeon General:

(Signed) D. C. HOWARD,
Colonel, Medical Corps.

[Second indorsement]

WAR DEPARTMENT, CANTONMENT DIVISION,
March 2, 1918.

To the SURGEON GENERAL OF THE ARMY,
Washington, D. C.

1. The statement in your letter of February 25, 1918, addressed to the officer in charge of cantonment construction, and in your letter of February 23, 1918, to Mr. G. N. Peek, industrial representative, Council of National Defense, Washington, D. C., that 16-mesh screening will be acceptable if the finer mesh can not be manufactured in sufficient quantities is noted, and as it is found to be practically impossible to obtain the 18-mesh screening, orders are being placed for 16-mesh, in order that this screening may be completed at the earliest possible date, particularly in the southern camps. Should a shortage occur, 14-mesh will be used only in northern cantonments where such a course becomes imperatively necessary.

By authority of the Secretary of War:

(Signed) R. C. MARSHALL, JR.,
Lieut. Colonel, Q. M. Corps, N. A.,
In charge of Cantonment Division.

FEBRUARY 27, 1918.

From: The Surgeon General of the Army.

To: The Adjutant General of the Army.

Subject: Screening camps, cantonments and other military stations in the United States.

1. In view of the near approach of the mosquito and fly season and the well-known connection of these insects with transmission of certain diseases, it is imperative that barracks, kitchens, mess halls, hospitals, etc., be screened without delay.

2. Recommendations of this office with regard to the amount and kind of screening required from a sanitary standpoint were furnished the Quartermaster General under date of December 27, 1917, in memorandum, copy of which is attached hereto.

3. Upon representation of the officer in charge, cantonment construction, that it would be impossible to procure screen cloth 18-mesh in sufficient quantities to cover all screening requirements without considerable delay, this office has modified its original recommendation relating to 18-mesh cloth in letter addressed to the officer in charge, cantonment construction, dated February 25, copy of which is attached. While 18-mesh cloth for all purposes was desired, it is preferable to complete the screening of all buildings with a coarse mesh cloth without delay rather than to adhere to the original recommendation for the finer mesh which could not be secured in sufficient quantity until late in the summer.

4. It is urgently recommended, therefore, that the cantonment division be directed to expedite the completion of this work in every possible manner.

For the Surgeon General:

(Signed) D. C. HOWARD,
Colonel, Medical Corps.

APRIL 9, 1918.

From: The Surgeon General of the Army.

To: The Adjutant General of the Army.

Subject: Screening, Camp Travis, Tex.

1. At a recent sanitary inspection of Camp Travis by Col. W. P. Chamberlain, M. C., the following recommendations were made:

(f) That screening be expedited. Constructing quartermaster says it will take 6 months to screen the buildings, owing to depleted condition of screen market.

(g) Camp quartermaster has received no instruction regarding purchase of fly paper or fly swatters. Recommend this be brought to attention A. G. O.

2. Prompt screening of all buildings at Camp Travis is urgent from a sanitary standpoint. Colonel Chamberlain's recommendations are concurred in.

For the Surgeon General:

(Signed) D. C. HOWARD,
Colonel, Medical Corps.

The Surgeon General particularly emphasized the necessity of 18-mesh gauze in southern camps, because this was the degree of fineness deemed necessary to exclude with certainty the Stegomyia, a most annoying pest as well as the host of the virus of yellow fever. As is shown above, it was found impossible to obtain netting of so small a mesh, and in fact obtaining wire gauze of any type was slow and difficult, because of the enormous demands of the war upon the metal supplies and industries of the country.

Fumigation was used to a considerable extent in getting rid of mosquitoes on the wing in the event of an influx of large numbers, and also in killing the few mosquitoes which hibernated during the winter months. Various methods were used, but the most common, in the wooded districts and away from the buildings, was spraying the place to be fumigated with gasoline and then burning. This method was found very effective in early spring campaign work in such places as hollow trees and old abandoned cellars.

COST OF MALARIA-CONTROL CAMPAIGN

It is impossible to state accurately the expenditures which were involved in malaria-control work as carried out by the Army during the World War, or to make any safe comparison between the costs at different stations. This is due to uncertainty regarding a large number of factors, chief among which are the following: Constant change in the number of men employed in the work; wide range of difference in terrain problems; lack of personnel sufficient to keep detailed cost data; seasonal differences as regards rainfall and subsequent mosquito breeding, and variation in the availability of labor and corresponding differences in prices where civilian labor was used. In most of the camps the rush of the work, the constant changing of troops, the strong effort to get enough men to start malaria control, the uncertainty as to how long the program would be continued, and other difficulties almost innumerable, made the task of tabulating expense data practically impossible. Energies were spent on the execution of the project, the cost being of secondary, or no, consideration.

However, based on Table 26, the following figures show the cost of the work so far as it has been reported.²⁷ This undoubtedly represents the cost of the major portion of the program as carried out: For labor, \$2,400,000; oil, \$50,000; tools, \$50,000; transportation, \$125,000; supervision, \$75,000; miscellaneous items, \$30,000; total, \$2,730,000.

The above figures for most camps are based on the cost of the work accomplished from September, 1917, until the spring of 1919. It was estimated that during the period 2,000 laborers, largely soldiers, were employed for 400 days, at an average cost of \$3 per day.²⁷ In addition to this expenditure of \$2,730,000, considerable money was spent for a number of special drainage projects executed under independent contracts, usually supervised by the construction division of the War Department.²⁷ Some work never was reported. The best estimate which can be placed on these two items is at least \$500,000, so that it is safe to say that the malaria control work up to the spring of 1919 had cost the Army at the lowest estimate about \$3,250,000.²⁷ Since the problem of malaria control is essentially a local one, costs vary over a wide range, even in the same State. On the basis of 541 square miles, which, as previously stated, was the average area controlled by the Army at 70 camps, from the beginning of the work until the spring of 1919, the cost per square mile was approximately \$6,000.²⁷ On the other hand, a great deal of expense data were received from individual projects and these, when studied collectively, emphasize the risk in drawing any conclusions as to relative costs. This is illustrated by the following figures per square mile which are taken from various reports which are available to the Surgeon General's Office.²⁷

Malaria-control costs

New Jersey cost per square mile (987.4 square miles)-----	\$1,197.00
United States Public Health Service cost per square mile (1,030 square miles)---	420.00
Camp Pike cost per square mile (40 square miles)-----	3,575.00
Camp Gordon cost per square mile (20 square miles)-----	1,575.00
Little Rock, United States Public Health Service cost per square mile (56.7 square miles)-----	1,621.00

The wide divergence in the cost per square mile in different localities and by different agencies may in part be due to difference in records. If the total area under control by the Army was computed on a basis of the maximum areas under control at the many stations reported on, the cost per square mile would be considerably less than that quoted above, yet it is believed that the cost per square mile as stated represents a conservative estimate for the average area controlled.

WORK IN AREAS SURROUNDING MILITARY STATIONS

The United States Public Health Service assumed the responsibility for carrying out antimalaria work in the extracantonment areas and in other regions where such work would be of benefit to the military forces and to adjacent civil population.²⁹ The following extracts from a report of the Surgeon General of the United States Public Health Service give a picture of work done by that agency:²⁹

Mosquito control and antimalaria work.—In reducing the disease hazard for the soldier and sailor it was realized that special effort would be necessary to combat malaria in the areas about military cantonments, naval reservations, aviation camps, munition plants, shipyards, and other important war industries established throughout the whole of the South. It was realized that the introduction of large forces of laborers from malarious regions would produce new conditions in and around cantonment towns that would make extra precau-

tionary measures more essential for the protection of the civilian, military man, and industrial worker. There was little danger of malaria being contracted within the cantonment reservation as the Sanitary Corps of the Army were prepared to adequately supervise these areas, but as the laborers and men were very likely to spend much of their time in the areas adjacent to the camps, protective measures were necessary for both. The important problem then was to do thorough work rapidly in all localities where military men were present in numbers in potentially malarious districts, as well as to prevent the breeding of mosquitoes and their subsequent flight into the reservations.

In the selection of camp sites the question of malaria prevalence and control of the future incidence of the disease was apparently only one of the many requirements to be considered, and as it was essential to expedite camp construction with all possible speed malaria preventive measures had to proceed accordingly in order to prevent future malaria transmission in that locality. The shortage of efficient labor and the necessity of obtaining funds that could be immediately applied were very important items. In connection with the antimalaria work in extracantonment areas the State, county, and city officials in many instances grasped this opportunity for the elimination of malaria and many made liberal contributions for assistance in the work. However, in some cases it was an extremely difficult and slow process to convince local authorities of the urgent necessity for appropriating immediately funds for this work. At this stage had it not been for the financial assistance received from the American Red Cross, before Federal funds were available, work would have been greatly delayed. However, as a whole the support given by the authorities throughout the Southern States was very encouraging.

Malaria-control measures were carried on usually in an area about 1 mile wide surrounding the reservation, industrial plant, and city or town adjacent, it being deemed sufficient, from experience obtained in the malaria-control work in the Panama Canal Zone, that, if this strip 1 mile wide were kept free from mosquitoes, those breeding beyond the border would not gain access to the camp, and if the 1-mile-wide area were kept free no malarial mosquitoes would be found in the camp.

The work which was done consisted in the drainage of swamps, ponds, wet areas, and seepage outcrops; the proper clearing, training, and regrading of natural watercourses; the application of oil at definite periods to all remaining mosquito-breeding areas; and the modification and systematic treatment of shore lines and shallow parts of large lakes and ponds, together with the proper maintenance measures necessary. In order to accomplish this work, the services of skilled engineers with special training and experience in antimalaria work was necessary.

To attain the desired results many and various local engineering problems had to be met and drainage work done by various methods, such as by the use of steam shovels, ditching machines, plows, explosives, and by hand.

* * * * *

In many places, where it was not practicable to drain all mosquito-breeding areas, it was necessary to control breeding by the use of oil applied to the surface of streams, ponds, and potential breeding places. A mixture of kerosene and crude oil was found most efficacious and was applied to the water surface by the use of various methods—knapsack spray pumps, by which the operator carried a spray pump strapped to his back fitted with a hose and nozzle which would throw a fine spray of oil. This method was particularly advantageous where stream edges could not be cleared, where there was no current, or where the current would not carry oil to the margin. The drip can was found very efficacious in slowly running streams, the oil being placed in a can and the dripping gauge so regulated as to allow the necessary amount of oil to pass out.

Still another method which proved very good was the use of oil-soaked sawdust or waste placed on the surface of the water or anchored beneath the surface.

Where oiling was used as a measure of malaria control, regular applications were necessary at certain specified times, and in order to keep a check upon the effectiveness of antimalaria operations trained personnel were detailed to completely cover the flight zone once a week to determine whether the breeding of mosquitoes was controlled. In this way the whole area was at all times under supervision.

Excellent results were accomplished by the Army Sanitary Corps within the military reservations. Most cordial relations existed between that corps, whose duty it was to prevent mosquito production within the military cantonment, and the officers of the Public Health Service, who directed measures in the 1-mile zone surrounding the reservation, as well as in the cantonment town and the area surrounding the town. In addition, it was frequently necessary that the Public Health Service undertake similar control operations about distant amusement parks and other areas where military men and industrial employees congregated.

A further method of control which was instituted in many of the zones was the seeding of ponds with larvæ-eating top minnows. Assistance was rendered by the Bureau of Fisheries in detailing their experts to several of the zones to properly supervise this seeding.

A very interesting and instructive piece of work was done in the extracantonment zone about the aviation field at Lonoke, Ark., in which three of the four general methods of malaria-control measures were instituted and enforced. The control of mosquito breeding was carried out as in other zones; preventing the access of mosquitoes to well people was carried out by requiring all buildings within the zone to be properly screened inclosures, hence all open-air night gatherings being eliminated; preventing the infection of mosquitoes, or human control, consisted in the detection and sterilization by quinine of human carriers of the malaria parasite, this being determined by blood examination. The fourth method, immunization against malaria, was not instituted. The results of malaria-control work in that zone are very interesting when the mortality and history incidence in 1917 is compared with mortality and case reports in 1918. In 1917 four deaths from malaria occurred within the controlled area, giving the death rate of 160 per 100,000. During 1918 no deaths occurred. The history incidence in 1917 showed that 29 per cent, or 522 persons, suffered from the disease, whereas in 1918 only 1 case occurred.

The results accomplished in antimalarial work in the extracantonment zones extending from Massachusetts to Texas and from Louisville, Ky., to Jacksonville, Fla., covering 40 acres in 15 States, have not been the absolute prevention of malaria, but certainly made the problem one of no consequence for the military authorities and for the civilian population within the controlled areas. As shown in Table No. 2, following, the total area of over 1,227 square miles has been under supervision, giving protection to an average total of 1,140,800 military men at all times, the individual men being constantly changed as well as to a total of 3,757,848 of the civilian population.

Where cantonments were located in notoriously malarious sections very little malaria has been contracted by enlisted men, and the malaria sick rate among enlisted men in camp, if from the South, was very much lower than had they stayed at home. When the Army and Navy sick-rate figures are published it will undoubtedly be shown that, due to the proper mosquito-control measures, practically very little and in many instances no malaria has been contracted at camps located in regions noted for malaria.

* * * * *

The great volume of work which has been done would not have been possible had the individual communities, towns, and local organizations not contributed liberally for assisting and extending antimalarial activities. The railroad corporations gave strong support and willingly did such drainage work as was requested. The support given by the public of the South and the officials who represent them, even in the relatively poor and sparsely settled districts, deserve highest commendation, and approximately half of the extracantonment towns of the South have planned to continue mosquito-control measures after the withdrawal of service officers.

As a result of the demonstration, one State legislature, for the first time in the history of this country, appropriated funds for carrying on the antimalaria control measures in the State. This should be followed in the next few years by all the States throughout the South and thus be a big step toward the prevention of the annual national loss due to malaria.

Table No. 2, * * * gives a summary showing the number of square miles under supervision in and around each extracantonment area, the number of miles of ditches dug, streams rechanneled, drained, etc., as well as the total amount of oil used as a larvacide. To carry out this work there were in the employ of the service 50 sanitary engineers and an average of 100 scientific assistants, 225 sanitary inspectors, 500 foremen, and 3,000 laborers.

RESULTS OF THE ANTIMALARIA CAMPAIGN

With a very few exceptions the work on malaria control at the various military stations at home as carried out during the World War was excellent and the results were extremely gratifying. General conclusions can best be drawn from a study of the reports from the larger stations, since these contained the majority of the forces that were mobilized. The relative incidence of paludism at the more important mobilization points is shown in Charts III and IV. There were several localities in which the problem was exceedingly difficult, and where the outcome was highly satisfactory, as judged by the almost total absence of mosquitoes and the practical elimination of locally contracted paludism. In this class should be placed Camps Jackson, Pike, Taylor, Travis, and Shelby.²⁷ On the other hand, results at a few stations were not satisfactory due to the inability of the Medical Department to secure proper cooperation in regard to furnishing labor, appropriating funds, and providing transportation to those supervising the work.²⁷ Camp Eustis is perhaps the most glaring example of this kind. At that station there was never satisfactory malaria or mosquito control, in spite of the fact that the work was for a long time under the supervision of one of the best mosquito-control officers in the sanitary engineering section.²⁷ Other southern camps in a number of instances were successful as regards prevention of malaria, but at the same time did not maintain the reservation free from mosquitoes at all times. It is apparent, therefore, that in evaluating the end results of this type of work one must take into consideration two factors: First, success in eliminating mosquitoes, and, second, the occurrence or nonoccurrence of locally contracted cases of malaria. It is unfortunate that in a large number of stations the Medical Department kept no consolidated record of the malaria cases which were of local origin and in which there was no previous history of this disease.²⁷ Of course, if figures were available to show the total number of cases which actually originated in each camp, one would know definitely the net results of the malaria control work. However, while these are lacking, there are enough data at hand to prove conclusively that for the Army at home malaria control was eminently successful.²⁷

In Table 26 (p. 314) is shown the total number of cases of malaria which occurred at each station, also the number supposed to have been actually infected at the military reservations concerned. It should be noted that there are three groups of figures, designated as (a), (b), and (c), in the tabulation. The first, (a), represents the total number of cases for 49 large stations covering the year 1918 only. These data are derived from the tables in the Annual Report of the Surgeon General for the Year 1919. The second, (b), represents miscellaneous figures obtained from the best sources available, such as annual reports, direct replies to questionnaires, sanitary engineers' special reports, etc.²⁷ The third, (c), represents cases as reported in the weekly telegraphic health reports (current statistics). It is also unfortunate that there are available no accurate records of malaria for all camps extending over the same periods as those during which their antimalaria campaigns were prosecuted. The data on the malaria of local origin (contracted at camp) were generally secured in response to special questionnaires, and as a result of reports from the camp

MALARIAL FEVERS, U.S. ARMY CAMPS ENLISTED MEN, WHITE AND COLORED, 1918

ABSOLUTE NUMBERS

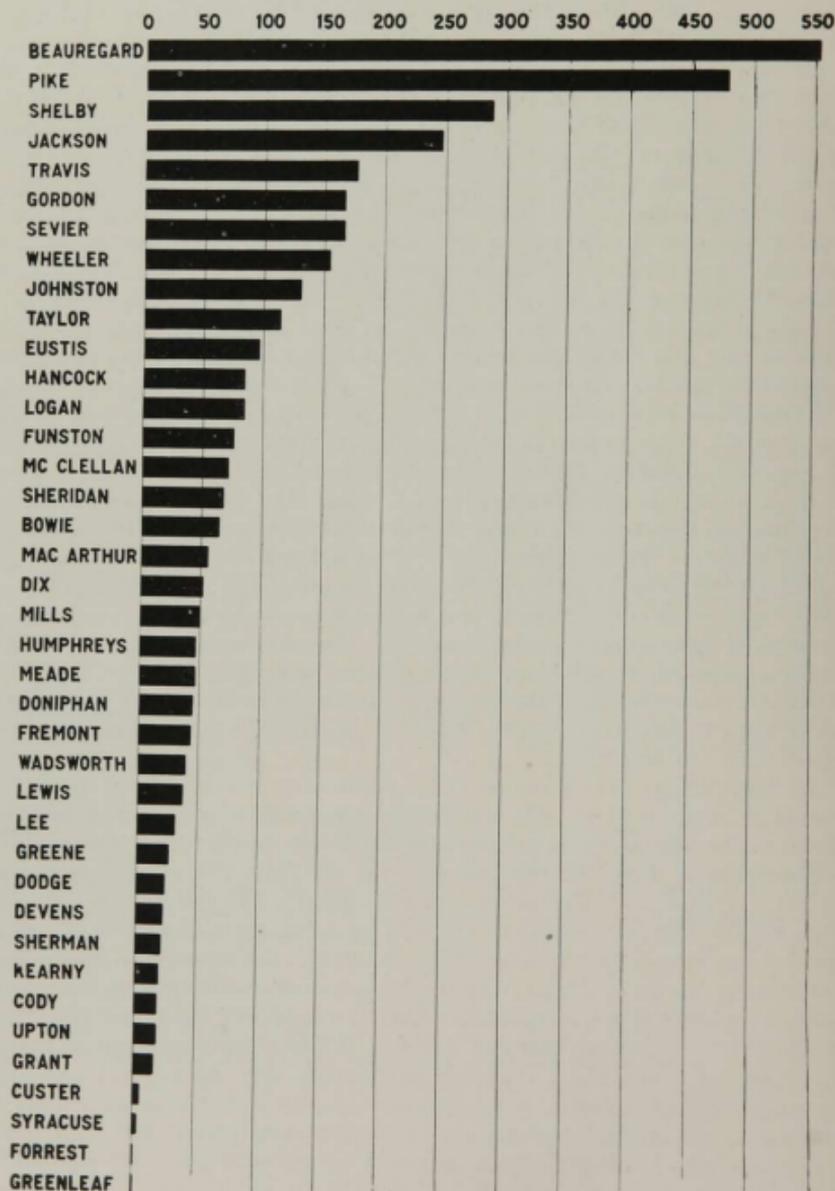


CHART III

MALARIAL FEVERS, U.S. ARMY CAMPS

ENLISTED MEN, WHITE AND COLORED, 1918

RATIOS PER 1000

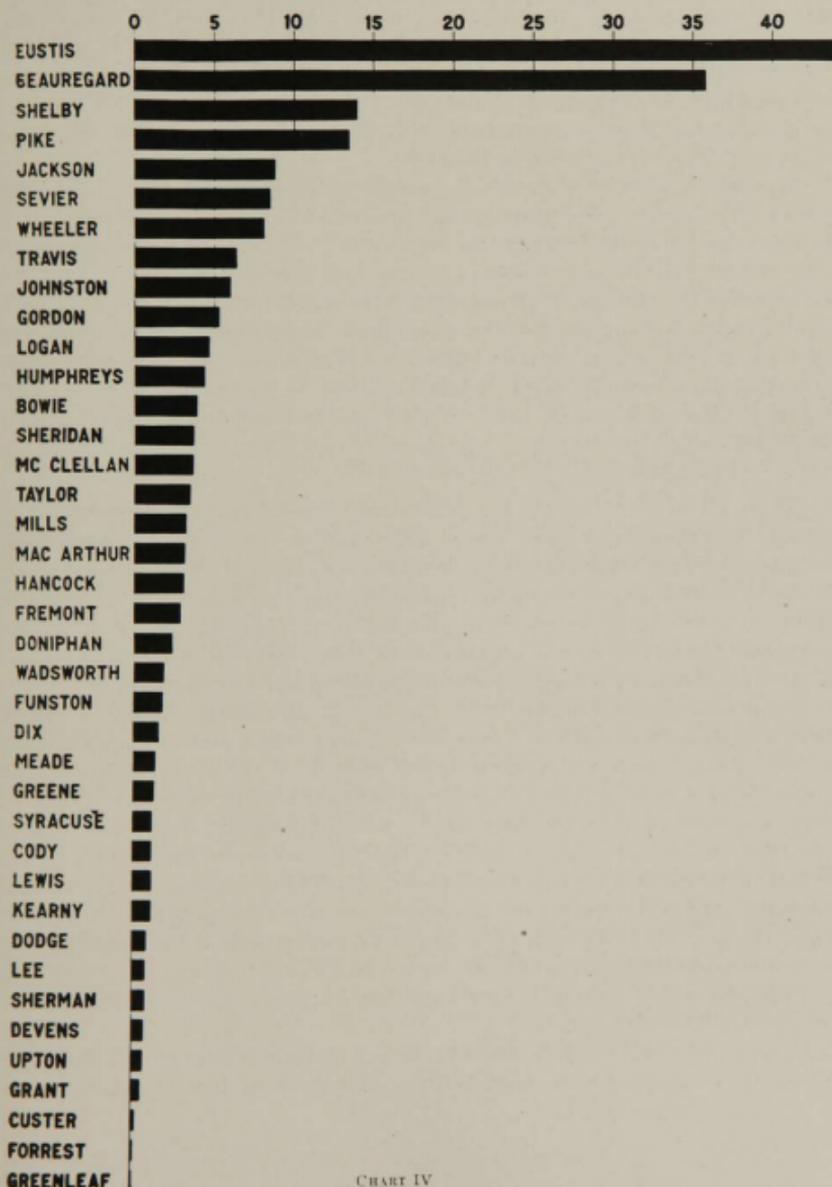


CHART IV

surgeons and sanitary engineers at the various stations.²⁷ The accuracy of these figures is open to criticism on several grounds, particularly as regards the difficulty in determining where a given malarial infection is incurred when the patient is dwelling in an endemic center of the disease.

It develops from a study of the data in Table 26 that during 1918 in the larger stations, as represented by the figures in group (a), there were 3,547 cases of malaria. Under group (b) no safe conclusions can be drawn from a collective study of these figures because of the fact that they do not cover the same period of time. The total as listed is 202 cases. The same is true of the group (c) figures, which are probably the least dependable of the three groups, and are given only because other data are not available; these total 489 cases. The grand total of (a), (b), and (c) is 4,238 cases. The number of cases of local origin as reported in Table 26 is 360.

The actual number of cases of malaria which occurred among the troops in the United States, as shown by the permanent statistics, was 4,167 in the calendar year 1917 and 5,198 in the year 1918.³⁰ A large part of those in 1917 occurred before the malaria-control program had been inaugurated. Two thousand one hundred and thirty-two of these cases in 1917 were among the National Guard troops, presumably for the most part contracted or developing while they were at the various State camps, since they did not begin to concentrate at the permanent camps until October or late in September, 1917.³¹ There were in 1917 only 5 and in 1918 only 14 deaths from malaria among troops in the United States.

CONCLUSIONS

When all of the factors are taken into consideration, particularly the national unpreparedness, the hasty mobilization, the difficulties attending screening, the fact that very many camps were located in malarial districts, and the great number of plasmodium carriers inevitably introduced into most stations, it may safely be asserted that the malaria-control work as a whole was executed in a very satisfactory manner. Due, however, to delays in organization, lack of funds, and insufficient operating personnel, mosquito control was frequently unsatisfactory until the spring and early summer of 1918.²⁷ During the balance of 1918 the work was of high order, and on a scale such as has never before been undertaken in the history of the United States. The end results were excellent; newly contracted malaria cases were very rare. The mosquito control in 1919, on the average, was considerably below the standard set in 1918, but better than in 1917.²⁷ This was due to the fact that the Army during its demobilization was somewhat disorganized at the expense of important work which was still required for the protection of the forces still in the service. Better results could have been obtained at an earlier date if the Regular Army had contained in its organization the technical assistants it ultimately obtained and if the practically unlimited funds and labor finally made available had been more promptly furnished.²⁷

During the war a considerable number of noncommissioned officers, largely students in, or graduates of, engineering colleges, were distributed among the

camps as assistants to camp sanitary engineers.²⁷ Many of these men were later commissioned.³²

It is apparent from a study of the methods used in the many camps that in instances the flushing of streams, by the aid of temporary dams and sluice gates, would have eliminated breeding more effectively than the use of oil, and at the same time would have saved considerable expense. This suggests that for the future a study of all the streams under control should be made with this method in mind.

It may be said in general that the collection of mosquitoes during the war was more or less neglected in many of the large camps and in most of the smaller posts.²⁷ This was largely due to the fact that for a considerable period it was difficult to secure personnel to carry out the most pressing malaria-control work; in some instances, however, there was apparently an entire failure to recognize the importance of gathering specimens.²⁷

As was well known before the war, the most important single factor in mosquito elimination proved to be drainage. Oiling should have been used only as a supplement to drainage.²⁷ As a result of a thorough study of the area to be put under control, large sums of money could ultimately have been saved through the systematic draining of a camp site.

As a result of war experience, it is safe to say that in the selection of southern sites for military stations two of the basic factors to be considered are the feasibility and the estimated cost of malaria control. Such consideration was given regarding some of the locations chosen during the World War, but in a number of instances this was apparently neglected.²⁷ This suggests that it is desirable that any board which selects camp sites should not act without the advice of a sanitary engineer of high qualifications. Such an arrangement would result in greater protection for the soldier and in the saving of large sums of money to the Government. That malaria can be controlled anywhere, in camps in the United States, if funds and labor for this purpose are sufficient, has been quite strikingly demonstrated by the experience of the World War. However, great expenditures for preventive measures were not justifiable when selection of a better camp site would render such use of funds unnecessary. This point is well illustrated in the case of Camp Beauregard; unless some unusual military factor demanded that a camp be located at that point, the site must be considered as a very bad selection. Large sums of money were spent in the effort to control malaria, but even so the results were far from satisfactory.²⁷ Properly to eliminate malaria at this point was possible, but sufficient funds and men were not available, nor was there time to establish control prior to the arrival of large numbers of troops.²⁷

The report which follows applies to a port of embarkation which was deemed essential to our overseas operations. It is quoted here on account of the paramount importance of malaria control work in such a situation and because the methods which were put into successful operation had to be modified to meet several interesting conditions, more various than in other camps.

MALARIA DRAINAGE OPERATIONS AT THE PORT OF EMBARKATION, NEWPORT NEWS, VA.²³

To understand the real menace of malaria to the military camps situated in the vicinity of Newport News, Va., one has but to read the report (unpublished) of a survey of this vicinity made by Dr. H. R. Carter, Assistant Surgeon General of the United States Public Health Service, and Dr. T. H. D. Griffiths, United States Public Health Service, in August, 1917. In this report there are abundant references to the widespread and prolific occurrence of *Anopheles quadrimaculatus*, *Anopheles crucians* and *Anopheles punctipennis* (in order of abundance), and to the prevalence of malaria. In the midst of these malarial conditions were planted Camps Stuart, Hill, and Alexander, and in spite of difficult drainage problems it was possible to report in December, 1918, that not a single case of malaria had originated in these camps. The value of this work is emphasized by the following paragraph from a letter from Col. Jere B. Clayton, then surgeon of the port of embarkation, Newport News, Va., to the Surgeon General, United States Army, dated November 27, 1917: "I regard the proper drainage of these swamps as the most important sanitary work that we have to do in this vicinity, as, if it is not done properly, troops stopping here while waiting overseas transportation during the mosquito season between July and October will unquestionably become infected with malaria in spite of netting and mosquito bars."

Although the United States Public Health Service had contemplated extensive extra-cantonment operations in malarial control at this port, and did considerable ditching in the vicinity of Boat Harbor during the autumn of 1917, the labor problem made extensive operations impossible, owing to the great amount of Government work in progress. The local representative, it is understood, was advised to postpone operations until March or April, 1918. However, the same difficulty to secure labor was again encountered, and extra-cantonment work made slow progress. In order to afford protection to troops stationed in camps and in various parts of Newport News, considerable extra cantonment work was done by the military authorities during 1918, and assistance was rendered the United States Public Health Service in many ways.

Organization.—With instructions to make a survey of drainage conditions at the port of embarkation camps, Newport News, Va., a sanitary corps officer was assigned for duty October 13, 1917, and a second officer December 29, 1917. The survey, owing to unusually severe weather conditions, was delayed until about February 1, 1918, and a report of the findings was submitted to proper authorities in due season.

A company of 200 colored Sanitary Corps troops arrived for duty April 8 and was organized as a malarial drainage detachment attached to the office of the surgeon, headquarters, port of embarkation. Later 47 colored Hospital Corps men were added, and temporarily, during the summer months, 50 colored stevedores, making a maximum of about 300 enlisted men, in addition to 12 white Hospital Corps men who were used as inspectors and noncommissioned officers. Owing to the fact that this organization was broken up into smaller detachments, in addition to the special nature of the work, a larger number than usual of commissioned officers (all white) was needed to carry on the operations. Thus, detachment headquarters were maintained at Camp Stuart in direct command of a captain (Sanitary Corps) assisted by a first lieutenant (Medical Corps) and a second lieutenant (Sanitary Corps), while a smaller detachment was stationed at Camp Hill in command of a captain (Sanitary Corps) and another at Camp Morrison in command of a captain (Medical Corps). Emergency details were stationed at the Nansemond Ordnance Depot, reservoir guard near Lee Hall, and at the rifle range. An officer (captain, Sanitary Corps), under the direction of the surgeon, port of embarkation, assisted by a small detachment of men, carried on malarial drainage work at the Army supply base at Norfolk.

Uniformity of action and proper coordination of the various detachments was satisfactorily maintained through the office of the surgeon. The detachments at Camps Stuart, Hill, and Morrison maintained their own mess and canteens, and a spirit of friendly rivalry in work and sports was promoted which added much to the otherwise dreary, monotonous pick-and-shovel work.

The drainage problem.—The drainage problem at once becomes obvious in the light of the following extract from a letter by Col. Charles Lynch, surgeon, port of embarkation,

dated March 29, 1918, viz: "Briefly, the camps constituting this port of embarkation are in swamps, or so near swamps that to all intents and purposes, so far as the mosquito menace is concerned, they might as well be in the swamps. Mosquitoes breed by the million in the swamps in question. These mosquitoes are of the malaria-carrying variety. Plenty of people in the vicinity suffer from malaria. * * *" To illustrate the difficulties concretely, the following example will serve the purpose: Newmarket Creek, really only a wooded watercourse with a drainage area of 7,000 acres, originates about 6 miles beyond the northern boundary of Camp Alexander and forms a typical fresh-water swamp immediately east of Camps Morrison, Alexander, and Hill, including several miles of swamp, both northerly and southeasterly from this point. The natural grade near its upper reaches is about 2.3 feet per mile, reducing rapidly to 12 inches per mile, which accounts for the swamp. It is this meager fall that made drainage operations difficult in nearly every part of the lower peninsula.

Camps Hill and Alexander were, furthermore, affected by Beaver Creek swamp, partly tide and partly fresh water, including about 20 acres between the two camps and draining in a southwesterly direction with an outlet in the James River. Drainage of this swamp presented no extraordinary difficulties.

Camp Stuart comprised nearly 300 acres, of which 25 acres consisted of the reservation and the Ivy Avenue swamp in the extreme southwestern corner of the reservation. Ivy Avenue swamp presented no difficult control problem, while Salters Creek swamp, in addition to being very low (only 0.5 foot above high tide), received a part of the city sewage and discharge from a number of private sewers.

In addition to the drainage and mosquito-control work at the camps mentioned, more or less extensive control operations were carried out at the Army supply base near Norfolk, the Nansemond Ordnance Depot at Pig Point, the rifle range, Lee Hall reservoir guard, and much extracantonment work in the vicinity of the camps mentioned and in Newport News.

Drainage operations.—Drainage and grading work within the actual confines of the camps was largely done by contract under the supervision of the construction quartermaster and the Government supervising engineer. This work, while fundamental in the building of a camp, may not affect the mosquito question materially, this side of the work being merely incidental as a rule. That much work remained to be done in all of the camps is shown by the various reports submitted to the Surgeon General and the port surgeon.

Ditching by the Sanitary Corps began April 15, 1918, at Camp Stuart, a small amount having been done for about a month prior to this at Camp Hill by details from colored labor battalions. Salters Creek swamp was systematically ditched so as to concentrate the water, and a 36-inch tide gate (model No. 100 Calco automatic) put in place at the point where the channel crossed Chestnut Avenue. The Ivy Street marsh was also properly ditched, the outlet into the James River being left open, allowing the tides to flood the ditches. Although a tide gate was planned for this point, it was deemed unnecessary after the ditching was completed, and, furthermore, considerable progress was made in filling the marsh with refuse (incinerated as far as possible) from the camps.

At Camp Hill, the Beaver Creek swamp was channelized, dyked, and sumped from Virginia Avenue to its outlet in the James. Aside from small local mosquito-breeding places, dependent on the seasonal rains and careless disposition of water containers, Beaver Creek and Newmarket Creek were responsible for practically the entire mosquito population of Camps Hill and Alexander.

Newmarket swamp, as already explained, presented a problem of considerable proportion owing to its extent and scant grade. As originally planned, a cut-off ditch was begun under contract about October 1, 1918, extending from the eastern end of Beaver Creek to Newmarket Creek in order to divert the upper waters from the latter to the former and thence into the James River. The length of this cut-off (open ditch canal) to Beaver Creek at Virginia Avenue is about 4,000 feet, with a maximum cut of 16 feet, a minimum of 3 feet at the junction with Newmarket Creek, average width at the top about 18 feet, at the bottom about 3 feet, with a grade of 1 foot to a thousand, and representing an excavation of about 20,000 cubic yards.

Very slow progress was made on this ditch, with completion April 1, 1919, too late to be of service to the military camps in this vicinity. In the meantime, all of the water from Newmarket Creek was carried through a new canal paralleling the old watercourse and constructed by the Sanitary Corps from the junction of the cut-off canal to the Sconesdam road, a distance of 4,000 feet. The original survey called for a ditch following the general course of Newmarket Creek through the swamp. This plan was discarded in favor of a ditch paralleling the swamp on comparatively dry ground and tapping the swamps at frequent intervals with laterals. This plan rendered the work much easier and made possible a much better ditch, giving just as good results. This new canal, 4,000 feet in length, with a maximum cut of 7 feet, a minimum of 2 feet, slide slopes 1 to 1, and a width of about 6 feet at the top, represents an excavation of 4,396 cubic yards. The work on this ditch was started September 12 and completed December 1, 1918. Carried under the Sconesdam road through a culvert, the water pours into a ditch constructed by the United States Public Health Service and thence through an old canal about $1\frac{1}{2}$ miles in length, 10 feet deep and 25 feet wide at the top, built, according to old negroes living in the neighborhood, from 50 to 60 years ago, apparently as part of an old drainage project and then abandoned.

With the completion of work on Newmarket swamp, which includes considerable channelization north of the above mentioned cut-off by the United States Public Health Service, many acres of land on both sides have been reclaimed for agricultural purposes and malaria should be very materially reduced.

Camp Morrison, while literally planted in the midst of a swamp, rapidly became a well-drained camp, largely due to effective and extensive drainage operations by the camp personnel. The work of the malarial drainage detachment here was chiefly intensive and against odds, due to the proximity of Newmarket swamp and the malaria-ridden town of Morrison. Soldiers from Morrison not only frequented the village but found rendezvous in and about eating houses for several miles along the Richmond road toward Lee Hall. In spite of these odds there occurred only 10 local malaria infections.

Lee Hall.—In April, 1918, a company of the 48th Infantry, relieved September 5 by Guard and Fire Company No. 327, was stationed about a mile south of the town of Lee Hall to act as a guard for the reservoirs at Lee Hall and at Harwoods Mills. The morbidity rate from malaria among the civil population was estimated by the United States Public Health Service at well over 90 per cent in this vicinity for the previous season, and *Anopheles quadrimaculatus* was the predominating and extremely abundant mosquito.

Control work directed against the mosquitoes consisted of temporary canalization of the portion of the swamp adjacent to the camp on the west. This swamp was formed by the backwaters of the Warwick River which originates at this point. At the time of the ditching it was only hoped to concentrate the water, but the operations so changed the ecological conditions that anopheline breeding was entirely inhibited in that portion where the ditching was completed.

Weekly oiling of the pools, water barrels, and other possible sources in the immediate vicinity of the camps failed to eliminate the abundant supply of mosquitoes infesting the camp until it was decided to oil the borders of the cut-off portion of the reservoir located about 400 yards from the camp site. This impounded water had a slight current due to the fact that its overflow was carried away by a culvert located at the end of the pond nearest the camp site. This flow brought down large masses of floatage always heavily infected with larvae and pupa. By oiling the borders of the pond, already covered with floatage, the additional masses that floated down were well covered with oil. The treatment of this source showed an immediate decrease in the number of mosquitoes infesting the camp. The United States Public Health Service, although operating in this district, was primarily interested in the protection of Camp Eustis and the town of Lee Hall and were not able to do much work in the vicinity of the guard camp. The nature of the work done by the troops at this camp—guard duty among the civil population and at some distance from points where control work was done—rendered them especially liable to infection. Head nets, repellants for the hands and wrists, mosquito bars, and a biweekly dose of 30 grains of quinine were additional precautions exercised. In addition, a daily collection of mosquitoes was made in tents and barracks through the camp. The tabulation of these captures is interesting, as the records were started at the time when mosquitoes are normally the most abundant in that section.

Date, 1918	Number anophelines taken	Average per screened shelter
Aug. 27 to Sept. 2.....	745	4.1
Sept. 2 to Sept. 9.....	245	1.4
Sept. 11 to Sept. 16.....	60	.25

Despite these precautions, 25 cases of malaria originated among troops stationed at this camp during the nine months from April to December. These cases totaled more than half the total number occurring on the records of the port.

A comparison of this morbidity rate of 5.3 per cent among these troops as compared with the high rate among the civilian residents (certainly over 90 per cent and actually 100 per cent in 1917 for eight families living within a few yards of the camp) throws a more favorable light on the results of the efforts at this station.

That cases occurred at all is due to the inability to make the order to wear head nets and the use of repellants ironclad. Numerous parties were given for the men in the neighborhood, baseball games often continued through the dangerous period of dusk, and men on guard, unless constantly watched and punished, were apt to become lax, particularly when the mosquitoes were not extremely abundant. The quinine treatment, in many cases, masked a latent infection which manifested itself when the dosage was discontinued through the man's transfer to other stations or to the hospital for treatment of disease other than malaria.

Nansemond Ordnance Depot, located at Pig Point, opposite Newport News on the James, like the camps already described, was seriously affected by mosquito-producing swamps of both salt and fresh water. Except for guards of the 48th Infantry and later guard and fire companies, very few soldiers were stationed at this depot during the building operations carried on by civilian contractors. For this reason, no extensive drainage operations were undertaken, and routine inspection and oiling for mosquitoes was in the hands of the sanitary engineer stationed at the Army supply base near Norfolk. However, inspections made August 3 showed an abundance of *Anopheles (A. quadrimaculatus)* in the civilian barracks and tents. Immediate arrangements were made to take this matter in hand by the malarial drainage detachment. An officer and a detail of 28 enlisted men began work on this problem about August 10. A whirlwind campaign was instituted over a period of four weeks, which included an extensive ditching program embracing a large amount of extra cantonment work, oiling, protection with head nets, bamber oil, collection of mosquitoes in tents and barracks, and quinine prophylaxis affecting both soldiers and civilian laborers. The result was most gratifying in that but 4 cases of malaria developed during late August and 5 in early September, a total of 9 local cases for the entire season in a military population numbering about 725.

Army supply base near Norfolk embraced a large acreage of swamp, much of which was permanently eliminated by the use of hydraulic dredges under contract. Necessary mosquito control work, which consisted of some ditching, the installation of two automatic drainage gates, and the systematic oiling of the sundry pools, was carried on by the camp sanitary engineer with the aid of a small detail of enlisted men. All extra-cantonment drainage work was carried on by the United States Public Health Service. Although a few anophelines (*A. quadrimaculatus*) were found at the base hospital, no cases of malaria originated at this camp and there was little complaint about mosquitoes in general.

The city of Newport News presented numerous drainage problems affecting the many military organizations located within the city limits. The city is inadequately sewered, and existing storm sewers presented clogged catch basins much of the time during the summer. Gutters and ditches in many parts of the city, originally designed to carry away water, became stagnant pools swarming with mosquito wrigglers.

Little or no attempt was made by the city authorities to correct these conditions, and the United States Public Health Service did not consider the control of mosquitoes in general, except where anophelines existed. At times during the summer, mosquitoes became abundant enough to be the cause of numerous complaints, and anopheline adults were taken in the

heart of the city at frequent intervals. As a matter of protection to the military population, the malarial drainage detachment was instructed to carry out control measures in various parts of the city during August and September. This work included the maintenance, regrading and cleaning of a mile and a quarter of ditches (6,920 feet), construction of a few new ditches (total of 500 feet), and the application of 450 gallons of oil to mosquito breeding pools (Table 1).

Inspection and oiling.—Inspection for mosquitoes was divided into two phases: (a) The inspection of all possible breeding places with the collection of samples for laboratory breeding, and (b) the collection of adult mosquitoes in and about the quarters and buildings as a prophylactic measure and for laboratory purposes.

This work was done by both white and colored enlisted men that had been trained in this special line of work by their officers.

Inspections were made at least once a week of each subdivision of the territory covered by the particular detachment. The presence of larvæ was reported to the detachment commander daily, and oiling by a special detail formed for this purpose followed. The oiling was immediately followed by another inspection.

The cost of inspection and oiling totaled 28 per cent of the entire cost of the work done by the malarial drainage detachment. The oil used was a half-and-half combination of Mexican crude oil and kerosene. Three hundred and ninety-three barrels were sprayed during the season, the cost of spraying per barrel totaling \$14.37. This apparently excessive cost of application was due to the intensive character of the spraying and the long hauls necessary to carry out some of the work. There was very little opportunity or necessity for spraying large areas, in which case the pumps would be emptied quickly and the cost of application per barrel decidedly reduced.

The oil was delivered to the detachment camps by tank trucks and stored in barrels until used. Myer's knapsack spray pumps were used for the work. The first oiling for the season was done during the week ending May 18, and the final application was made during the week ending November 2. Applications during the height of the season were made about every 10 days. However, considerable variation in time was necessary, depending on the weather conditions; for example, oiling was repeated several times at intervals of five or six days when the weather was excessively hot, dry, and windy, and during cooler weather two weeks might elapse between oilings. Careful inspections and a good knowledge of mosquitoes are essential in such operations.

Records.—Each detachment was assigned a given area for which it was responsible. These areas in turn were subdivided into plots to which letters were given in order to facilitate the giving of directions and the tabulation of collections.

Each detachment made a weekly report of the mosquitoes, both larval and adult, that were taken during the week, designating the subdivision in which they were taken. In this way the surgeon's office was able to exercise a fairly accurate check on the effectiveness of the control measures under way.

A large blue-print map in the surgeon's office was also kept up to date by spotting with map tacks the occurrence of the different anopheline species, the occurrence of cases of malaria, as well as the location of ditching and oiling operations.

Weekly reports were submitted covering the activities of the detachments for the previous week, such as the number of feet of ditch built or maintained, barrels of oil sprayed, acres of brush cleared, etc. From time to time, these records were consolidated and curves prepared to show the relation of the work to the set program. Special problems were covered by extra reports accompanied by maps and drawings.

Species of Anopheles.—Three species of anophelines occur in this vicinity—*A. quadrimaculatus*, *A. crucians* and *A. punctipennis* in order of their abundance.

Their local distribution seems to depend entirely on a given set of ecological factors, *A. crucians* occurring in the neighborhood of slightly brackish water, *A. quadrimaculatus* in the so-called typical anopheline breeding places such as wayside pools, neglected ditches, and the borders of impounded water, while *A. punctipennis* is found where wooded areas occur.

With these factors in mind, it is interesting to note that collections at Camp Stuart showed *A. crucians* almost exclusively; Camps Hill and Alexander, *A. crucians* and *A. quadrimaculatus*; Nansmond Ordnance Depot, *A. quadrimaculatus* greatly predominating and *A. crucians*; while at Camp Morrison, which is farther removed from the tidewater and in the midst of a wooded area, *A. quadrimaculatus* persisted to the extent of 50 per cent for all collections, and *A. crucians* and *A. punctipennis* in about equal proportions. Again, at Lee Hall, when the near-by wooded marsh was controlled, *A. punctipennis* practically disappeared and *A. quadrimaculatus*, breeding in the near-by impounded water of the reservoir, became the dominant species.

The first anopheline larvae for the season of 1918 were seen May 11 at Camp Stuart and were all very young. It is interesting to note that these were discovered together with Culicine larvae in water barrels piled near a warehouse. Mosquito collections made at this time embraced only Culicine species, larvae and pupae of these being encountered in abundance during the last week in April. Anopheline adults began appearing in the collections about May 15, when *Anopheles crucians* began to be taken under the wards at the embarkation hospital, where they appeared in increasing numbers for about two weeks, having originated, it is believed, in a portion of Salter's Creek marsh, three or four hundred yards distant. In this marsh great numbers of anopheline larvae were found from which this species (*crucians*) was bred. With the correction of this location by ditching and oiling during June, the number of anophelines in the collections became very low, ranging from 140 at the beginning of the month to zero during the first week in July for the same area. Thereafter, weekly collections for this area included anopheles (all *crucians*) as follows: 8, 1, 11, 2, 1, 3, 3, 2, 5, 5—which indicates in a very fair manner the degree of control exercised in the vicinity of embarkation hospital at Camp Stuart.

While *Anopheles crucians* and *A. punctipennis* were the first to appear and persisted in greater or less numbers during the entire summer in a given locality, *A. quadrimaculatus*, appearing somewhat later, rapidly became the dominant species for the region.

As late as the second week in November, anopheline larvae, ranging in size from very small to practically full grown, were seen in large numbers in impounded waters in Newmarket swamp. About 50 of these in various sizes were transplanted to a pool that was screened and observations were made to determine their fate. These larvae grew slowly and the older ones pupated, one by one, favored by occasional warm periods, and the imagoes (mosquitoes) emerged. An examination made on December 26 showed one full-sized larva remaining on the surface, and careful search in the mud failed to reveal a single larva hidden therein, where it was thought that overwintering might perhaps take place until spring when further development would be continued.

Occurrence of malaria.—A total of 144 cases of malaria were treated at embarkation hospital, where all cases and suspects were sent during the malarial season of 1918, the first case reporting on April 8 and the last on December 12. This is a fairly accurate statement of all the cases actually occurring, as all suspects were hospitalized at once and diagnosed only on the basis of a positive blood smear.

Complete histories were made whenever possible of the cases and in every instance sufficient data were secured to determine whether the case was of local origin or imported. A tabulation of this information showed that 44 cases were contracted within the zone controlled by this port, while 100 were contracted elsewhere, although treated at embarkation hospital. Attention is invited to the rather striking point that no cases originated at the large camps, Stuart, Hill, and Alexander, where the great majority of the troops were quartered. All cases of local origin became infected at the outlying camps, Morrison, Lee Hall, and Pig Point, where the extracantonment mosquito breeding conditions were so extensive that perfect mosquito control was not possible of accomplishment by the Army authorities.

Accurate histories of 60 per cent of the imported malaria cases showed that 40 per cent of the infections were contracted at home before entering the service, while Camp Johnston, Fla., and Camp Eustis, Va., contributed 20 per cent and 13.3 per cent, respectively, the remainder being scattered.

The infections were all of the tertian variety except 3 cases of estivo-autumnal (all imported), 1 of which, the only fatal case, was a mixed infection of tertian and estivo-autumnal.

The appended table (Table 1) gives a consolidated tabulation of the camps, month, and infection foci (whether local or imported) of all the cases occurring during the season of 1918. In the consideration of this table it must be borne in mind that the rate per 100,000 is for morbidity and not mortality as usually given. It is generally estimated that 1 death may be expected from every 50 cases. With this as a basis, the local morbidity total of 44 cases would be equivalent to 0.88 deaths, or a mortality rate of 0.57 per 100,000 as compared with 4.6 for the registration area of the United States.

TABLE 1.—*Malarial control work done by the Sanitary Corps, port of embarkation, Newport News, Va. (season's report, 1919)*

	Alexander and Hill	Rifle range	Stuart and Brewery	Morrison	City of Newport News	Pig Point	Lee Hall	Total
Lineal feet of new ditches.....	10,800	12,600	18,050	1,610	500	3,500	4,700	51,760
Lineal feet of old ditches maintained.....	17,290	1,480	22,660	6,355	6,920	2,300	630	57,625
Acres cleared and weeds out.....	24	15	41	25	35	3	3	111
Cubic yards fill.....	242	-----	-----	214	-----	-----	-----	456
Gallons oil used.....	9,035	1,090	4,525	2,468	450	950	650	19,768

TABLE 2.—*Showing distribution of malaria cases at the port of embarkation, Newport News, Va., April to December, inclusive, 1918*

Month, 1918	Camp Stuart		Camp Hill		Camp Alexander		Camp Morrison		City detachments ¹ Newport News		Reservoir guard, Lee Hall		Ordinance depot, Pig Point		Army supply base, Norfolk		Totals		Grand totals	Monthly strength	Malaria rate per 100,000 (Local morbidity)
	Local cases	Imported cases	Local cases	Imported cases	Local cases	Imported cases	Local cases	Imported cases	Local cases	Imported cases	Local cases	Imported cases	Local cases	Imported cases	Local cases	Imported cases	Local cases	Imported cases			
April.....	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	1	24,837	0
May.....	5	-----	7	-----	4	-----	-----	-----	-----	1	1	-----	-----	-----	-----	-----	-----	12	12	30,098	0
June.....	8	-----	7	-----	2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	21	21	31,822	0
July.....	6	-----	3	-----	5	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	3	17	23,460	13
August.....	8	-----	1	-----	6	3*	2	-----	-----	1	8	-----	4	1	-----	-----	-----	15	19	34,25	431
September.....	6	-----	3	-----	2	6	4	-----	-----	1	7	-----	5	-----	-----	-----	-----	18	16	34,28	237
October.....	6	-----	9	-----	-----	1	-----	-----	-----	5	-----	-----	-----	-----	-----	-----	-----	6	9	15	24,276
November.....	-----	-----	3	-----	1	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	1	4	5	27,772
December.....	-----	-----	-----	-----	1	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	1	1	2	24,125
Total.....	33	-----	28	-----	22	10	8	-----	3	25	1	9	2	-----	3	44	100	144	153,301	28.7	

¹ Malaria rate for July to December inclusive.

A more direct comparison of the degree of protection afforded men at the port of embarkation is found in a consideration of the local morbidity rate of 0.28 per 1,000 and the admission rate from malaria for troops in the United States for 1917 of 7.46 per thousand and the statement of the Surgeon General that the incidence of malaria in the Southern Department for 1917 was 6.8 per thousand.

The comparison of these figures, although comparatively accurate, should be tempered by the fact that the constant flow of men through the port rendered the final statistical results not strictly comparable with fixed stations or populations.

The question may be raised as to whether men quartered here for a few days did not become infected and manifest symptoms only after they had embarked for overseas. It seems fairly safe to assume that this was not the case, for practically all the overseas troops were quartered at Camps Stuart, Hill, and Alexander before embarkation, at which camps none of the troops permanently stationed became infected and, furthermore, no reports of malarial admissions of overseas troops on transports were reported to this office.

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- (7) Correspondence. On file, Record Room, S. G. O., Correspondence File, 17239 (Old Files).
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CHAPTER XVI

THE INFLUENZA EPIDEMIC OF 1918

ADMINISTRATIVE CORRESPONDENCE DEALING WITH THE CONTROL OF THE EPIDEMIC

The present discussion of influenza is confined to the widespread epidemic in the fall of 1918, and to the many important questions relating to sanitary administration to which this epidemic gave rise.

The first authenticated case of influenza in the autumn epidemic of 1918 occurred at Camp Devens, Mass., on September 8,¹ though it was not so recognized at the time. At that date telegraphic reports of influenza were not required by the Surgeon General, because this disease hitherto had not represented a factor of major importance in the morbidity of the Army. Consequently, the Surgeon General was not immediately so informed of the influenza outbreak. About the middle of September it was apparent, however, to the Surgeon General that a most serious situation existed at Camp Devens and that influenza was certain to spread to other stations. It was therefore recommended to The Adjutant General, on September 25, by the Surgeon General (see correspondence *infra*) that during the continuance of the epidemic new men should not be sent to Camp Devens, nor should men be sent away from that camp. Camp Devens was then overcrowded, having nearly 10,000 men over and above its normal housing capacity.² It was pointed out that new men brought into the camp at this time would almost surely contract influenza and add to the already heavy burden of caring for the sick. Further, that by transferring men from Camp Devens, a virulent form of disease would undoubtedly be conveyed to other stations.³ The Adjutant General, in returning this communication, stated that it was impossible to cancel the movement of registrants who were due at Camp Devens on September 25, but that orders had been issued to cancel the movement of 3,000 registrants who were due to report on October 7. Influenza had by this time made its appearance at Camp Dix, and similar action was recommended with respect to sending new men to Camp Dix, N. J., and to sending men away from that station, as had been advised for Camp Devens. The War Department canceled all future movements of registrants to Camp Dix during the continuance of the epidemic.⁴

Based on a memorandum from the Acting Surgeon General, dated September 19, 1918, The Adjutant General, on September 20, directed that all possible precautions be taken against the transfer of influenza contacts from camp to camp, but that transfer of officers and men not contacts should be carried out as promptly as ordered.⁵ The effect of these instructions was to restrict movements of troops very slightly, if at all. Under orders previously issued, camp commanders were not authorized to transfer "contacts" of any communicable disease. On the other hand, practically all men in the infected camps had been exposed to influenza and the transfer of any of them to other stations resulted in the bringing of the disease to stations previously uninfected.

On September 26 the influenza situation was reviewed in a letter addressed to the Chief of Staff, by the Surgeon General.⁶ As at this time 18 camps were heavily infected, emphasis was laid on the fact that the disease was now no longer local, and that the restrictive measures recommended for Camp Devens and Camp Dix in the earlier communication should be applied to all military stations. It was then predicted that, if the experience at Camp Devens be repeated in the other National Army camps, our losses by death would amount to 8,000 or 10,000 men in the 16 cantonments alone. Unfortunately, this prediction was justified. In the summary of the Surgeon General's review of the situation it was recommended that all draft calls of registrants destined for severely infected camps be canceled and that transfer of personnel from one station to another be reduced to the minimum required by urgent military necessity, especially restricting movements from an infected to a noninfected camp and vice versa.

Influenza-pneumonia epidemics also developed on troop ships bound for Europe at this time.⁷ Many cables were received from the American Expeditionary Forces indicating explosive outbreaks of the disease en route with high fatalities among troops. It was reported that soldiers were arriving improperly clothed, having only one blanket, no overcoats, and light cotton underwear.⁸ Overcrowding of troopships was considered by the Surgeon General as the most menacing insanitary condition then existing with reference to the spread of influenza. Under date of October 1, the attention of the War Department was invited to this condition, and request made that the overcrowding of transports be immediately relieved.⁷ It was recommended that the authorized capacity be reduced at least one-half.⁹

It may be said in passing that the severe outbreaks of influenza and pneumonia and the heavy mortality therefrom on troop ships were not due, except in part, to their sanitary conditions *per se*. This was generally good, save for overcrowding. Yet overcrowding and lack of sufficient hospital space, medical personnel, and supplies undoubtedly increased the percentage of pneumonia complications, and also the case mortality from that disease. But it should be emphasized that the epidemic would have appeared among these troops had they remained in camps in the United States, and it is safe to say the fatality would have been nearly the same as occurred aboard transports. In later troop movements, after the peak of the epidemic had been passed in the majority of Army camps, recommendation was made that only commands which had passed through the epidemic be selected for shipment overseas;⁹ that those who had actually had the disease could now be transported abroad with safety; and those who had not suffered from the disease might be assumed to be immune to future attack if they had lived in a station which had passed through a severe outbreak. As a result of this policy, shipments made later than October 15 were accomplished with very little influenza and pneumonia among those en route.

Early in the pandemic (September 28, 1918), before the disease had actually appeared in the majority of Army camps, a review was submitted to the Chief of Staff by the Surgeon General, together with appropriate recommendations.¹⁰

* Consult Chap. XVIII of this section for details concerning the capacity of troop ships.

The action of the War Department on the recommendations was prompt and efficacious. A telegram was sent to commanding generals of all camps, embodying the substance of the Surgeon General's letter.¹¹ The effect of these instructions was to secure the fullest possible cooperation and support on the part of commanding officers for camp surgeons, commanding officers of base hospitals, and others responsible for the local management of the epidemic. Special inspectors from the Surgeon General's Office visited the majority of the camps during the height of the outbreak, and not a single report was received indicating that the line of the Army had not given the Medical Department all assistance and support that it was possible for it to render.

The correspondence forming the basis of the statements made in the foregoing paragraphs, together with some other letters, telegrams, and cablegrams bearing on the influenza pandemic, is considered to be of so much historical interest and importance that it is quoted here in full.

SEPTEMBER 16, 1918.

Memorandum for the Surgeon General:

The Chief of Staff directs that the memorandum of the Director of Military Intelligence, dated September 16, 1918, herewith, relative to influenza and pneumonia among the troops of the American Expeditionary force at Archangel, be referred to you to note and return, with such comment as you may desire to make.

FULTON Q. C. GARDNER,
Lieutenant Colonel, General Staff, Secretary.

SEPTEMBER 16, 1918.

Memorandum for the Chief of Staff:

Subject: American Expeditionary Force, Archangel.

1. The following telephone message was received this morning from Mr. Harrison of the Department of State:

Ambassador Francis, Archangel, dated September 12. Epidemic Spanish influenza broke out on three transports conveying American troops. Were 5 days from Archangel. Men not acclimated. Many cases developed into pneumonia, and 24 deaths have resulted. Speert thinks infection under control. Out of about 250 afflicted there will possibly be a few more deaths. Coolidge leaves tonight for America direct via Canada.

M. CHURCHILL,
*Brigadier General, General Staff,
Director, Military Intelligence.*

SEPTEMBER 19, 1918.

Memorandum for the Chief of Staff:

This office is without information as to the organizations composing the American Expeditionary Forces at Archangel, and the port from which the commands embarked, and is, therefore, unable to comment intelligently on the source of the infection. It is understood that influenza has been widespread among our troops in France, and it is presumed that the epidemic had its origin on the other side. The conditions appear to be serious, and it is hoped that ample medical personnel and hospital supplies and equipment are available with these forces to properly handle the situation. This office is without information with respect to the above data.

Influenza is now epidemic in many camps on the Atlantic seaboard, including Camps Devens, Upton, Dix, and Lee. A few cases have appeared at Camps Mills, Merritt, and Stuart. If movements of troops overseas continue without interruption, influenza may be expected to break out on our troop ships, which under present conditions of overcrowding may be expected to result in thousands of cases of the disease, with many deaths, and thus duplicate on a larger scale the experience of troop ships bound for Archangel. The probability of a similar outbreak on troop ships en route to France must be foreseen and considered in connection with movements of troops during the continuance of this epidemic.

The military situation may demand that troops move without interruption, and this office recognizes that military necessity must govern in the last analysis. However, if the situation will permit, it is recommended that organizations known to be infected, or recently exposed to the disease, be not permitted to embark for overseas service until the disease has run its course within the organization, or until it is considered comparatively safe from danger of infection.

CHARLES RICHARD,
*Brigadier General, Medical Corps, N. A.,
 Acting Surgeon General, U. S. Army.*

SEPTEMBER 25, 1918.

Memorandum for the Acting Surgeon General:

1. There is transmitted herewith for your information, a copy of the memorandum for the Chief of Staff from the Acting Surgeon General, dated September 19, 1918, relative to the matter of the embarking for overseas of troops known to be infected with, or recently exposed to, influenza.

2. Attention is invited to the action of the Chief of Staff as indicated by the following notation:

The recommendation of the Acting Surgeon General on last paragraph of his letter herewith is approved. If carried out, there will be no reduction of men embarked.

MARCH, C. of S.

3. Copy of this paper has been referred to the Director of Purchase, Storage, and Traffic for action as indicated in the notation above referred to.

FULTON Q. C. GARDNER,
Lieutenant Colonel, G. S., Secretary.

SEPTEMBER 25, 1918.

DEPARTMENT SURGEON, WESTERN DEPARTMENT,
San Francisco, Calif.

It is desired all camps and posts in your department report daily by wire direct to this office number new cases influenza comma pneumonia and deaths period If no new cases appear no report required.

RICHARD, *Acting Surgeon General.*

Same telegram to all departments and to independent stations.

[Night letter]

SEPTEMBER 20, 1918.

COMMANDING GENERAL, NORTHEASTERN DEPARTMENT,
Boston, Mass.

Reference all movements of men to and from your camp at this time all possible precautions will be taken against transfer of any influenza contacts but movements of officers and men not contacts will be effected promptly as ordered period.

Details of all movements from your camp to other camps will be arranged with commanding officers thereat period Make no movements until commanding officers of camps to which men are to be sent advise you their camps not quarantined and they are ready to receive men period All movements which may be suspended due to quarantine will be effected as soon as conditions will permit.

You will inform all under your control.

HARRIS.

War Department telegraph desk:

Please send same telegram to: Commanding general, Eastern Department, Governors Island, N. Y.; commanding general, Southeastern Department, Charleston, S. C.; commanding general, Southern Department, Fort Sam Houston, Tex.; commanding general, Central Department, Chicago, Ill.; commanding general, Western Department, San Francisco, Calif.; commanding officer, North Atlantic Coast Artillery district, Boston, Mass.; commanding officer, Middle Atlantic Coast Artillery district, Fort Totten, N. Y.; commanding officer, South Atlantic Coast Artillery district, Charleston, S. C.; commanding officer, South Pacific Coast Artillery district, San Francisco, Calif.; commanding officer, North Pacific Coast Artillery district, Seattle, Wash.

ADJUTANT GENERAL

[First indorsement]

WAR DEPARTMENT, A. G. O.,

September 30, 1918.

To the Surgeon General, who will inform all under his control.

By order of the Secretary of War:

C. M. THEILE, *Adjutant General.*

SEPTEMBER 25, 1918.

From: The Acting Surgeon General of the Army.

To: The Adjutant General of the Army.

Subject: Influenza epidemic.

1. A most serious situation exists at Camp Devens, Mass., due to the outbreak of epidemic influenza in that camp, followed in many cases by pneumonia which has been, and is, extremely fatal. More than 10,000 cases of influenza have been reported up to date, with 776 cases of pneumonia. One hundred and forty-two deaths have occurred since September 19, the greatest number in any one day being 63 on September 23. The strength of command is approximately 45,000. Hospital facilities are entirely inadequate, and many barracks have been turned over for extemporized hospitals. Influenza appears to be on the decline, but pneumonia is increasing. Additional medical officers and nurses and supplies have been sent so far as available, but the situation remains grave and many more fatalities are expected before the epidemic has run its course.

2. During the continuance of this epidemic new men should not be sent to Camp Devens nor should men be sent away from that camp. New men will almost surely contract the disease and add to the already heavy burden of the camp in caring for them. In transferring men from Camp Devens at present a virulent form of the disease will almost surely be conveyed to other stations.

3. It is understood that 500 registrants are scheduled to go to Camp Devens on September 25, and 3,000 registrants about October 7. It is recommended that orders be modified, if possible, either to send these registrants elsewhere, or to detain them at their homes until these epidemics have subsided.

4. Similar conditions are reported from Camp Dix, N. J., though less serious than at Camp Devens. Twenty-five deaths from pneumonia occurred at Camp Dix on September 23. If military necessities will permit, similar action is recommended with respect to sending new men to Camp Dix, or sending men from that camp, during the continuance of the epidemic.

CHARLES RICHARD,

*Brigadier, Medical Corps,**Acting Surgeon General, U. S. Army.*

SEPTEMBER 26, 1918.

From: The Acting Surgeon General of the Army.

To: The Chief of Staff.

Subject: Epidemic influenza.

1. Epidemic influenza, which is prevailing extensively in many camps and cantonments in the United States, has become a very serious menace and threatens, not only to retard the military program, but to exact a heavy toll in human life, before the disease has run its course throughout the country. The danger in this disease lies in the frequency of pneumonia occurring as a complication, which under the conditions of existing density of population in our camps and cantonments has a high incidence and mortality.

2. The experience at Camp Devens, Mass., may be instanced as what may be fairly expected to occur at other large cantonments in the United States. The disease in epidemic form appeared first in camps and stations along the Atlantic seaboard. From the knowledge of previous epidemics, it may be expected to travel westward and involve successively military stations in its course. Camp Devens, with a strength of approximately 45,000 men, has reported over 12,000 cases of influenza. The first cases were reported on September 12. The number of new cases increased each day up to September 20 when 1,543 new cases were reported, and the disease curve reached its highest point, since which date a daily

decline in the number of new cases has occurred, 271 new cases being reported on September 25. Twelve hundred and ninety cases of pneumonia have been reported since September 19, with 287 deaths at this camp alone since September 19 up to and including September 25. The greatest number of deaths in any one day was 83 on September 25. While influenza itself is on the decline, pneumonia has been increasing up to and including September 24, when 342 new cases were reported for that day alone. On September 25, 309 new cases of pneumonia were reported, which may indicate that the height of the curve for pneumonia in the present epidemic at this camp has been reached. An increasing daily death toll may be expected at this camp until the pneumonia admissions curve shows a permanent decline.

3. Camp Devens is fairly representative of the 16 large cantonments. With few exceptions, they are densely populated from a sanitary point of view, a condition which tends to increase the chance for "contact" infection, the tendency to complicating pneumonias, and the virulence and mortality of the disease. Hospital facilities are entirely inadequate to meet such heavy sudden demands, and the majority of cases must be treated in barracks. Medical and nursing personnel available in each cantonment can not properly handle the situation without outside help.

4. The deaths at Camp Devens from influenza and its complications will probably exceed 500. Multiply this number by 16 (the number of similar cantonments), and assuming that the other camps have a similar experience, it is seen that the loss in men in all 16 cantonments may conceivably reach 8,000 or 10,000. This takes no account of the many large tent camps and the numerous permanent military stations. The noneffective loss and delays in training and movements of troops must also be considered in connection with this epidemic.

5. The disease is now prevailing in 10 of the 16 large cantonments, at the port of embarkation, Hoboken, N. J., and two of the tent camps in the South. The problem is, therefore, no longer local. Recommendation was made to The Adjutant General in a recent communication that no drafted men be sent to Camps Devens and Dix during the continuance of the epidemic. Although the disease can not be completely excluded from the camps, at least its progress can be controlled, its spread limited, complications and fatalities lessened by proper restrictive measures, the chief of which are restriction of communication to and from infected camps and adjacent infected communities (quarantine), relief and prevention of overcrowding in camps, and adequate provision for the proper care of influenza patients to prevent occurrence of the highly fatal complicating pneumonias.

6. The new men brought to an infected camp are almost certain to contract the disease in their first days in camp and add to the already heavy burden of the camp in caring for them. Under conditions existing in a home the danger of having pneumonia superimposed upon influenza is much less than is the case in densely crowded cantonments. It is believed, therefore, that registrants should have influenza in their own homes, if they must contract it, where mothers or sisters can care for them, rather than come to a camp already overcrowded and overtaxed to have the disease under much less favorable surroundings and with greater chances for complicating pneumonias and deaths. Bringing new men into camp under such circumstances would be destructive to morale at the very start of the soldiers' career. It is believed that aside from the humanitarian aspect, the economic gain in the number of lives saved by retaining registrants due to be called for service in the near future in their home communities until the epidemic has run its course or is under control, justifies immediate action looking to stopping the movement of registrants to camps and cantonments, or the transfer of men from infected to uninfected camps and stations during the present emergency.

7. It is recommended, therefore, that—(a) All draft calls of registrants destined for severely infected camps in the immediate future be canceled. The list of severely infected camps is herewith appended. The duration of the need for such cancellation can not now be estimated. (b) Transfer of military personnel from one camp or station to another be reduced to the minimum required by urgent military necessities, especially restricting military movements of troops from an infected to an uninfected camp or station, or vice versa.

CHAS. RICHARD,
Brigadier-General, Medical Corps,
Acting Surgeon General, U. S. Army.

BASE HOSPITAL,
Camp Devens, Mass., September 25, 1918.

From: The Medical Board from the Surgeon General's Office.

To: The Commanding General, Camp Devens, Mass.

Subject: Statements and recommendations regarding the epidemic of influenza.

1. That no accession of troops be received at Camp Devens until the present epidemic of influenza wholly subsides.

2. That no troops be sent from this to other camps until the epidemic has disappeared.

3. That as soon as the epidemic disappears the population of this camp be reduced to the number for which quarters have been provided, by sending 10,000 troops elsewhere, or that the quarters be enlarged to properly accommodate the number here. This recommendation is founded upon the fact that this camp is overcrowded and was overcrowded to this extent before the epidemic appeared.

4. That immediately the quarters be expanded by proper tentage sufficient to provide 50 square feet per man.

5. That all nonmilitary assemblies be discontinued during the prevalence of the epidemic.

6. That visitors to the camp be restricted to the friends of those who are seriously ill.

7. That no convalescents be returned to duty, except on certificate of the proper medical officer.

8. That the services of experts be secured by arrangement with the camp surgeon and the commanding officer of the hospital, to determine as far as possible the nature of this epidemic and the best procedures in its control.

9. That additional hospital space be secured by the erection of hospital tents to a sufficient extent to secure for each patient 100 square feet of floor space.

10. That during the epidemic every occupied bed in hospital and barracks be cubicled.

11. That mess tables be so arranged, either that all shall sit on one side of the table, or that the occupants of the two sides of the table be separated by screens suspended above the middle of the table.

12. That instructions be given all men in the Medical Enlisted Corps and all sergeants in the organizations as to the manner of spread and the procedures desirable in the elimination of the spray-borne diseases.

13. That the Surgeon General be requested to supply the base hospital with 20 medical officers, in addition to those already requested.

14. That the Surgeon General be requested to furnish the base hospital with 200 more nurses than those already promised by the Surgeon General. Pending the arrival of nurses sent by the Surgeon General, the commanding officer of the hospital should be authorized to employ as many nurses as are needed, or as he can obtain, in accordance with Army Regulations 1476.

15. That the commanding general give the camp surgeon verbal orders to assign for temporary duty in medical detachment at base hospital, such number of enlisted men as may be available.

16. That the camp surgeon be authorized to purchase in the open market such property as can not be obtained through military channels, and is needed to properly equip the hospital for the number of patients contained therein.

17. There are evidences furnished by a decrease in the number reported sick, and in admittances to hospital, that the epidemic has reached its height, and will soon begin to decline. In all probability the number of deaths will continue to be large for some days.

18. We desire to express our high appreciation of the skill, energy, and devotion shown by both medical and line officers in the handling of this epidemic which came so unexpectedly and so overwhelmingly on the camp. Special approval is deserved by the camp surgeon, commanding officer of the hospital, the epidemiologist, and their assistants.

VICTOR C. VAUGHAN,
Colonel, M. C., U. S. A.
WILLIAM H. WELCH,
Colonel, M. C., U. S. A.
RUFUS I. COLE.

[First indorsement]

WAR DEPARTMENT, S. G. O., *September 27, 1918.*

TO THE ADJUTANT GENERAL OF THE ARMY.

1. The within statements and recommendations made to the commanding general, Camp Devens, Mass., by Cols. Victor C. Vaughan and Wm. H. Welch, M. C., U. S. A., and Contract Surg. Rufus Cole, M. C., U. S. A., are concurred in.

2. The recommendations in paragraphs 1 and 2 have already been made to your office in letter dated September 25. Recommendations 4, 5, 6, 7, 8, 11, 12, and 15 are matters of local administration and have probably already been complied with so far as possible. The recommendations in paragraphs 8, 10, 13, 14, and 16 have been or will be given necessary action by this office.

3. The recommendation in paragraph 3 is most important. Camp Devens has been overcrowded during the entire summer, as have practically all the larger cantons. Repeated recommendation has been made that every man in barracks be allowed 50 square feet of floor space; and where overcrowding has been found, recommendation has been made that additional construction be provided on this basis. The recommendation in paragraph 3 that 10,000 troops now at Camp Devens be sent elsewhere as soon as the present epidemic has subsided, is concurred in. It is not considered safe at the present time to transfer these men from an infected to a noninfected camp.

4. Tentage should be sent to Camp Devens in such quantities as will properly meet the requirements for additional hospital space and relieve present overcrowding in barracks.

CHARLES RICHARD,
*Brigadier General, Medical Corps,
Acting Surgeon General, U. S. Army.*

[Second indorsement]

WAR DEPARTMENT, A. G. O., *October 1, 1918.*

TO THE SURGEON GENERAL.

Action has already been taken in connection with the recommendations in paragraphs 1 and 2 on the strength of your letter dated September 25.

The draft of 3,000 men who were to go to Camp Devens on October 7 has been suspended. Steps are being taken to send other troops away from Camp Devens as soon as the quarantine is lifted.

Additional tentage needed will be shipped at once.

By order of the Secretary of War:

PAUL GIDDINGS, *Adjutant General.*

SEPTEMBER 27, 1918.

From: The Acting Surgeon General of the Army.

To: The camp surgeon, Camp Devens, Mass.

Subject: Overcrowding, Camp Devens, Mass.

1. Your telegram, September 26, is acknowledged. Wire has just been sent you saying that orders for the October 7 draftees had been canceled.

2. Recommendation has been made to The Adjutant General that no more men be sent to Camp Devens until the present epidemic subsides; further, that as soon as the epidemic has subsided the 10,000 men now at Camp Devens in excess of the accommodations be transferred to another station, and that no further overcrowding be permitted.

3. With reference to the 500 colored draftees, it is hoped that you will be able to segregate them from the infected command and, if possible, prevent the infection reaching them. Recommendation had been made that orders for these colored men be canceled, but the recommendation was made too late to secure the desired action, as the machinery for sending them to Camp Devens was already in motion and they could not be stopped. If overcrowding recurs, it should be noted on monthly sanitary reports that it may be brought to the attention of the War Department.

By direction of the Acting Surgeon General:

D. C. HOWARD,
Colonel, Medical Corps.

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, September 28, 1918.

From: The Acting Surgeon General of the Army.

To: The Chief of Staff.

Subject: Influenza in camps.

1. The present influenza epidemic among troops in the United States has assumed serious proportions; and, as the disease extends to other camps, the noneffectiveness and mortality may be expected to materially increase. Every possible measure must be taken in all camps and stations, infected as well as noninfected, to prepare for handling epidemics of this disease, to restrict its ravages, and reduce the mortality therefrom. With this end in view, it is recommended that instructions be sent all commanding officers substantially as follows:

2. Influenza is a "crowd" disease. Epidemics of the disease will be more extensive and the complications more frequent and serious in direct proportion to the degree of overcrowding in camps. Where housing facilities or tentage are inadequate to allow for each man in camp a minimum of 50 square feet of floor space in barracks or tents, immediate steps will be taken to remove a part of the command and place them in camp under canvas, if no other means are available for relieving overcrowding. If the camp is not infected, the number of men in camp in excess of the number for which accommodations are available based on the minimum of 50 square feet per man, may be reported to The Adjutant General with a view to their transfer to another camp or station which is noninfected and where accommodations may be available.

3. The prevention of overcrowding of influenza patients in hospitals or barracks extemporized as hospitals is of the greatest importance. For each influenza patient under treatment the minimum of 100 square feet of floor space is required; furthermore, each patient must be kept and treated in a cubicle during the continuance of the disease. Hospital facilities will be entirely inadequate as soon as the disease assumes epidemic proportions. Early provision must be made to completely vacate barrack buildings, preferably near the base hospital, which in the presence of an epidemic will be required as extemporized hospitals. Ample provision in bed capacity must be made in advance, as admissions will frequently number well over 1,000 daily during a well-developed epidemic. The treatment in regimental infirmaries or in parts of barracks occupied by well men of a disease as contagious as influenza should not be permitted. Barrack buildings used as temporary hospitals ordinarily will be administered by the hospital staff as an adjunct to the main hospital.

4. Temporary details of commissioned and enlisted personnel, including cooks and kitchen helpers, from the line may be necessary to assist the medical officers in handling the situation. Additional medical officers and nurses will be supplied from the Surgeon General's Office so far as they are available upon proper request. Unskilled workers must come from an extemporized personnel detailed from the line or other camp source to supplement the trained personnel on duty at the hospital. Sufficient trained Medical Department enlisted men are not available for transfer.

5. It is recommended that a synopsis of these instructions, if approved, be transmitted by wire to all camp and cantonment commanders, department and independent station commanders. The element of time is of vital importance. Delay in sending out these instructions by mail in the view of this office would not be justified in the present emergency.

CHARLES RICHARD,
Brigadier General, Medical Corps,
Acting Surgeon General, U. S. Army.

[First indorsement]

WAR DEPARTMENT, A. G. O., September 30, 1918.

To the SURGEON GENERAL.

With the information that a synopsis of paragraphs 2, 3, and 4 has been wired to the commanding officers of all camps, cantonments, ports of embarkation, independent stations, and departments.

By order of the Secretary of War:

C. M. THIELE, *Adjutant General.*

[Night letter]

SEPTEMBER 28, 1918.

COMMANDING GENERAL,
Camp Fremont, Calif.

Following regarding influenza is for information and guidance period Instructions therein will be complied with without delay period

Influenza is a crowd disease period Epidemics more extensive and complications more frequent and serious according to degree of overcrowding period Where housing facilities or tentage are inadequate to allow for each man a minimum space of fifty square feet of floor space in barracks or tents, immediate steps will be taken to remove a part of men and place them in camp under canvas if no other means are available for relieving overcrowding period Extreme care must be taken in moving men from barracks into camp under canvas during inclement weather and when men are provided with insufficient clothing and bedding to protect them against serious consequences period. If camp not infected comma number of men in camp in excess of number for which accommodations are available at rate of fifty square feet per man may be reported to Adjutant General with a view to transfer elsewhere period

Prevention of overcrowding of influenza patients in hospitals or extemporized hospitals of greatest importance period For each patient under treatment comma minimum of one hundred square feet of floor space required and each patient must be kept and treated in cubicle during continuance of the disease period Early provision must be made to completely vacate barrack buildings comma preferably near base hospitals comma when required as extemporized hospitals in the presence of an epidemic period Treatment in regimental infirmaries or parts of buildings occupied by well men comma of influenza should not be permitted period Barrack buildings used as temporary hospitals will be administered by hospital staff as adjuncts to main hospital period

Temporary details of commissioned and enlisted personnel comma including cooks and kitchen police from line may be necessary to assist medical officers in handling the situation period Additional medical officers and nurses will be supplied from the Surgeon General's Office as available upon proper request period Unskilled workers must come from personnel detailed from line or other camp sources period Sufficient trained medical department enlisted men not available for transfer.

HARRIS.

War Department Telegraph Desk:

Please send same telegram to the following commanding generals:

* * * * *

SEPTEMBER 30, 1918.

From: The Acting Surgeon General of the Army.

To: The Adjutant General of the Army.

Subject: Epidemic of influenza.

1. On account of the spread of epidemic influenza, unprecedented demands are being made on the department for commissioned personnel. Many of these demands are in excess of the need and more than can be supplied. In order that due economy may be practiced and the personnel equally distributed, it is recommended that the following telegram be sent to commanding generals of all camps:

During present epidemic of influenza it is essential that medical personnel be utilized in most economical manner. Retain minimum number of medical officers on duty with organizations and assign all others to care of sick in hospital. All requests for additional officers for camp or hospital will be made through camp commander. If officers are asked for duty in hospitals in excess of 1 officer to each 35 bed patients, including all administrative, laboratory, and other officers on duty with the hospital, specific explanation of necessity should be made.

For the Acting Surgeon General:

R. B. MILLER,
Colonel, Medical Corps, U. S. A.

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, October 1, 1918.

From: The Acting Surgeon General of the Army.

To: The Chief of Staff.

Subject: Overcrowding of troop ships.

1. Attention is invited to the following quotation from a cablegram from headquarters, S. O. S., A. E. F., dated September 25:

American troops joining A. E. F. through French ports thoroughly infected with influenza and large percentage of these cases develop pneumonia. Influenza severe type epidemic throughout France and in A. E. F. complicated by septic rapidly fatal type of pneumonia. Resources of Medical Department in personnel and hospital accommodations strained to limit by epidemic in view of great shortage of medical equipment, personnel, and transportation. Urgently recommended personnel, equipment, and supplies now due A. E. F. on medical personnel and tonnage allotments be shipped as rapidly as possible. Exceptional requests for trained nurses to assist in handling this situation will follow as soon as proper estimates of number needed can be made. Further recommend close camp segregation without leaves or furloughs of one week for troops prior to their embarkation and more liberal allowance of hospital space for isolation of pneumonia cases on transports. Two vessels entered port September 24 with 425 hospital cases, of which approximately 170 were pneumonia.

2. From the above it is evident that a serious situation exists in the A. E. F. with reference to influenza and pneumonia. If infected troops continue to arrive in France it will add greatly to the burden already heavy of caring for sick and noneffectives with the present shortage of medical personnel and equipment.

3. Uncomplicated influenza is not often fatal. The danger lies in a complicating pneumonia, the fatality of which is heavy. Overcrowding in camps and hospitals increases the percentage of pneumonia cases during epidemics of influenza. The danger of overcrowding troop ships is even greater. Troop ships have been greatly overcrowded during the past summer. If the same degree of overcrowding is continued while influenza is so generally prevalent in the United States, transports arriving in France may be expected to have well-developed pneumonia epidemics aboard with many fatalities during the voyage. It can not be said with safety that any particular command is absolutely free from infection at the time of embarking while the disease is so widespread in this country.

4. The recommendations in the above-quoted cablegram that commands be held in quarantine for one week prior to embarkation and that more liberal allowance of hospital space for isolation of pneumonia cases be provided are concurred in. There may be difficulties in carrying out these measures in some instances, but the principles should be approved and followed in practice so far as possible. It is advisable that troop movements overseas be restricted to actual immediate necessities until the epidemic of influenza from this side of the water has subsided.

5. It is recommended further that the overcrowding of troopships be immediately relieved, covering such shipments as may be imperative during the present epidemic. It is believed that the present authorized capacity of troopships should be reduced at least one-half for the present and it is so recommended.

CHARLES RICHARD,
Brigadier General, Medical Corps,
Acting Surgeon General, U. S. Army.

[First indorsement]

WAR DEPARTMENT, A. G. O., October 5, 1918.

To the SURGEON GENERAL.

Returned.

In view of the instructions which have already issued from the War Department on the subject of physical examinations and inspections prior to departure from camps and prior to embarkation, your recommendation for a reduction in the transport capacity to 50 per cent, and that troops be held in quarantine for one week prior to embarkation, is disapproved.

By order of the Secretary of War:

PAUL GIDDINGS, *Adjutant General.*

[First indorsement]

WAR DEPARTMENT, S. G. O., *October 5, 1918.*

TO THE ADJUTANT GENERAL OF THE ARMY.

1. Forwarded, inviting attention to letter from this office dated October 1, copy inclosed.
2. While influenza is so widespread throughout the country, it is impossible for medical officers to state with any degree of safety that any particular command is free from infection, or that it may safely embark on troopships for overseas service. It may be assumed that all commands at ports of embarkation are infected or have been exposed to the disease. It is recommended, therefore, that all troop movements overseas be suspended for the present, except such as are demanded by urgent military necessity. Similarly, movements to and from camps in this country should be restricted to absolute necessities.

CHARLES RICHARD,
Brigadier General, Medical Corps,
Acting Surgeon General, U. S. Army.

[Night letter]

OCTOBER 8, 1918.

COMMANDING OFFICER,

Camp Fremont, Palo Alto, Calif.

In order to prevent the spread of influenza through civil communities, the commanding officers of camps, posts, and stations, not quarantined, but in which influenza is prevalent, will suspend all individual furloughs for enlisted men and leaves of absence to officers, except where exceptional circumstances of great weight render such furlough very necessary.

HARRIS.

Sent to all stations.

[Third indorsement]

WAR DEPARTMENT, S. G. O., *October 10, 1918.*

TO THE CHIEF OF EMBARKATION SERVICE,

Purchase, Storage, and Traffic Division, General Staff.

1. Returned. The suggestions of the surgeon, port of embarkation, Newport News, are concurred in for such troop movements as are imperative during the prevalence of the present epidemic. Recommendation was made by this office to The Adjutant General, in indorsement, October 5, that "all troop movements overseas be suspended for the present, except such as are demanded by urgent military necessities." However, several camps have now passed the peak of the epidemic wave, and it is believed if the suggestion is approved of shipping only men who have already had the disease, and are therefore presumably immune, that such shipments may be resumed at an early date with safety.
2. It is believed to be desirable at the present stage of wide-spread epidemic now sweeping through our camps that shipments be made of individual men who have actually had the disease rather than shipments of entire organizations in which is certain to be many non-immunes. It is true that usually no more than 40 per cent of the population of a given community contracts the disease. At the present time, there is no camp in the United States in which 40 per cent of the command has contracted the disease. If the percentage of infection of a command is to be taken as a guide in this matter, it is believed that 40 per cent will prove altogether too high. Camp Devens, for instance, has now had a total of 13,000 cases with a command of something over 45,000 men. Camp Devens was first infected, and the disease has practically run its course there. The degree of infection at Camp Devens is about 30 per cent of the command, and the epidemic is practically over.
3. Individual men who have recently had the disease may be safely sent at the present time. If it is imperative to send organizations intact, it will, of course, be safer to send a command in which the disease has run its course, rather than one in which the disease has not yet appeared, and it is so recommended.

CHARLES RICHARD,
Brigadier General, Medical Corps,
Acting Surgeon General, U. S. Army.

SURGEON GENERAL, U. S. ARMY,
Washington, D. C.

DETROIT, MICH., *October 17, 1918.*

The following telegram has been sent to the commanding officer of all Army and Navy camps in the Middle Western and Southern States: Investigation shows that a great many men are daily arriving in Detroit from military establishments and that a majority of them are on furlough, many convalescent after influenza period. Specific instances are at hand where men have been stricken with influenza on their way to this city and after coming here have infected people with a virulent type of the disease period. Detroit has one hundred fifty thousand men working on war contracts period. Liberty motor and aircraft production depend upon this city and men in these industries must be protected period. It has been decided to-day to establish a quarantine against all military encampments Army and Navy this quarantine will go into effect Saturday the nineteenth period. Will you kindly issue orders that no men will be allowed to come to Detroit from your camp period. Exceptional cases where men are on necessary military business having a statement from a superior officer and who are in good health will be considered.

J. W. INCHES,
Commissioner of Health.

[First indorsement]

WAR DEPARTMENT, S. G. O., *October 18, 1918.*

TO THE ADJUTANT GENERAL OF THE ARMY.

1. Forwarded, for his information. No action appears necessary.
For the Acting Surgeon General:

D. C. HOWARD,
Colonel, Medical Corps.

[Third indorsement]

WAR DEPARTMENT, S. G. O., *October 18, 1918.*

TO THE ADJUTANT GENERAL OF THE ARMY.

1. Returned. Influenza is now prevailing in all camps and cantonments in the United States. This disease will probably continue for several months.

2. It is recommended that five men only be permitted to occupy a single pyramidal tent during the present fall and winter. This will give each man 50 square feet of floor space, which is absolutely essential to prevent overcrowding. It is recommended that decision to this effect be communicated to all commanding officers, without delay, for their information and guidance.

For the Acting Surgeon General:

D. C. HOWARD,
Colonel, Medical Corps.

FORT SAM HOUSTON, TEX., *October 12, 1918.*

SURGEON GENERAL, U. S. ARMY, *Washington.*

No. 1066. Following telegram received by department commander: "Washington, D. C., October 3, 1918. Commanding General, Southern Department, Fort Sam Houston, Tex. Reference movements of men to and from camps and stations at this time all possible precautions will be taken against transfer of any influenza contacts but movements of officers and men not contacts will be effected promptly as ordered. Details of all movements from camps or stations to other camps or stations will be arranged with commanding officers there to make no movements until commanding officers of camps or stations to which men are to be sent advise you their camps or stations not quarantined and they are ready to receive men. All movements which may be suspended due to quarantine will be effected as soon as conditions will permit. Harris." Following telegram received October 9, "Washington, D. C., Commanding General, Southern Department, Fort Sam Houston, Tex. You will effect as directed all transfers ordered by this office of men from S. A. T. C. units in your Department regardless of quarantine from influenza at their school or at destination to which ordered provided that you will send only men who are not ill at time of departure. Direct that all men sent be warmly clothed. Advise Commanding Officers at destination as to men who go from schools quarantined for influenza. Harris." Influenza epidemic particularly

severe in S. A. T. C. stations this department. Believe if movements of students are carried out now serious cases may develop on trains causing undue suffering, possibly deaths and criticism medical administration. Request you take this up with proper authority department commander approves this wire.

CLAYTON.

To be sent in broken code:

OCTOBER 15, 1918.

COMMANDING GENERAL, *Camp Wadsworth, S. C.*

During present epidemic, following instructions govern: When an organization has been ordered to a port of embarkation, you will send to that port, as soon as notified by the port commander of that port, all men in that organization who are physically fit for overseas service who are well at the time and who have not been in contact with an influenza case for four days. All organizations who are within ten per cent of their authorized strength and fulfill these health conditions will be reported at once.

HARRIS.

S. O. S. No. 186.

SEPTEMBER 26.

THE ADJUTANT GENERAL.

Paragraph 2. For the Chief of Staff. There are a great number of cases of severe influenza and pneumonia and consequently many deaths among troops recently arriving in France. On investigation it developed that troops are arriving improperly clothed, having only one blanket, no overcoats, and light cotton underwear. This is exceedingly dangerous at this season of the year. In addition to 3 blankets called for by S 99, paragraph 1, it is imperative that troops be provided with overcoats and winter underwear.

HARBORD.

No. 1744.

TO THE ADJUTANT GENERAL.

H. A. E. F., *October 3.*

Paragraph 1. For the Chief of Staff and Surgeon General.

Subparagraph A. Reference S 178, paragraph 1 B. Influenza exists in epidemic form amongst our troops in many localities in France accompanied by many serious cases of pneumonia. Request coming * * * all quarters for additional members of the Army Nurse Corps. In all probability conditions will not improve but will grow worse during the winter. Request 1,500 members of Army Nurse Corps, item M 1181 W, be sent to France as an emergency requirement at the earliest practicable date for duty at camp hospitals and to make up shortage. Cancel an equal number of Medical Corps replacements requested for October and November.

PERSHING.

S. O. S. 248. Confidential.

OCTOBER 9.

THE ADJUTANT GENERAL. (For the Chief of Staff and Embarkation.)

Inspection by inspector general of condition on *Louisville*, recently arrived at Brest, shows cause of epidemic of influenza pneumonia to have been overcrowding, poor ventilation, filth, and insufficient covering, each man having but one blanket. Bunk capacity of *Louisville* is about 3,000 and there were 3,300 passengers on board. Statement of ship's surgeon was that influenza was brought on board by a naval draft which he endeavored without success to have removed before sailing. Surgeon further stated that ship's captain and executive officer were never present at daily routine inspection of ship's compartments and that the *Louisville* was dirty during entire trip. There were 500 cases of influenza on the *Louisville*, 32 deaths on the voyage and 18 after arrival.

Report of inspector general on the *Vale* shows spread of epidemic was due to overcrowding and lack of covering, each man having but one blanket. Bunk capacity of transport is 1,600, and there were 2,600 on board. There were 500 cases of influenza on the *Vale*, 80 of which developed into pneumonia; 31 deaths on the voyage and 14 after arrival.

HARBORD.

S. O. S. No. 246. Confidential.
 To The ADJUTANT GENERAL, *Washington*.

OCTOBER 8.

(For Chief of Staff and Surgeon General.)

At noon October 7 there were 1,541 influenza and 1,062 pneumonia cases at Brest, with total of 77 deaths. On *Leviathan*, which arrived there same date 3 p. m., there were 571 cases influenza, 134 pneumonia, and 67 deaths during the voyage. Convoy arriving St. Nazaire October 6 with 24,488 officers and men had 4,147 sick during voyage, 1,357 needing hospitalization on arrival, and had * * * deaths from pneumonia during the voyage. Presume all ships are being disinfected there before return trip and that quarantine recommended is being enforced. Am informed that statement of shortage in medical personnel and material is being cabled you from commander in chief to-day. The need for these things is urgent and can not be too strongly stated.

HARBORD.

OCTOBER 9, 1918.

From: The Acting Surgeon General, U. S. Army.
 To: The Adjutant General of the Army.
 Subject: Remedial measures to prevent transferring influenza to France.

1. With reference to the attached cable of October 7, signed by Harbord, no reply to which has been made by this office, attention is invited to the attached recommendation to the Chief of Staff, dated October 1, 1918, with reference to remedial measures and first indorsement to A. G. O., October 5, 1918, disapproving said recommendations.

For the Acting Surgeon General:

D. C. HOWARD,
Colonel, Medical Corps.

2 incls.

(Attached was letter from Acting Surgeon General, dated October 1, 1917, already quoted.)

H. A. E. F. *October 8.*

No. 1766.
 THE ADJUTANT GENERAL, *Washington*.

* * * * *

Paragraph 7.

Subparagraph B. Request information as to when personnel now due will be shipped; as to present status of influenza and pneumonia at embarkation ports, and practicability of your acting upon our recommendations in cable S 178. Also as to whether you are prepared to ship and in what amounts, as exceptional supply polyvalent pneumococcus lipovaccine over and above our present request.

* * * * *

PERSHING.

S. O. S. No. 261. Confidential.

THE ADJUTANT GENERAL.

OCTOBER 11.

(For the Chief of Staff and Surgeon General.)

Leviathan arrived October 7. Deaths en route, 85; 6 more moribund, 366 pneumonias, 597 influenza in ship's hospital on arrival. One per cent of the total strength of convoy arriving Liverpool October 8 died of pneumonia at sea. Deaths expected from cases sent to hospital on arrival will raise total mortalities to 2 per cent of this convoy.

HARBORD.

No. 1785. Confidential.

H. A. E. F., *October 12.*

To THE ADJUTANT GENERAL, *Washington*.

Paragraph 1. For the Chief of Staff and Surgeon General. Inadequate hospitalization facilities becoming more critical. In order to enable us to care for serious sickness and battle casualties it is absolutely imperative that the 1 base hospital and 31 evacuation hospitals,

due September 30, and 14 base hospitals, due in October, should be sent immediately and that their nurses and equipment should be sent with them, or, when possible, in advance. Forty-six base hospitals have arrived since June without equipment, which later on did not become available for many weeks. There are 15 base hospitals now here without their quota of nurses. We have reached the limit of what we can do without necessary Medical Department personnel and equipment. Situation so serious that it merits immediate attention and exhaustion of every possible effort to get this material and personnel to us at once.

PERSHING.

S. O. S. 329. Confidential.

TOURS, October 23.

TO THE ADJUTANT GENERAL.

Paragraph 1. For Chief of Staff and Surgeon General. Convoy 49 arrived Liverpool October 17, strength 21,000. Influenza and pneumonia 606, measles 20, mumps 26. Deaths on voyage 88 from pneumonia.

Subparagraph A. Convoy 50 arrived Liverpool October 19; strength 4,236. Influenza and pneumonia 94 cases, 59 deaths.

HARBORD.

S. O. S. No. 340. Confidential.

OCTOBER 24.

TO THE ADJUTANT GENERAL.

(For the Chief of Staff and Surgeon General.)

Seven transports arrived Brest October 20; strength, 12,821. Deaths en route, 47; cases influenza, 314; pneumonia, 88 sick on arrival. Three transports arrived Brest October 21; strength, 6,474; deaths en route, 10; cases influenza, 101; pneumonia, 24 on arrival.

HARBORD.

S. O. S. No. 357.

H. S. O. S., October 26.

TO THE ADJUTANT GENERAL.

Paragraph 1. For Chief of Staff. Convoys just arrived England show marked improvement health conditions due to efficacious preventive measures taken in United States.

* * * * *

HARBORD.

S. O. S. No. 362. Confidential.

LONDON, October 27.

TO THE ADJUTANT GENERAL.

(For the Chief of Staff.)

Marked improvement from 3 base ports in condition of troops arriving on 17 transports past 24 hours. Total arriving, 28,898; influenza and pneumonia on voyage, 149; deaths from pneumonia on voyage, 2.

HARBORD.

S. O. S. 375. Confidential.

TOURS, October 29.

TO THE ADJUTANT GENERAL.

(For the Chief of Staff and Surgeon General.)

Convoy *Antigone*, 12 transports arriving Liverpool October 25, strength 19,154; cases pneumonia and influenza registers; deaths, pneumonia, 2; others sick, mumps, 80; measles, 33; chicken pox, 3. Transport *Olympic* arrived Southampton October 25; strength, 5,430; influenza, 34; pneumonia, 2; no deaths. Mouth and nose masks worn day and night. One per cent of iodine in albolene used as sprays. Three transports arrived Brest October 25; strength, 4,215; influenza, 26; pneumonia, 3; no deaths.

HARBORD.

REPORTS OF SANITARY INSPECTIONS DURING THE INFLUENZA EPIDEMIC

While sanitary inspectors from the office of the Surgeon General made frequent routine visits to all important camps during the World War, when influenza began to assume a serious aspect, special inspections in addition were ordered at most stations in the East and Middle West, partly by regular members of the inspection service and partly by officers borrowed for the purpose from other divisions of the Surgeon General's Office. At these inspections it was contemplated that the visiting sanitary inspector obtain first-hand information regarding the situation for the Surgeon General's Office and offer to the local authorities such advice as appeared necessary in respect to the control of the disease and the care of the sick. The presence of inspectors and their recommendations served to steady morale and to convey the impression that everything possible was being done by the central authorities. In general, it was found that the difficult situation was being well handled in the camps.

One of the first of the special inspections was made on September 25, 1918,² at Camp Devens by a board of medical officers from the Office of the Surgeon General. The recommendations made by this board were referred by the Surgeon General to The Adjutant General for appropriate action on September 27, as shown in the above quoted correspondence on the subject of influenza.

The report of an inspection regarding the influenza situation at Camp Dix, made on September 28, 1918,¹² was considered to be representative of conditions existing in other military commands. Therefore, it was thought that knowledge of the steps taken by the local authorities, and of the recommendations offered by the inspecting officer, might prove useful to the camp surgeons at other stations, particularly those at which the epidemic was just commencing. Consequently, copies of this inspection report were sent all the more important camps, posts, and aviation fields, together with the prefacing remarks shown in the memorandum below. This report is quoted in full as giving a vivid picture of the situation in a camp which was one of the largest in this country and which was among the most seriously afflicted.¹²

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, September 30, 1918.

Memorandum for all camp surgeons, surgeons of recruit depots and independent stations, department surgeons, and officer in charge of Air Service divisions:

1. The attached report of a sanitary inspector from this office is furnished for your information, first, as showing the steps taken at one camp to handle a serious situation in a very satisfactory manner and, secondly, the recommendations for further improvement made by an inspector.

2. In epidemics of influenza every effort should be made to avoid overcrowding of the uncomplicated cases with a view to forestalling complications. At least 100 square feet of floor space per man should be provided, and all the precautions used which are prescribed for measles in memorandum this office, January 1, 1918.

3. Prior to the development of epidemics of influenza, camp surgeons should consult with the camp commander with a view to laying out an extensive scheme for evacuating barracks and using them for hospital purposes.

4. The camp surgeon should take steps to keep himself informed as to the sanitary situation at the base hospital, and should endeavor to prevent overcrowding of that institution if other buildings or tentage can be obtained to shelter the sick.

By direction of the Acting Surgeon General:

D. C. HOWARD,
Colonel, Medical Corps.

REPORT OF INSPECTION IN RELATION TO EPIDEMIC OF INFLUENZA AND PNEUMONIA AT _____,
MADE SEPTEMBER 28, 1918

By Colonel _____, M. C.

1. The strength of the command is 51,177, of which number 5,934 are colored. There is no overcrowding, and for some time there has been none, except possibly in isolated instances temporarily. Barracks are marked on basis of 45 square feet floor space per man, and the number of occupants is in practically every instance much below the allowances, so that over 50 square feet is provided each man. In the depot brigade from 12,000 to 15,000 men are kept under canvas, 5 men to a tent. In the division, men have been put under canvas when necessary to reduce overcrowding in barracks. Men sleep with head and feet alternating, and in many barracks the "cubicle system" is in use by means of shelter tents suspended between the beds.

2. Fires have been started in all buildings and the freest possible ventilation is enforced. Beds, bedding, and clothing are put out doors all day, weather permitting. Tents are furled daily. All floors have been reoled once and in some instances twice since epidemic started. Overcoats and woolen underwear have been issued. There is ample bedding. Men are kept out doors practically all day. An officer is on duty in each barrack day and night.

3. Police of camp and barracks is excellent. Messes very clean. Ample steps have been taken for fly eradication, and flies are rarely seen in messes. Dishes are boiled after each meal. Where individual mess kits are used they are washed in boiling water after each meal, and are actually boiled at intervals. There are no common drinking cups in use.

4. There is still much dust in the camp and during the afternoon of my visit the air was filled with it. Part of the camp has been treated with "Dustex Gluten," which appears in every way superior to oil in allaying the dust nuisance. Enough of the material can not be obtained to finish the work. The epidemic of influenza is said to have started promptly after a severe dust storm.

5. Absolute quarantine of camp against adjacent territory and vice versa has been in force some days, except that relatives of severely ill are admitted and visit the hospital, wearing masks. Interorganization quarantine was in force until the epidemic became so general that it was deemed useless. All large assemblies have been prevented, but the regimental Y. M. C. A. entertainments have been allowed to go on with a man in every other seat. The sale of food in post exchanges has been suspended and this has greatly reduced crowding therein. It was felt that absolute suspension of entertainments and of exchange privileges would be so detrimental to morale, already somewhat shaken, that the disadvantages would more than counterbalance the advantages.

6. There is ample cooperation on the part of the line officers. Men experienced in nursing have been drawn from all organizations in camp. Line officers in barracks are constantly on watch for new cases and see that men are properly cared for. Medical officers visit all barracks at least twice a day.

7. Throughout the camp a part of each barrack, generally one room, has been set aside for the care of suspected cases of influenza, and the mild cases. The men are cubicled in many instances, and masked in many others. The keeping of these cases in barracks, where more or less contact with the well is inevitable, is believed to be a serious mistake. These men were carried as "sick in quarters."

8. In the barracks frequent temperatures were being taken by medical and line officers, and by enlisted men. The methods for disinfecting the thermometers in some instances appeared inadequate.

9. In all barracks and tents containing sick men, paper receptacles, usually pasteboard ice-cream plates, had been bought to use as bedside sputum cups. These were collected and burned at intervals. It had been ordered that a piece of newspaper be kept on the floor under each plate, but this was not done in all cases.

10. In the tent area of the depot brigade 36 pyramidal and store tents had been set aside as an infirmary and all suspected and mild cases were removed thereto. There were enough medical officers and attendants, and an ample supply of spit cups and commodes. The sick were neither cubicled nor masked. All were given food six times a day. The sanitary conditions of the entire tented area in the depot brigade were exceptionally good.

11. Two thousand negroes who arrived at the camp from civil life between two and five days ago, were put in an area by themselves and absolutely quarantined. The guard was most efficient and no officer or enlisted man could pass through without proper credentials. No influenza has occurred among these men.

12. All but three motor ambulances had been sent away from the camp at the time the epidemic began. The mule ambulances were entirely inadequate. Efforts to obtain ambulances and delivery wagons from an adjacent city have thus far been unavailing. Fifteen motor busses, which had been put out of business when the camp quarantine went into effect, were commandeered and this action has fairly well solved the transportation proposition.

13. Owing to the pressure of work, the statistics of the epidemic have not been entirely satisfactory. Until the last two or three days the "quarters" cases, referred to in paragraph 7 above, were not reported to the Surgeon General, so the actual number of influenza cases was in excess of the figures reported to the Surgeon General. On September 16 the reports of the base hospital show no cases of influenza, 51 cases of pneumonia, and no deaths. On September 27 there were 536 cases of pneumonia in the base hospital and the following numbers of influenza cases in the entire command:

In base hospital proper	383
In base hospital annex	977
In 34 division field hospitals (isolation hospital)	663
In quarters	3,728
Total	5,751

During this period there had been 253 deaths, almost exclusively from pneumonia.

The daily admissions for influenza and pneumonia since September 16 are as follows (the 970 cases on September 18 represent an accumulation of three days. The first known cases was on the 16th):

	Pneu- monia	Influ- enza		Pneu- monia	Influ- enza
Sept. 16	5		Sept. 23	40	288
Sept. 17	2		Sept. 24	41	803
Sept. 18	0	970	Sept. 25	122	1,067
Sept. 19	0	325	Sept. 26	90	1,049
Sept. 20	22	274	Sept. 27	113	1,047
Sept. 21	16	149	Sept. 28	89	899
Sept. 22	33	179			

14. To supplement the base hospital, a group of 18 company barracks, fortunately empty, were set aside and fitted up as an "annex" base hospital, being administered by the base hospital. This group of buildings was three-fourths mile from the base hospital proper. The annex had been in operation three days at date of my arrival and, considering the suddenness of the organization, it was in excellent condition. Quartermaster cots were used and the rooms supplied on the bases of a bed for each 100 square feet of floor space. In some rooms the beds were too close together around the walls and the central space was empty. This will be corrected at once. The capacity of the annex was 1,040 beds. On day of my visit another adjacent group of barracks, with a capacity of 1,000 beds (on basis of 100 square feet per bed), was being vacated and the occupants placed under canvas.

The annex was equipped with straw mattresses and the soldiers' own blankets. Medical Department sheets, some pillows, pillow cases, and pajamas were provided. There was one female nurse on duty, and more were to come on arrival of nurses now en route. Messes were run in some of the buildings and were shortly to be started in more. "Ambulant cases"—that is, influenzas whose temperatures had been normal 24 to 48 hours—went out of their particular building to the nearest mess for meals. No men with temperatures were allowed to go out to the lavatories. No cubicles had been installed. All attendants were masked. Part of the medical personnel was drawn from the camp physical examining board. A portion of the 186 enlisted men on duty were soldiers from the line who had some previous experience

in hospital work. There were 977 patients in this annex, of which 18 were pneumonia. The order and system were most commendable. Adjacent officers' quarters had been set aside for a part of the 100 additional female nurses now under orders for the camp.

15. Near the annex a group of company barracks had been set aside for hospital purposes and was run by the four field hospitals of the division. This hospital had accommodations for 700 patients. The conditions here were not quite as good as in the annex. No sheets, pillow cases, or pajamas were provided. Coughing cases were neither masked nor screened. There was no overcrowding. Female nurses are to be sent here as soon as available.

16. The base hospital was in excellent condition and appeared to be meeting the situation in a most creditable manner. At time of visit there were 2,800 cases at the base hospital proper, but 300 of these were venereal cases which had been placed in tents, and 400 others were to be transferred to the new part of the annex that afternoon. There was only slight crowding at date of visit and that should be entirely obviated when the 400 are moved out. The corridors were not used for sick at all. The porches were occupied by beds and are provided with rolling canvas curtains to keep out rain. All pneumonia cases in wards were cubicled, but not those on porches, though the beds were too close together. Patients were arranged heads and feet alternating. Masking of attendants throughout the hospital was most thoroughly enforced. Ventilation of entire hospital was ample. Straw mattresses and quartermaster beds were used to a considerable extent. All influenza patients are fed in their own wards. They are not cubicled because of lack of sheets.

17. There was one ward full of sick female nurses, of whom 30 were said to have pneumonia. There were 51 on sick report. One nurse and one dietitian have died. One medical officer and one dental officer also have died.

18. There were over 100 bodies in the morgue and adjacent building used as an extemporized morgue. Relays of men were embalming, washing, and dressing the dead. The supply of coffins was adequate. The order and cleanliness of the morgue buildings was not entirely satisfactory. Only three autopsies have been done, as commanding general disapproves. The commanding officer did not know that the authority for doing autopsies had been placed in his hands. The three autopsies showed bronchopneumonia.

19. There is no serious shortage of supplies. At the outset the camp surgeon directed the camp supply office to purchase anything necessary.

20. Thirty medical officers are en route or arriving at the camp, and it is thought this number will be sufficient, except that two additional laboratory men are needed at once, there being only two on duty, one of whom is a chemist. Ninety-four nurses are ordered to the hospital, of whom thirty have arrived. This number is not sufficient. One hundred additional enlisted men, Medical Department, arrived last night, and the number appears sufficient at present, in view of the men detailed from the camp.

21. The type of pneumonia was reported to be about one-half pneumococcus and one-half streptococcus (not hemolytic), in both instances usually associated with influenza bacillus. Six cases of empyema have developed thus far. The colored men appear to be suffering less from the influenza and pneumonia epidemic than are the whites. Influenza cases are being kept seven to eight days in hospital. The rule is to keep them in till temperature has been normal four days.

22. Numerous circulars relative to prevention of influenza and its complications have been issued by the camp authorities. These are very complete and satisfactory. The whole situation has been well handled. The only serious defect has been the retention of mild cases in quarters, but this will shortly be changed and perhaps was necessary at the outset, owing to the suddenness of the onset.

23. Report and recommendations made to commanding general:

SEPTEMBER 28, 1918.

From: Colonel ———, M. C.

To: The commanding general, Camp ———.

Subject: Sanitary inspection.

1. With reference to the epidemic of influenza and pneumonia at this camp, it is my opinion that the situation is being handled in a generally satisfactory manner, in so far as conditions will permit. The following recommendations are made with a view to improving certain details of the work, and it is understood that, in some respects, the procedures recom-

mended are already contemplated by the camp authorities or under way, but not yet completed, on account of lack of time or lack of material. Such recommendations as follow are probably not arranged in the most logical manner because of limited time in which to prepare this letter.

2. It is recommended:

(a) That no soldiers who have been afflicted with influenza be returned to duty until at least 10 days after the temperature has become normal.

(b) That, in caring for influenza patients, all the provisions in regard to the care of measles which were prescribed in memorandum S. G. O., January 1, 1918, be carried out. At least 100 square feet of floor space should be provided for all uncomplicated influenza cases with a view to preventing the onset of pneumonia. This is considered even more important than providing the same space for cases which have already acquired pneumonia. All cases of influenza should be screened from each other as rapidly as possible, using cheesecloth if sheets are not available.

(c) That, as far as possible, no cases of mild influenza be treated in barracks which are in part occupied by healthy soldiers. To accomplish this purpose it is recommended that additional barracks, if possible, be set apart exclusively for the care of such cases and be administered as an annex to the hospital in the same way as the present annex is administered.

(d) That, both in barracks and in tents, the cubicle system be adopted for all healthy men by the use of the shelter tent, supported at one corner of the bed by a stick or hung from the ceiling by a wire. This was being done in some barracks visited.

(e) That mess tables be so arranged that the men shall sit either on one side of the table alone or else the occupants of the two sides of the table be separated by a screen of cheesecloth suspended above the middle of the table.

(f) That the present quarantine of the camp against the surrounding country and of the surrounding country against the camp be continued except as regards the entry and exit of the friends and relatives of the seriously ill.

(g) That, as soon as the epidemic disappears, the population of the camp be reduced to the number for which quarters have been provided, on the basis of 50 square feet of floor space per man, or else that the quarters be sufficiently amplified to provide accommodations for the number here.

(h) That female nurses be provided for the barracks used as a hospital annex and in the barracks used as a hospital by the field hospital companies as soon as they are available.

(i) That, if possible, improvised corridors covered with canvas be provided to connect the lavatories with the barracks which are being used for hospital purposes.

(j) That steps be taken to prevent men from crowding together in post exchanges and also about the stoves when they are in barracks.

(k) That the laying of the dust in the camp be expedited as much as possible.

(l) That the greatest care be taken in the disinfecting of thermometers used for taking temperatures in the barracks.

(m) That all the patients in the infirmary annex to the tent area in the depot brigade be masked or cubicled.

(n) That the providing of pieces of newspapers under the spit cups in the barracks used as wards be enforced.

(o) That messes be started as soon as possible in all the barracks used as wards in order to save convalescents from the necessity of going outdoors.

(p) That sheets and pillow slips be provided for the sick in the barracks run as a hospital by the sanitary train.

(q) That greater care be taken to maintain order and cleanliness in the buildings which are now being used for the temporary shelter of the dead at the base hospital.

(r) That cases of pneumonia and influenza on porches at the hospital be cubicled as well as those in the wards.

24. Recommendations to Surgeon General:

(a) That 30 additional nurses be sent at once.

(b) That two additional officers for the laboratory service be sent at once.

(Both these matters have been taken up personally with the proper divisions, and are being adjusted).

The following extracts from reports of sanitary inspectors throw light on the situation at many of the other camps during the influenza epidemic and indicate certain of the difficulties under which the personnel labored.³ It should be noted that only faults are mentioned; this is the usual practice in such reports.

Base Hospital, Camp Cody, N. Mex., March 22, 1918.—Gowns, caps, and masks not habitually worn by officers, nurses, and attendants in the influenza wards. No paper napkins and bags in use.

Debarcation Hospital No. 3, New York City, December 28, 1918.—Cubicles not used in influenza and pneumonia wards. Attendants not isolated.

General Hospital No. 14, Fort Oglethorpe, Ga., May 8, 1918.—Different types of pneumonia not separated. Cases of empyema after operations are placed in surgical wards with clean cases.

Letterman General Hospital, San Francisco, Calif., September 28, 1918.—Pneumonia cases not cubicled; attendants not isolated; floors in measles ward not mopped up with a disinfectant.

Camp Grant, Ill., October 7, 1918.—Following recommendations made concerning the influenza epidemic: Convalescents discharged from the hospital to be kept at the battalion infirmary for five days before going to their company. That not more than five men be quartered in each pyramidal tent (now contain six men). That a cheesecloth or gauze screen be hung down the center of each mess table to separate the men on each side. That a sheet of paper be placed on the floor beneath each sputum cup.

Camp Gordon, Ga., September 13, 1918.—Many cases of influenza being cared for in the regimental infirmaries, due to crowded condition of the base hospital.

Camp Gordon, Ga., October 12, 1918.—Following recommendations made during the influenza epidemic: That closer supervision of the isolation barracks be maintained by the commanding officer, base hospital. That additional nurses be detailed for night duty at the isolation barracks. That all post exchanges be closed. That number of men sleeping in tents be reduced from seven to five.

Camp Hancock, Ga., October 15, 1918.—Cases of influenza which are not seriously ill are treated in tent infirmaries. No cubicles are used; flies are numerous and there is overcrowding in some groups. These defects were corrected on recommendation of the inspector from the Surgeon General's Office. No attempts made to boil mess dishes throughout the camp.

Camp Humphreys, Va., October 3, 1918.—In the colored camp mild cases of influenza were being treated in portable frame buildings holding 14 patients each. These were unscreened and flies very numerous. In the base hospital the pneumonia cases were not entirely segregated from uncomplicated influenzas. In only one organization in camp were cubicles being used in barracks. No particular effort made to prevent men from congregating during the influenza epidemic.

Camp Lee, Va., October 4, 1918.—Following recommendations made by the special sanitary inspector regarding the influenza epidemic: (1) That all organizations be inspected daily to detect sick men; (2) that out-door drills be continued in good weather, modifying so as to eliminate anything strenuous; (3) that screens made of cheesecloth be used down the center of each mess table; (4) that companies boil their dishes; (5) that gas masks be thoroughly disinfected after use.

Camp Lee, Va., January 6, 1919.—In the barracks at the remount station the cubicle system was not in use as per camp order.

Camp MacArthur, Tex., October 27, 1918.—Throughout the entire influenza epidemic the troops were not quarantined against the outside communities, nor were those outside quarantined against the troops. Also no orders were issued preventing the congregation of troops in mess halls, exchanges, theaters, etc., inside the camp. Both of the above measures were recommended by the camp surgeon, but not followed by the camp commander.

Base Hospital, Camp MacArthur, Tex., October 28, 1918.—Memorandum, S. G. O., January 1, 1918, not complied with in all respects. Paper bags and paper napkins not supplied; insufficient floor and air space for pneumonia and influenza cases.

Camp Meade, Md., March 14, 1918.—Owing to crowded conditions at the base hospital, many cases variously diagnosed as coryza pharyngitis, laryngitis, and influenza are being treated at the infirmaries.

Camp Meade, Md., October 8, 1918.—The following recommendations made concerning the handling of the influenza epidemic: (1) That all dishes be boiled; (2) that all floors in barracks used as hospitals and in latrines be disinfected at least once a week; (3) that all mess tables be provided with screening hung through the center; (4) that all floors be oiled; (5) that temporary buildings be constructed at once for use as morgues.

Hospital, Fort Monroe, Va., October 20, 1918.—There is failure to completely comply with memorandum, S. G. O., January 1, 1918. Masks were tried and discarded. Cubicles not used; paper napkins and bags not used.

Aviation Mechanics School, St. Paul, Minn., October 8, 1918.—No typing of pneumonia done during the influenza epidemic.

Camp Hancock, Ga., October 15, 1918.—On September 29 and 30 approximately 2,800 troops arrived from Camp Grant, Ill. They were two days en route from Rockford, Ill., to Augusta. Seven hundred of these men were admitted directly from the train to the base hospital with influenza, the next day 500 more were sent to the hospital. Since that time the total number admitted has been approximately 2,000. Amongst these there have been 143 deaths to date. The infection in these men was most virulent. Over half of the deaths in this camp were from these men. Laboratory reports indicate that they had a staphylococcus infection.

Camp Humphreys, Va., October 3, 1918.—On October 3 there were 314 cases of influenza in hospital and 2,183 in infirmaries (barracks specially set aside for this). The cases had not been evenly distributed through the command. The incidence here, as at Camp Dix, was much higher than among the white men. The number of whites was about three and one-half times the number of blacks, but the white had had 11 times as much influenza. Both here and at Camp Dix the negroes were all in tents and the white mostly in barracks.

REFERENCES

- (1) Report from Base Hospital at Camp Devens, relative to influenza pneumonia, and respiratory diseases. On file, S. G. O., 710 D.
- (2) Report of a medical board from the Surgeon General's Office, September 25, 1918, to the Commanding General, Camp Devens, Mass. Subject: Statements and recommendations regarding the epidemic of influenza. On file, S. G. O., 710 (Camp Devens).
- (3) Letter from the Surgeon General, September 25, 1918, to The Adjutant General. Subject: Influenza epidemic. On file, S. G. O., 710 (Influenza).
- (4) Second indorsement War Dept., A. G. O., October 1, 1918, to the Surgeon General. On file, S. G. O., 710 (Influenza).
- (5) Telegram from The Adjutant General, September 20, 1918, to Commanding Generals all departments reference movements of troops to and from camps. On file, S. G. O., 710 (Influenza).
- (6) Letter from the Acting Surgeon General, September 26, 1918, to the Chief of Staff. Subject: Epidemic influenza. On file, S. G. O., 710 (Influenza).
- (7) Cablegram from Hq. A. E. F., September 25, 1918, reference arrival of American troops at French ports with influenza and pneumonia, quoted in letter from the acting Surgeon General, October 1, 1918 to the Chief of Staff. Subject: Overcrowding of troop ships. On file, S. G. O., 573.2.
- (8) Cablegram from Hq. A. E. F., September 27, 1918 (S. O. S. No. 186 September 26, 1918, Par. 2. On file, S. G. O., 710 (Influenza).
- (9) Third indorsement W. D., S. G. O., October 10, 1918, to Chief of Embarkation Service, P. S. and T. Div., Gen. Staff. On file, S. G. O., 710 (Influenza).
- (10) Letter from the Acting Surgeon General, September 28, 1918, to the Chief of Staff. Subject: Influenza in camps. On file, S. G. O., 710 (Influenza).
- (11) Night letter from The Adjutant General, September 28, 1918, to Commanding Generals 13 camps. On file, S. G. O., 710 (Influenza).
- (12) Mimeograph letter from the Surgeon General, September 30, 1918, to surgeons of all camps, recruit depots and independent stations. Subject: Method, etc., to be used in combating the influenza epidemic. On file, S. G. O., Mimeograph (C-47).

CHAPTER XVII

VERMIN INFESTATION AND DELOUSING

BIOLOGY OF THE LOUSE

Lice are small wingless insects and are divided into two groups, according to their method of feeding. The Mallophaga include biting lice, like the bird lice, which feed on the hair and feathers of animals, but do not suck blood. So far as is known, these lice do not transmit disease. The Anoplura, or sucking lice, feed by sucking blood, and it is this order which is concerned in the transmission of disease. Human lice have been regarded as belonging to three different species, *Pediculus humanus* (Linnaeus), *capitis*, (De Geer); *Pediculus corporis* (De Geer); and *Phthirus pubis* (Leach). Nuttall¹ and Bacot² regard the head louse and clothes louse as races of the same species, and so the former grouped them under one title, *Pediculus humanus*, designating the head louse as *capitis* and clothes lice as *corporis*. This nomenclature will be followed hereafter.

Pediculus humanus corporis is often called the "body louse" or "clothes louse," the "grayback" of Civil War days, or "cootie" of the World War. This insect is a parasite which depends upon human blood for sustenance, and man's body and clothing for prolonged life and reproduction. The size varies with its maturity; a newly hatched louse is about the size of a pin's head, while a full grown, well-fed louse is about one-sixteenth of an inch in length. The louse is protected with a smooth hard substance known as chitin which is impenetrable to most chemicals. The body is covered with bristles more or less symmetrically arranged. There are brown and gray lice, the common variety being gray.

The body is divided into head, thorax, and abdomen. The head bears black simple eyes and two antennae. The mouth has a long sharp stylet or stabber, which is used for puncturing the skin, and is adapted solely for blood sucking. The thorax has three segments which are fused, and there are three pairs of legs attached to it, which are jointed, and at each end is a single large curved claw, especially adapted for progression on hair. The first pair of legs in the male differ from those of the female in that a thumblike projection is present, which is much larger than that of the female, and is used to grasp the third pair of legs of the female during copulation. The abdomen is divided into eight segments. The terminal segment is indented in the female and rounded in the male. The abdomen of the female is broader than that of the male, and is supplied with a pair of appendages, the gonopods, which assist in oviposition. The stomach is large and has two anterior pockets, and its walls contract and expand in waves. The respiratory system consists of tubes or tracheae, which are ingrowths from the skin. The system opens to the exterior by means of small pores called spiracles which are situated along the sides; oils clog up the pores and so kill the insect.

The life histories of *Pediculus humanus* (*capitis* and *corporis*) and *Phthirus pubis* are similar, in that the insects, after emerging from the egg, undergo three moults before attaining sexual maturity. There are five stages in the life of the louse: (1) The nit or egg; (2) first larval stage; (3) second larval stage; (4) third larval stage; (5) adult stage.

The eggs or nits are laid on fibers of clothing or body hair. The female prefers to lay eggs on rough material such as sheepskins, felt, wool, or flannel, but will deposit eggs on silk. Therefore, silk underwear is of little protective value. The egg is ovoid, about one twenty-fifth of an inch long, with a granulated cap or operculum. They are firmly fixed to the hair by the cement, the operculum usually pointing to the distal end of the hair. The freshly laid egg is almost transparent, but, as the embryo develops, assumes a yellowish color.

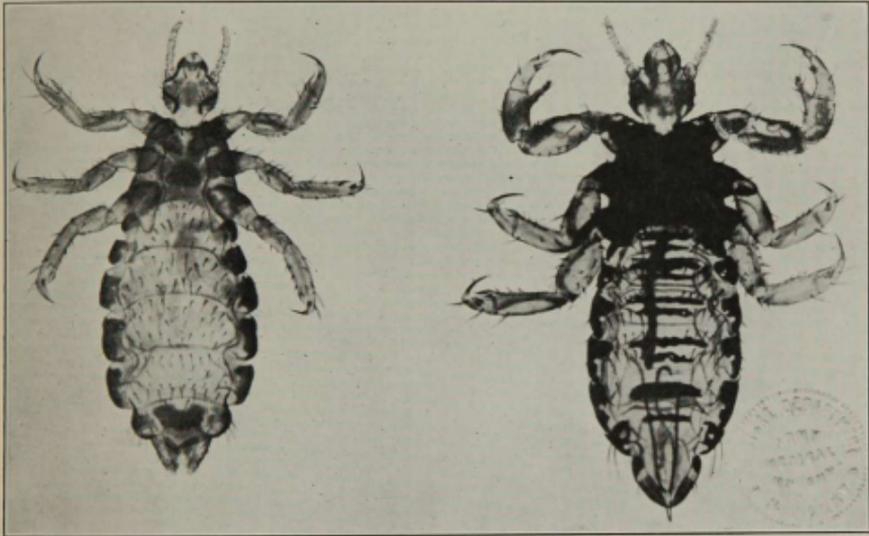


FIG. 73.—*Pediculus humanus corporis*. Female and male

Eggs are difficult to find on white or gray cloth, but can be seen easily on dark materials. The empty shell is hard and remains attached after the louse has emerged. The shell and the cement is resistant to chemicals; no solution will remove it without first destroying the hair or fiber to which it is attached. At the temperature which ordinarily exists between the skin and the clothing, the eggs hatch in from 7 to 10 days, but if kept in a cooler atmosphere the incubation period is lengthened.

Oviposition in *Pediculus humanus*, under favorable conditions, begins 24 to 36 hours after the emergence of the female from the third larval skin, but is delayed by a low temperature. The gonopods clasp the hair upon which the insect deposits. In describing the process of oviposition, Nuttall³ states that, to bring the gonopods into play, the female walks backward along the hair, flexing the gonopods upon it. The expulsion of the egg follows a few moments after the gonopods have clasped the hair; the process taking place in the fraction

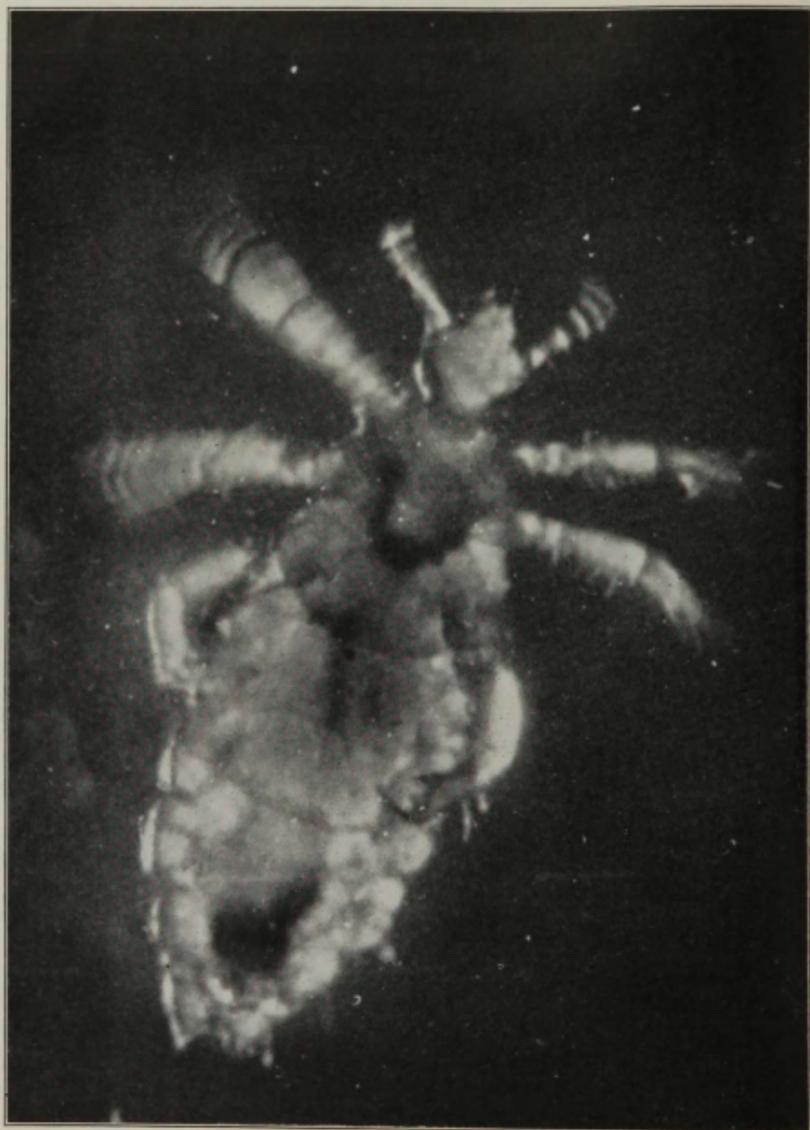


FIG. 74.—*Pediculus humanus corporis*, taken from the moving picture "Fighting the Cootie"

of a second; after which the female promptly walks forward, away from the egg. The cement, which attaches the egg to its support, issues before the egg has emerged, and flowing about it and the hair, hardens rapidly. The cement behaves like chitin in its resistance to chemicals. The temperature at which females are kept markedly influences oviposition. *Pediculi corporis* cease to lay at a temperature beneath 20° C., the highest temperature being 37° C., and the optimum 32° C. This is an important fact, for infested persons who remove their clothing at night will consequently become less infested than those who wear their clothing continuously—the periodic cooling of the clothing and their contained lice necessarily lead to their progeny being materially reduced.



FIG. 75.—Ova of *Pediculus corporis*

Under optimum natural conditions about 300 eggs represent the normal number which a female louse (*Pediculus corporis*) is capable of laying, the average being about 10 a day. Bacot² states that a female louse (*Pediculus corporis*) under ideal conditions might have 4,000 offspring during her lifetime. The average life of a louse is from 35 to 40 days; probably a little less for the males.

There is no uniformity in the period required for the hatching of eggs; i. e., eggs laid on the same day, even if kept under the same conditions, will not hatch at the same time. Eggs never hatch before the fourth day. They do not hatch at temperatures below 20° C.; at 30° C. hatching occurs in 12 days; at body temperature (32° C.) eggs hatch in 6 to 8 days. Eggs may remain viable for 40 days away from the body, when kept at low temperature.

The freshly laid egg appears almost transparent and faintly yellow, the contents fill the shell and are finely granular. As the egg develops, these fine

granular masses become larger, and on the third day the egg is opaque and the limbs begin to appear. On the next day the body and limbs are more defined and the eyes become visible. On the fifth day "pumping movements" are seen, and on the next these movements become more exaggerated. Nuttall,³ in describing the mechanism of the emerging louse states that air passes in through the operculum, is taken in by the insect, and passed out behind until the air pressure increases and the louse is gradually forced out through the operculum. The pumping movements are interpreted as the process of taking in air.

The first moult usually occurs after three days; the second, two days later, and the third after three days. This period varies greatly with the temperature and food supply of the larva. The complete life cycle from egg to egg ordinarily takes about 16 days, divided as follows: Development, 8 days; first larval stage 2 days; second larval stage, 2 days; third larval stage, 3 days; adult preoviposition period, 1 day.

The female louse may lay infertile eggs which soon shrivel up. There is no evidence of parthenogenesis. Lice feed immediately after emerging from the egg, and will only imbibe human blood taken through the skin. A young louse can live 10 days away from its host. Lice feed many times during the day, but mostly when the host is at rest or at night. This causes considerable annoyance to the host during sleeping hours. Lice feed more frequently at body temperature than when cool. During feeding the louse passes a great deal of excreta, which contains a large percentage of undigested red blood cells. The virus of louse-borne disease is present in the feces. When lice become ravenous with hunger, they feed to excess and may rupture their intestinal canal. The louse depends upon the salivary secretion to dilate the capillaries so that blood flows freely. An adult louse imbibes about 0.5 mg. of blood at each feeding.

Lice prefer the dark. There is no evidence of an olfactory sense. They are attracted by the warmth of the body. At 0° they are immobilized and at 20° C. they are fairly active. At 37 to 40° C. they are extraordinarily active. They die in a few minutes at 45 to 50° C.

Pediculus humanus capitis is perhaps the commonest variety of louse found in civil life and shows no material difference in its biology from the *Pediculus corporis*. It lays fewer eggs and is perhaps shorter lived. Head lice are found mostly in children, especially girls, on account of their long hair, and in old people. They are met with most commonly in the temporal and occipital regions, but may be found on other parts of the body, in which case it would be difficult to determine whether one was dealing with *P. corporis* or *capitis* without careful examination of the specimen. This insect is spread by contact, such as occurs in schools, and by brushes and hats. It has been reported by Goldberger⁴ that the head louse may transmit typhus fever.

Phthirus pubis is commonly called the crab louse, because of its appearance. This insect has not been known to transmit disease. The occurrence of *Phthirus pubis* causes a bluish discoloration of the skin called "taches bleuâtres" by the French. It is usually found on the pubic and peri-anal region, but may be found over the abdomen and chest, axillæ, and down over the

thighs. Crab lice have been found in the eyebrows. They are about one-sixteenth of an inch long. The biology of this insect is the same as *Pediculus humanus*. Phthirus feeds almost continuously and remains immobile when upon the host. There appear to be more females than males. The hatching period is about seven days, and the life cycle from egg to egg is about 22 days. The insect is usually spread by coitus, infested clothing, bedding, and possibly toilets and bathtubs. The crab louse is very common among negroes.

DISSEMINATION OF LICE

Vermin infestation is spread mainly by contact with the infested persons themselves or with their belongings. Lice are disseminated in barracks, billets, dugouts, trenches, trains, prison camps, etc., but they are found less frequently the farther one goes from the host. The soldiers on the Western Front believed that trenches and dugouts were "lousy" and that they obtained their unwelcome parasites from them. This was not exactly true, the infestation generally being from man to man as a result of the overcrowding and close contact in these places, rather than actually from the trenches themselves. One vermin-infested man may spread lice to many of his associates. Infestation may be acquired from a stray louse on trains or bedding. Contact with the sick or dying frequently leads to infestation; when a person has an elevated temperature lice actively wander from the host, and this may account for the high incidence of typhus fever among physicians who come in such close association with their patients while examining them. Enormous numbers of lice are sometimes found on a person. Peacock⁵ reports 10,428 lice and 10,253 nits on one shirt. In Serbia and Bulgaria peasants have been seen so heavily infested that 400 or 500 lice could be obtained from an individual at any time.

As a rule lice leave the host voluntarily only when the individual has high fever or dies. In the first instance, the excessive heat drives them off, and in the latter case the lack of food supply causes them to seek new pasture. They may be dislodged by brushing and so fall to the ground. It has been found that lice buried at a depth of 4 inches may crawl to the surface, and that they may penetrate dry sand to a depth of 12 inches and live beneath it for at least 4 days. There is a possibility that prisoners become infested in this way by sitting about in prison camps. Lice may be blown about by the wind. They move rapidly and can crawl the length of the entire body in a few minutes.

Pediculus corporis is more numerous on those parts of the garments which are in closest contact with the body, such as the fork of the trousers, waistline, armpits, and neck. The insects congregate where there is warmth, humidity, and shelter. They are found on the inner as well as on the outer garments and may be present on any article worn by an infested man. It has been denied by some observers that *P. corporis* will deposit its eggs on the body hair; however, in Serbia and Bulgaria nits have been reported upon the hair of the head and of the axillary and pubic regions. The *P. corporis* egg can be distinguished from the *pubis* egg because the operculum in the latter is heaped up and the cement about the hair is of a greater amount. In conducting vermin inspections, it is important to search for nits on the hair of the body, for the neglect to do so may lead to a rapid reinfestation, even if the clothing is sterilized.

PEDICULOSIS

Lice are more common in winter than in summer, partly because of the favorable temperature for oviposition, and partly because the clothing is likely to remain unchanged and bathing is less frequent. The effect of temperature on the occurrence of lice is illustrated in Mexico City, where the climate is cool and lice are prevalent, while at Vera Cruz, which is low and warm, there are very few vermin-infested individuals.

Besides transmitting typhus fever, relapsing fever, and trench fever, lice may lead directly or indirectly to secondary pathologic conditions of various kinds. They may convey plague, mycotic infection, such as favus, or pyogenic infection, such as impetigo contagiosa and furunculosis, these diseases being spread by purely mechanical means. Urticaria, eczema, and cutaneous pigmentation are direct results of pediculosis. The local effect of louse bites depends in large part upon the host. Some people are very susceptible and react with a large urticarial wheal and intense itching, while others develop only a small hemorrhagic spot. The latter is true of the Serbian peasants, who are ordinarily vermin infested and have become immunized to the toxin contained in the salivary secretion of lice.

LICE AND DISEASE

TYPHUS FEVER

The rôle of lice in the spread of typhus fever was first suggested by Tobias Cober ⁶ in his book on camp diseases published in 1685. Mackie ⁷ and Smith, ⁸ and especially Sergeant, ⁹ first demonstrated that relapsing fever was transmitted by lice, this being followed by the work of Nicolle, Comte, and Conseil ¹⁰ in 1909, who showed that lice transmitted typhus fever. They were able to transmit typhus from monkey to monkey by the bites of infected lice (*corporis*) that had fed on a typhus patient one to seven days previously. This observation was confirmed by Ricketts and Wilder (1910), ¹¹ who also infected monkeys through scarified skin by means of the gut contents of lice. Wilder again in 1911 ¹² infected monkeys through the agency of lice (*corporis*). Anderson and Goldberger confirmed this observation and Goldberger (1912) ⁴ infected monkeys with *Pediculus capitis*. This experimental evidence has since been confirmed by the unfortunate human experiments of Ricketts and Prowazek, who died of typhus fever following infection from lice.

The period of infectivity of lice, following their exposure on typhus patients, has varied in the hands of different observers. Nicolle, Comte, and Conseil ¹⁰ found lice infective after 1 to 9 days, Wilder infected monkeys after 7 to 11 days, ¹² and Anderson and Goldberger after 1 to 4 days. ¹¹ Prowazek infected a monkey with the contents of a single louse fed two days before on a typhus patient, ¹⁴ and Nuttall ¹⁵ failed to infect monkeys and guinea pigs by inoculating crushed lice which had bitten 1 to 8 days previously, but succeeded, by inoculating lice crushed 9 to 10 days after feeding. Prowazek, ¹⁴ Da Rocha-Lima, ¹⁶ and others have found minute bacillary bodies named "Rickettsia" in the stomach wall of lice that were infective for animals, but since these same bodies have recently been found in lice infected with trench fever by Arkwright, Bacot, and

Duncan¹⁷ their significance must remain uncertain for the present. The feces of typhus-infected lice are infective for animals and contain small bacilli which are morphologically identical with the Plotz bacillus in typhus fever, the later organism having been cultured from infected lice by Olitsky, Denzer, and Husk.¹⁸

RELAPSING FEVER

Mackie⁷ (1907) was the first to believe that relapsing fever was transmitted by lice, and Sergent and Foley (1908)⁹ succeeded in inoculating a monkey with a louse crushed after feeding on a relapsing fever patient. Smith (1909)⁸ found spirochetes in one louse, but failed to transmit the disease to monkeys, and Sergent and Foley (1910)¹⁹ infected a monkey with the contents of lice which had fed 5 to 6 days previously on a relapsing fever case. Sergent, Gillot, and Foley (1911)²⁰ infected 5 out of 18 monkeys that were inoculated with crushed lice collected from patients 1 to 9 days previously. Nicolle, Blaizot, and Conseil (1913)²¹ report that in the examination of lice, rapid degeneration and disappearance of spirochetes were observed in a few hours, which was followed by their reappearance after 7 days. After 5 days the spirochetes appeared in the coelomic cavity and persisted for 8 to 12 days. The spirochetes were virulent for man and monkey. Nuttall¹⁵ believes that the infectivity of lice does not depend upon the presence in them of microscopically visible spirochetes, but believes that lice usually become most infective about the sixth day, just before the spirochetes reappear in them. Their infectivity subsequently diminishes, and it vanishes when the spirochetes are constantly present and have attained their full size.

TRENCH FEVER

Lice had been suspected as the transmitting agent by Hurst,²² Hughes,²³ Hunt and McNee,²⁴ and Grieverson,²⁵ but Davies and Weldon²⁶ were the first who brought forward any proof that lice transmitted trench fever. They conveyed the disease from trench fever infected lice to themselves. This was followed by the positive result of Pappenheimer.²⁷ The American Red Cross research committee confirmed these observations and demonstrated conclusively that lice transmitted this disease.²⁸ Twenty-two men were exposed to infected lice, and four to noninfected lice, while eight were kept as controls under the same conditions but free from lice. From 25 to 100 lice which had been fed on patients ill with trench fever were placed on each volunteer and were allowed to remain for 30 days, or until trench fever developed. Twelve of the 22 men exposed contracted the disease, after an interval of from 16 to 25 days.

Byam²⁹ and his coworkers found that the bite of infected lice was not sufficient to transmit the disease, but that the excreta of such lice, rubbed into the scarified skin, would do so with regularity. The excreta were found to be infective only after an interval of 7 to 9 days subsequent to feeding. Incubation period with lice is from 16 to 35 days.

On reviewing the evidence regarding the methods by which lice convey disease, there seems to be some difference of opinion as to whether lice transmit the infection directly by the biting organs, or by inoculation of the virus contained in the feces. It has already been clearly demonstrated that the

organism of typhus fever, trench fever, and relapsing fever is present in the feces of infected lice, and it is likely that this is the most common method of infection, the virus gaining entrance through the puncture wound made by the insect while sucking, or being scratched in later by the host. Cases of trench fever and typhus fever have been reported in which the clothing has been free of lice and nits, but the infected feces were still present.

INSPECTION FOR BODY VERMIN

Inspection for body vermin, except under the best of conditions, is of doubtful value so far as eliminating men from a general delousing process is concerned. Lice are small, move rapidly from one garment to another, and nits are found with difficulty by the untrained eye. On white material it is almost impossible to detect nits. Vermin inspection, as originally conducted in camps, was poorly done, which accounted partially for the inaccurate results reported. In some places the early inspections merely consisted of an examination of the pubic region, with no examination of the clothing. This error was due largely to lack of knowledge regarding the habits of the body louse on the part of the majority of medical officers drawn recently from civil practice. In order that a vermin inspection be properly carried out, the man and all his clothing should be carefully examined. The soldier should appear stripped and the seams of the inner and outer clothing should be carefully gone over, paying particular attention to the crotch of the breeches: lice very often will be found under the flap in the crotch when found in no other place. Likewise, the hair and body should be inspected for nits.

DELOUSING

Because of more pressing sanitary concerns at home, and the fact that no great dangers were to be apprehended from louse-borne diseases in this country at the time, the belief obtained that lousiness would not be common in troops in the United States and what there was could be corrected locally; therefore, no special section dealing with this subject was organized in the sanitary division of the Surgeon General's Office until June, 1918.³⁰

Prior to this date, management of the louse problem—so far as it was given attention at all—like all other sanitary problems, was vested in the sanitation division of the Surgeon General's Office. Good bathing facilities, with very rare exceptions, were provided at all camps, but no facilities for disinfestation of lousy clothing existed save the large steam sterilizers constructed for quite another purpose at base hospitals. No special examinations for lice were required at this time.

The louse problem in the United States received heightened attention in May, 1918, in consequence of a complaint made from the American Expeditionary Forces that about 50 per cent of all men arriving in France from the United States were vermin infested.³¹ Reports alleging such a degree of infestation among troops arriving from this country were received with surprise and led to immediate investigations, which were carried on at the two main ports of embarkation, Hoboken, N. J., and Newport News, Va., as well as on transports and at base ports in France and England. The following were the more important findings:

In order to obtain information as to the degree of infestation in the United States, a letter requesting investigation was addressed to all camps, cantonments, and posts.³² The reports indicated that vermin infestation, though occasionally found, was rare.

A careful expert examination of a large body of troops at Newport News, Va., who were ready for transportation overseas, was made in June, 1918,³³ and revealed that vermin infestation was not common there. This was before sterilizers had been provided, and the bathing facilities for negro troops were inadequate. White troops showed 0.6 per cent of infestation, while colored troops showed 42 per cent. (These percentages include the three types of lice). Of the white men examined, 2.8 per cent admitted having been lousy at one time or another since entering the service. Statements obtained from colored soldiers on this point were worthless. Among 841 sailors examined on three transports, 2.1 per cent were found infested. It should be noted that these examinations were very carefully conducted, each man being stripped, and the inner and outer clothing, as well as the body, exhaustively examined. At the time these investigations were made the transports were carrying 40 per cent more troops than their normal capacity, and there was a scarcity of bathing facilities on them. Already at this time many of the transport commanders were complaining of the presence of vermin-infested troops returning from France.³³

In order that the high degree of infestation at Newport News, Va., might be traced, all possible contacts had been examined. From examinations made by port medical authorities prior to arrival of an expert from the Surgeon General's Office, it was learned that a group of negro workmen, living outside but working in the camp, showed 100 per cent infestation with *Pediculus corporis*. Likewise 105 prostitutes plying their trade near by had been examined and were found to have about 59 per cent of infestations, divided as follows:³³

White women.....	42
<i>Phthirus pubis</i> present.....	18
Negro women.....	63
<i>Pediculus humanus capitis</i> present.....	10
<i>Pediculus humanus corporis</i> present.....	10
<i>Phthirus pubis</i> present.....	24

Attention should be called to the fact that these investigations were made in summer when the degree of infestation is ordinarily lower than winter.³³

A similar study carried on at the port of embarkation, Hoboken, N. J., revealed that the vermin inspections as then conducted were poorly made, and that infestation was present in troops here also. Of 170 men examined in the stockade, 32 were found vermin infested, of whom 16 had *Pediculus corporis*.³³

In order to obtain an estimate of the degree of infestation among drafted men arriving in camp, a group was examined at Camp Meade, Md. Of these 3.5 per cent of the whites and 26 per cent of the negroes were found infested.³⁴ Prior to the dates of these examinations no clothing sterilizers had been provided save one at each embarkation hospital.

These results appeared to indicate that lousiness in the United States was more prevalent than had been believed; that it was being brought into the Army by new recruits; that it might result from contact with lousy men in camp or with prostitutes; that the camp facilities for delousing were inadequate; and that, as a result of the crowding on transports and the scarcity of bathing provisions, infestation could readily be spread from soldier to soldier, and even to the crews of transports, during the comparatively slow voyage to France.

The policy subsequently pursued by the Surgeon General's Office was based on these deductions.

PROGRAM ADOPTED FOR HANDLING THE LOUSE PROBLEM

As a result of the investigations made in home camps, at the ports of embarkation, on transports, and in France and England, the following program to combat louse infestation was formulated; the details will be discussed at length in the succeeding pages: (a) Immediate steps to delouse troops scheduled for overseas; (b) educational campaign; (c) research into methods for combating lousiness; (d) construction of delousing plants in the United States.

IMMEDIATE STEPS TO DELOUSE TROOPS SCHEDULED FOR OVERSEAS

On receipt of the information that men were arriving in France infested with lice, the following recommendation was made by the Surgeon General:³⁵

[First indorsement]

WAR DEPARTMENT, S. G. O., April 22, 1918.

TO THE ADJUTANT GENERAL OF THE ARMY:

1. Returned. Pending the provision of permanent plants for delousing commands before embarking, it is recommended that instructions be communicated by wire to commanding generals at ports of embarkation in the following words:

Require all commands to be thoroughly inspected, in ample time before embarking, with a view of detecting and eliminating lice of all varieties. Cause infested commands to be deloused by such extemporized means as are available pending establishment of permanent delousing plants. Take proper measures for disinfection of infested ships under control of War Department, and for providing of proper bathing facilities thereon. Direct surgeon to instruct surgeons of incoming units to spread throughout their commands information concerning the dangers of lousiness and the methods by which it may be prevented.

2. Two portable steam sterilizers are en route to Newport News and sufficient extemporized facilities are now available at Hoboken, where more elaborate apparatus is now being installed. Plans for permanent delousing plants are now being prepared which will be adequate for commands passing through the ports of embarkation.

3. It is understood that the majority of ships carrying troops are not under the control of the War Department.

It was not found necessary either at Hoboken or Newport News to delouse white troops embarking for overseas service, but at the latter port, through which passed many negro labor battalions, all negroes were deloused as soon as portable sterilizers were provided.³⁶ This was in the late spring of 1918. As a matter of fact, on account of the long delay in the construction of the permanent plants, apparatus improvised from these portable sterilizers bore the entire burden of this work for all troops going and for those returning for a considerable time. So far as known no measures were taken under the War Department to delouse ships.³⁶

Prior to the signing of the armistice, delousing of military personnel returning to the United States proved a comparatively simple matter because the number was small, consisting almost entirely of casual officers and invalided enlisted men. The officers usually had facilities for delousing themselves, if infested; the soldiers had been long in fixed hospitals where they had been freed from vermin.

EDUCATIONAL CAMPAIGN

Realizing that the louse problem was little understood by line officers and enlisted men, as well as by some medical officers, it was decided to carry on an educational campaign in the United States so that troops arriving in France would be able to protect themselves from lice, so far as might be and, if infested, would understand the methods of ridding themselves of the pest. A memorandum on the subject, which contained information on the biology, habits, and methods of disinfection, was therefore prepared in the Surgeon General's Office, and distributed to medical officers.³⁷ The memorandum presented a definite method of procedure which was to be followed in treating each type of infestation. This was considered of importance because various and curious methods had been advocated, many of which were entirely inadequate. This publication also recommended that special officers be detailed to supervise louse inspections and that enlisted men be directed to devote three minutes a day to examining their clothing for lice. The early detection of lousiness would prevent widespread infestation.³⁷

For the information of all officers and enlisted men, paragraph 18½, supplementing Special Regulations, No. 28, was issued on June 17, 1918, as follows:³⁸

Numerous reports indicate that lousiness is occurring to a greater or less extent among troops in this country and on transports, and to a much larger extent among our troops overseas. Body lice transmit typhus fever, a disease which has been a serious scourge in some of the European armies. They are believed to transmit "trench fever," which in many commands in France causes a higher admission rate than any disease except the common itch. The same methods of inspection and disinfection which are effective in preventing lousiness will also have a very important effect in detecting and preventing the common itch.

There are three distinct kinds of lice: The head louse, the pubic louse or "crab," and the body louse or "grayback." The latter is the most difficult to prevent and the most important in spreading disease. All kinds of lice are readily visible to the naked eye, as are also their eggs or "nits." All lice by their bites produce itching. Body lice leave small reddish marks on the body when they bite.

The head louse lives on the scalp and the hairs of the head; very rarely elsewhere. The nits are firmly attached to the hairs, particularly at the back of the head. The adult louse is easily killed by applying kerosene to the head, but the eggs are not killed by this treatment. When a man has head lice his hair should be saturated with kerosene and then cut short and the clippings burned. The head should be shampooed several hours later. Search should then be made for nits, and if any remain they should be removed. Softening the nits with hot vinegar favors their removal and destruction. Hair should be kept short at all times and occasional search made for lice. The issue of the necessary amounts of kerosene and vinegar by the Quartermaster Corps is hereby authorized.

Pubic lice or "crabs" live in the hair about the private parts, very rarely elsewhere. The nits are attached to the hairs. The method of getting rid of them is the same as for head lice.

Body lice or "graybacks" should properly be called "clothes lice," as they live and lay their eggs in the clothing and are rarely present on the body except when feeding. The adult lice, as well as the nits, are to be found not only on the underclothing but also in many instances on the outer clothing, particularly in the seams of the garments. The fork of the trousers is a region especially liable to harbor adults and nits. The body louse readily passes from man to man when soldiers are sleeping near each other. The development and spread of body lice is favored when troops are crowded together and have insufficient bathing and laundry facilities. Both body and crab lice are frequently contracted during sexual intercourse with infested prostitutes. They are rarely contracted from latrine seats.

To get rid of the body louse it is necessary to bathe the body most thoroughly and to boil or steam launder the underclothes. The outer clothing also must be disinfected, either by steam, hot air, or by the careful pressing of the garments, paying special attention to the seams. Immersion in gasoline will destroy the adult louse, but not the nits. Smearing the seams of garments with vaseline is of use when complete disinfection is impracticable. Antilice powders, such as naphthalene, are of some use in limiting the development of lice, but can not take the place of the above measures. The delousing of clothing will be carried out under the supervision of the Medical Department.

At the semimonthly physical inspection, special attention will be given to the detection of lice on the body or in the clothing. Upon receipt of orders for oversea service, daily inspections by medical officers will be made of commands under such orders, particular care being taken to detect and eliminate lice. Similar inspections will be made on shipboard.

The ultimate responsibility for the personal cleanliness of the soldier rests with the company or detachment commander. In providing for such cleanliness the prevention of lousiness will be considered one of the most important factors. Enlisted men will be thoroughly and repeatedly instructed in the substance of this regulation. It will especially be impressed upon them that any persistent itching, burning, or irritation of the head or covered parts of the body is almost certain to be an indication of the presence of lice, common itch, or other disease or parasite. Such sensations should be an immediate cause for consulting the surgeon.

A moving-picture film, entitled "Fighting the Cootie," was prepared especially for instructing the enlisted man.³⁹ This picture consisted of three reels and told in a readily understood manner the entire story of the louse. It started by calling attention to the prevalence of infestation and showing the results of diseases so transmitted. It then demonstrated methods by which lousiness was spread, showing pictures of the various types of lice and giving their development and methods of eradication. The picture ended with the subtitle, "It is no disgrace to have lice, but it is to keep them." This sentence was meant to impress the idea that a soldier should not feel ashamed and so hide his infestation, but should present himself for early treatment.

RESEARCH INTO METHODS FOR COMBATING LOUSINESS

The medical section of the Council of National Defense had early assigned investigators to study the louse problem.⁴⁰ At the same time the Bureau of Entomology, Department of Agriculture, was conducting various experiments along the same line.⁴¹ Numerous suggestions regarding vermin eradication which reached the Surgeon General were submitted to these two bodies for study. It was soon realized, however, that much better results could be obtained if a research group, consisting of a biologist, a chemist, and an entomologist, was assembled in a laboratory near Washington, where the various problems arising could be studied under the direction of the division of sanitation of the Surgeon General's Office. This group was being formed when the armistice was signed on November 11, 1918.

EXPERIMENTAL WORK OF LAUNDERING AND DRY CLEANING IN THE ERADICATION OF LICE

It was important to determine whether the ordinary camp laundry equipment could be relied upon to delouse garments, and also to estimate the value for this purpose of the portable mobile laundry which was used at the front. The studies showed that the modern laundering machinery, adopted for Army stations during the war, afforded a very practical means of destroying vermin, and that the usual processes of the laundry establishment, as specified by the laundry branch of the Quartermaster Corps, were thoroughly adequate for disinfection and disinfestation.⁴²

The laundry process consists of washing, extracting, drying, and finishing. The washing is done with hydraulic machines consisting of an outer stationary wooden cylinder and an inner revolving perforated cylinder, both of which are provided with doors. The clothing is placed in the inner cylinder and the water introduced into the outer one, whence it enters the inner cylinder, which revolves by automatic reverse gearing. The extractor is a bucket centrifugal machine. Drying is accomplished by hot-air tumblers which consist of large metal chambers with heated coils and inner revolving cages. The moist air is driven out of the tumblers by a fan. The finishing is carried out either on the flat-work ironer or by pressing machines. With the flat-work ironer the clothing is passed under revolving rollers, over a highly-heated surface, and carried out on an apron. The pressing machine consists of two surfaces, the bottom one padded and the upper exposed, both heated by steam. The garments are placed on the padded surface and the upper hot surface is brought down upon them.

Tests were carried out upon each part of the laundering process to determine whether it alone was sufficient to destroy lice, and then the entire process was tested. The results given below were taken from the report of Hutchison, Pierce, Moscovitz,⁴³ and Moore.⁴⁴

As a basis for the temperature experiments, the following table prepared from Nuttall⁴⁵ showing the thermal death points for eggs of the louse was used:

IMMERSION IN HOT WATER

Temperature (° F.)	Time	Result	Observers
192	15 seconds	Killed	Nuttall.
169	30 seconds	do	Do.
138	10 seconds	do	Do.
130.5	1 minute	do	Do.
140	5 minutes	do	Widman.
131	10 minutes	do	Do.
131	30 minutes	do	Bacot.
129	10 minutes	do	Nuttall.
121.5	15 minutes	do	Widman.
112.5	15 minutes	Not killed	Do.

EXPOSURE TO DRY HEAT

124	15 minutes	Not killed	Experiments of Captain Orr, Canadian A. M. C., and Bacot.
127	15 minutes	do	
130.5	30 minutes	Killed	
132.5	20 minutes	do	
134	30 minutes	do	
133	15 minutes	do	

The experiments as conducted by Hutchison, Pierce, Moscovitz,⁴³ and Moore⁴⁴ resulted in the same conclusions, except that the former washed woolens at 131° F. and the latter at 120° F. for 15 minutes.

The value of using live steam in the wheel was tried,⁴³ as live steam is less injurious to woolens than steam under pressure, or in a closed cylinder. Fifteen minutes exposure to current steam in the cylinder is the minimum which can be counted upon to produce satisfactory results, but even in this case precautions must be taken to prevent overloading of the wheel. Live steam does not shrink woolen clothing.

The soap used in washing plays a compound rôle by removing dirt and possibly by inhibiting the growth of bacteria.⁴³ Regarding the bactericidal action of soap, Rodet⁴⁶ carried out experiments for determining the antiseptic properties of plain soap, the inhibitory action on the growth of bacteria in favorable culture media, and also direct bacteriolytic action. He found that 1 per cent solution of soap not only inhibits growth but actually kills typhoid bacilli in a few minutes. The average strength of the soap solution used in laundries is 1½ to 2 per cent. The contact with the disinfecting alkali is multiplied by the constant rotary motion of the wash wheel. The ordinary nonspore-bearing bacteria are destroyed at 140° F. (60° C.) for 20 minutes. It has been shown that lice and eggs are destroyed in the wash wheel by washing at 120° F. to 131° F. for 15 minutes and rinsing three times at the same temperature, but this will not destroy bacteria. Therefore, when soiled hospital linen is being handled the articles should be soaked at 165° F. for 15 minutes without motion, or a current of live steam should be passed through for 15 minutes. This is not necessary if a hot tumbler is used. The laundry extractor plays no part in the disinfecting process; it merely serves to draw off excessive water.⁴³

If lice and eggs escape being destroyed in the washing process, they are surely destroyed in the drying tumbler. A temperature of at least 140° F. should be present at starting. With the usual washing formula in which the clothes are washed at any temperature below 131° F. with the washing machine in motion, and then continuing through the rinses and the extractor, ending with the 15-minute tumbling in the dry tumbler, there will be no shrinkage. The drying tumbler is an effective and noninjurious element in the process of cleaning woolens, and of disinfecting them and killing insects, when the clothing is treated wet, but it is not desirable to use the drying tumbler as a preliminary measure in the disinfection and disinfestation process, or as the only measure because of the effect of dry heat on the shrinkage of woolens.

The following method of laundering is effective for the destruction of lice and eggs, and the clothing will be returned in good condition without shrinkage:

a. In the washer run a current of live steam 15 minutes, revolving the cylinder every 5 minutes and discharging water of condensation every 5 minutes. Remove the garments and shake until almost dry. This requires only a few shakes. *b.* Submerge in water at 165° F. for 20 minutes without motion, except a few revolutions every 5 minutes. *c.* Wash 15 minutes at 131° F. in heavy suds and light load. *d.* Rinse three times, 3 minutes each, at 131° F. *e.* Extract. *f.* Run in tumbler 15 minutes at a minimum of 140° F.

The overseas mobile laundry unit, using the same methods, proved entirely satisfactory for delousing.

In investigating the value of the dry-cleaning process on the destruction of lice, the specifications of the dry-cleaning branch, salvage division, Quartermaster Corps, were followed; these read as follows:

OPEN ROTARY-WASHER SYSTEM

(1) *a.* Goods shall be washed in benzol, naphtha, or gasoline, specific gravity of which shall not be less than 56° by hydrometer test. *b.* One gallon of cleaning fluid shall be used to every 2 pounds of goods. *c.* Two ounces of standard dry cleaning soap shall be used to every 10 pounds of goods. *d.* One ounce of 26 per cent ammonia shall be used to every 25 pounds of goods. *e.* All goods shall be washed 30 minutes and rinsed 15 minutes. *f.* All clothing must be extracted for a period of not less than 3 minutes between wash and the rinse. *g.* Cleaning or washing fluid to be used once; rinsing fluid once, only for rinsing, after which it may be used for washing fluid, once only, by adding soap and ammonia as specified in paragraphs *b* and *c*. *h.* All cleaning fluid used for washing shall be new, distilled, or clarified. *i.* All cleaning fluid used for rinsing shall be new or distilled. *j.* After cleaning, all goods shall be inspected and all spots removed by a process known as "spotting," after which, if garments are not satisfactory, they shall be steam cleaned by the following method: Goods to be immersed in water at temperature of hand heat, which contains enough carbonated soda to soften the water, after which they shall be brushed with a neutral soap and water at hand heat, after which they shall be rinsed in two waters at hand heat and dried, as in (2) *c*.

(2) *a.* After goods are cleaned they shall be run in a drying tumbler at a temperature not less than 160° for 30 minutes, the temperature to be taken at point of discharge of air from tumbler. *b.* If a dry room is used, goods, after being thoroughly dried and deodorized, shall hang in the dry room at a temperature of not less than 160° for 30 minutes, after which they shall be run in a dust wheel for 20 minutes. *c.* After goods are wet cleaned, they shall be dried in drying rooms or open air at a temperature not exceeding 160° F. (71.1° C.).

The results of the studies on the effect of the dry cleaning process on louse destruction demonstrate that:

(*a*) The open rotary washer system of dry cleaning, when done according to the above specifications, is effective in destroying adult stages and eggs of body lice (*corporis*). There is no shrinkage of woollens. (*b*) The high temperature required in the drying tumbler was found to be essential for the destruction of the eggs. (*c*) The wash and rinse in gasoline was found effective in destroying active stages, but a large percentage of eggs will survive. (*d*) Gasoline itself is of no value as an ovicide. Eighteen and seven-tenths per cent of the eggs in one test hatched after 54 hours immersion in gasoline. (*e*) The gasoline emulsion soap was found to have little killing effect on eggs, even after 30 minutes immersion.

CONSTRUCTION OF DELOUSING PLANTS

While the subject of elaborate delousing plants was taken up by the Surgeon General's Office in the spring of 1918,³⁵ the long delays resulted in none being ready till long after the armistice. Considerable correspondence took place in the spring of 1918 with reference to the establishment of delousing plants at camps and ports of embarkation. This, it should be noted, was before the special section dealing with this subject was organized in the Surgeon General's Office.³⁰ Owing to the diversity of recommendations, and the inadequacy of most of them, it was finally decided in the Office of the Surgeon

General to recommend construction of delousing plants in the United States in three sizes, these being capable of handling respectively 260, 80, and 48 men per hour.⁴⁷ This rate was fixed mainly in each case by the sterilizer capacity. The type of plant to be constructed at a station depended upon the population and the rapidity of its movement. The plants recommended combined all the principles of a satisfactory disinfector, their design being based upon the habits of the louse. Copies of the plans were sent to the chief surgeon, A. E. F., in France. The construction of 45 of these deverminization stations was initiated by the following letter:⁴⁷

AUGUST 9, 1918.

From: Surgeon General, U. S. Army.

To: The Adjutant General of the Army.

Subject: Delousing plants.

1. With reference to previous correspondence regarding the necessity for delousing plants at military stations, this office has given the matter careful consideration by experts on the subject, and submits herewith plans for the construction of three types of delousing plants: (a) Large plant, capable of handling 2,600 men in 10 hours; (b) medium size plant, capable of handling 800 men in 10 hours; and (c) small plant, capable of handling 480 men in 10 hours. Only floor plans are attached hereto, the remaining plans and specifications being on file in the construction division.

2. It is recommended that delousing plants be constructed as promptly as possible of the types indicated below at the stations named:

(a) Large plants at Camp Upton, Camp Dix, Camp Lee, Camp Meade, Camp Jackson, Camp Merritt, Camp Mills, Camp Travis, Fort McDowell.

(b) Medium size plants at Camp Custer, Camp Devens, Camp Dodge, Camp Funston, Camp Gordon, Camp Grant, Camp Lewis, Camp Pike, Camp Sherman, Camp Taylor.

(c) Small plants at Camp Beauregard, Camp Bowie, Camp Cody, Camp Fremont, Camp Greenleaf, Camp Hancock, Camp Kearny, Camp Logan, Camp MacArthur, Camp McClellan, Camp Shelby, Camp Sevier, Camp Sheridan, Camp Wadsworth, Camp Wheeler, Camp Johnston, Camp Humphreys, Camp Greene, Camp Eustis, Fort Thomas, Columbus Barracks, Jefferson Barracks, Fort Slocum, Fort Logan.

3. Special plans have already been recommended for delousing plants at Camps Stuart and Hill.

4. At commands not mentioned above it is believed that there is no necessity to construct elaborate delousing plants. Such occasional delousing as may be necessary at such stations can be accomplished by extemporized means.

5. The establishment of delousing plants of the sizes indicated, and at the points mentioned above, is considered essential not only for the delousing of troops going overseas, but also in preparation for the delousing of troops returning from overseas, with a view to preventing the introduction into this country of diseases now prevailing extensively abroad and which are practically unknown in the United States at the present time. These plants will also prove extremely useful for treating the large quantities of bedding and clothing which frequently require disinfection in a camp and for which facilities have hitherto been lacking.

6. On May 6, 1918, this office made recommendation to your office that commanding generals of divisional cantonments and other large camps be directed to submit estimates for such delousing plants as were considered necessary for their commands. A number of plans and estimates resulting from this recommendation have been referred to this office for remark by the construction division. None of these is considered to be thoroughly satisfactory. Since the writing of the above mentioned letter of May 6 the subject of delousing plants has been given intensive study by various experts, one of whom has had extensive practical experience with military delousing plants in Serbia, Turkey, Bulgaria, Austria, and Russia. As a result of these studies it is now believed desirable to adopt standard types of delousing plants and to construct one at each of the points indicated above, regardless of the specific recommendations of local commanders.

7. Under military conditions delousing is considered to be an essential element in the maintenance of general cleanliness and to be analogous to the providing of laundry and bathing facilities. It is, therefore, assumed that delousing plants will be constructed, equipped and operated by the Quartermaster Corps with funds pertaining to that corps. In camps where laundries have been provided it is thought that the delousing plant should be an adjunct to the laundry and should receive its steam supply from the same power plant.

For the Surgeon General:

D. C. HOWARD,
Colonel, Medical Corps.

In order that each of the delousing plants might be adequate, certain definite principles were taken into consideration by the Surgeon General's Office, viz: ⁴⁸ (1) It should operate rapidly. (2) There should be a dirty side

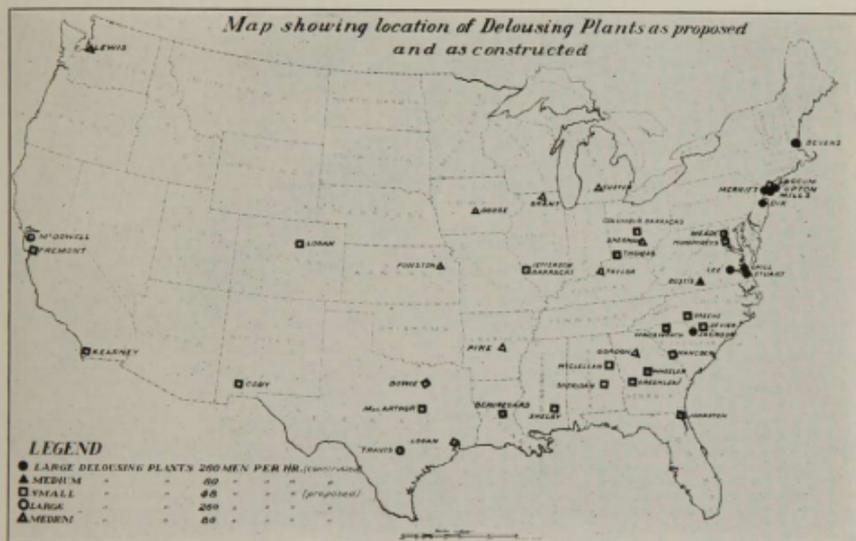


FIG. 76

and a clean side, absolutely separated except by passage through the shower room or through the sterilizer. (3) There should be a barber shop. (4) There should be a shower room. (5) There should be a checking room. (6) Floors should be of cement to allow frequent washing. (7) There should be good light for examination. (8) There should be a separate toilet for clean and dirty men. (9) The building should be warm, but not too warm. (10) All men should go in one way and come out another, so as to keep the clean from mingling with the dirty men.

The original plan suggested (as shown in fig. 77) provided a pressing room, but this was disapproved by the construction division, because it was thought it would be a duplication of machinery. The pressing room was recommended because it was anticipated that following steam disinfection of clothing some wrinkling would occur, which would render it unsightly. The construction division believed that the pressing machines already in the camp laundry would be adequate for this purpose, and as pressing was not directly

concerned with delousing the matter was not further advocated by the Surgeon General. Experience with delousing showed that a room devoted to the exchange of unserviceable garments for new ones was a valuable addition to the plant. Actually the arrangement of this room proved very important.

The large size plant as designed could handle about 6,000 men a day, working continuously, while the medium plant could disinfect about 1,900, and the small one 900.⁴⁷

PLAN FOR THE OPERATION OF DELOUSING PLANTS

The plan for the operation of the delousing plants was as follows:⁴⁷ The man entered the receiving room with his barrack bag containing all his spare

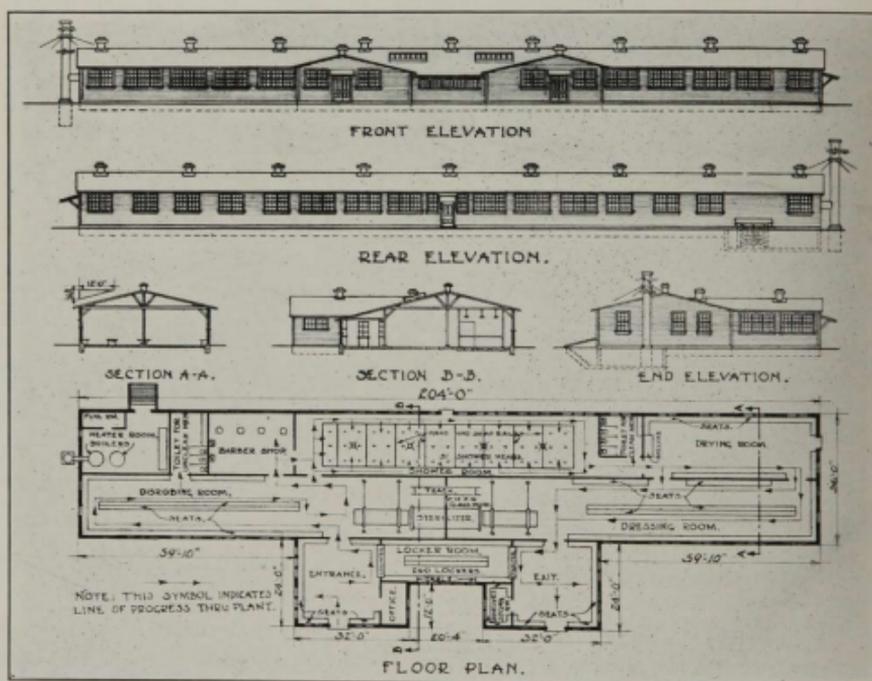


FIG. 77.—Large delousing plant, as designed in the Surgeon General's Office and constructed under the direction of the Construction Division of the Army

clothing. The leather material (shoes, belt, and hat), rubber, celluloid material, and money were passed in at the locker room. These articles were rarely infested. The man received two numbered tags, corresponding to the number of the locker, and then proceeded to the disrobing room with his barrack bag. Here he undressed and placed all his clothing in the bag, which was tied and numbered with one of the tags, the man retaining the other tag. The bag was placed in a carriage, which, when filled with bags, was pushed into the steam sterilizer. The soldier then proceeded to the barber shop. Before entering, the hair of the head, axilla, and pubic region, as well as of the body was carefully examined for lice and nits by a medical officer. This

was done under good illumination. Should nits be found he passed into the barber shop, where the hair was cropped. In order to remove the hair rapidly an electric hair-clipping machine was provided. If crab lice were found he was shaved. Following this he entered the shower room where a bath with soap and warm water was administered. Plenty of warm water was provided and a liquid soap used, which could be painted on the individual by an attendant. Actually one man assisted another. The drying room came next, a table being provided for the clean towels and a basket for soiled ones. Following the sterilization of the bag of clothing it was returned to the man in the robing room, where he donned the sterilized garments as soon as they were cooled. The disinfectant was provided with two carriages and a transfer track, so that one car could be loading or unloading while the other was in the



FIG. 78.—Eggs of *Pediculus corporis*, before sterilization

disinfectant. Following sterilization a vacuum was applied and the clothing was removed dry. In the exit room leather material, etc., was claimed by the owner. If lice or nits were found on examination, the leather material was treated with a liquid disinfectant.

For delousing in the United States it was not considered necessary to disinfect shoes. In order that the personnel in the delousing plants might be protected from becoming vermin infested, a "louse-proof" suit was recommended. This was a one-piece uniform, which went over the clothing and shoes and was tied about the neck. Cotton gloves were sewed into the sleeves and so the entire body was protected. The uniform was sterilized after removal. In the general absence of lousiness in the United States such suits were rarely used there.³⁷

OPERATION OF STEAM DISINFECTOR

The two main difficulties encountered in the use of steam under pressure are shrinkage and wrinkling of woolen clothing. It has been found that when the disinfector is properly operated no great shrinkage results, and if the clothing is appropriately handled the amount of creasing is decidedly lessened. Without care the wrinkling is very serious. The chief measures for preventing wrinkling are suspension on hangers and careful folding of garments. The method of using sterilizers was as follows:⁴³ A preliminary vacuum of 10 inches was produced, obtainable in 2 to 3 minutes in the small sterilizer and in 3 to 4 minutes in the large apparatus. This insured penetration of the steam through-



FIG. 79.—Same as Figure 78, after sterilization

out the load, an important factor in sterilizing large amounts of clothing. The live steam was turned into the chamber at a pressure of 15 pounds. The steam pressure was maintained for the following 15 minutes, being held at 12 pounds, except for the first 2 or 3 minutes required at the beginning to reach this pressure. The steam was then shut off and a drying vacuum produced and held for 10 minutes, reaching a maximum of 10 inches. The entire sterilizing process occupied a minimum of 30 minutes, but under low pressure in the boiler might be extended an additional 6 or 8 minutes. The garments came out practically dry. The plan of allowing 15 minutes exposure to live steam at a pressure of 12 to 15 pounds was generally found to be effective. Efficiency tests with both large and small sterilizers usually developed at 15 pounds steam

pressure in the sterilizing chamber a temperature of 121° C. or 250° F. Several factors operate to render the temperature lower than this in the center of the mass of clothing rolls, the main ones being the resistance of the air and of the fabrics to penetration. The former factor is offset by the preliminary vacuum; the latter was evident only in large loads. To insure penetration to the center of the mass the bags of clothing must not be packed tightly in the carriage. Open-mesh bags are preferable to the ordinary barracks bags.

RESULTS OF PREEMBARKATION VERMIN INSPECTIONS OF TROOPS LEAVING THE UNITED STATES

Before troops were permitted to board ship for overseas, an inspection was made to exclude all cases of infectious disease (including venereal) and vermin infestation. Owing to the fact that troops were embarking so rapidly, it was impossible to make careful vermin inspections. At Newport News, during August, September, and October, 1918, 118,872 men (in part negroes) were examined, and 727 cases of lousiness were reported (including the three types), or about 0.6 per cent. It will be noted that this figure is considerably lower than those obtained at the examination made by a representative from the Surgeon General's Office, who found 0.6 per cent of white troops and 42 per cent of colored troops infested. This was in June, however, when neither methods nor facilities were nearly as good as they were later.³³

Preembarkation vermin inspections at Hoboken, N. J., were conducted in essentially the same manner as at Newport News, Va. In 1918, 684,710 were examined, with the detection of 4,609 cases of lousiness, divided as follows: *P. pubis*, 4,554; *P. corporis*, 52; *P. capitis*, 3, or about 0.6 per cent of infestation.³⁴

Table 27 indicates the degree of infestation among troops passing through Camp Mills and embarking from Hoboken, N. J. It should be noted that troops were being handled rapidly during the period indicated and that careful vermin inspections were impossible, except with greatly increased personnel. It was found that the degree of infestation increased with the number of colored troops examined.

TABLE 27.—Degree of infestation in troops passing through Camp Mills⁴⁹

Month, 1918	Number examined	<i>P. capitis</i>	<i>P. corporis</i>	<i>P. pubis</i>	Scabies
June.....	34,612	1	9	188	32
July.....	123,147	1	33	532	131
August.....	104,608		8	1,382	52
September.....	65,715		6	1,596	65
October.....	35,222		2	273	31
November.....	5,571			26	2

PROGRAM CARRIED OUT FOR HANDLING THE LOUSE PROBLEM AFTER THE SIGNING OF THE ARMISTICE

With the signing of the armistice, practically all construction at home camps, including that of the delousing plants, was discontinued. Now the possibility of the early return of troops in great numbers rendered the delousing problem one of great importance with reference to the possibility of intro-

ducing vermin infestation and louse-borne diseases into the United States. Typhus fever was epidemic in parts of Europe; cases of trench fever were occurring in great numbers and had already been imported into England. Since endemic typhus fever (Brill's disease) is probably always present in the United States, it was feared that the introduction of large numbers of vermin-infested soldiers might lead to a greater number of cases of this disease, with a possible increase in its virulence. Consequently, on November 20, 1918, the Surgeon General addressed the following letter to the Chief of Staff:⁵⁰

1. The elimination of lice among troops returning from Europe is the most important sanitary problem now confronting the Army. If vermin infestation is once introduced in civil communities, it is almost impossible to eradicate it. Hotel proprietors in New York City have already complained about infestation brought into their hotels by soldiers, while the commissioner of health, New York City, has been reported to have said that we have more to fear from vermin infestation brought in by troops than from an epidemic of influenza. It is assumed that about 10 per cent of the returning troops are vermin infested. This percentage will be greatly increased as larger bodies of men from the front areas in France are brought back, unless proper precautionary measures are promptly taken.

2. Typhus fever, a louse-borne disease, has already made its appearance in Greece. This disease is very common also in Serbia, Bulgaria, Turkey, and Russia, while trench fever, another louse-borne disease, is very common in France. Typhus fever is a disease of winter months, and there is a real danger that with the present impoverished condition of the populations in Europe the disease may become epidemic, and thus seriously menace our own country. It is necessary, therefore, to safeguard in every possible way the population in the United States from louse infestation and louse-borne diseases.

3. Delousing plants have been authorized for many of the large camps and cantonments in the United States, and are actually under construction at the ports of embarkation, Hoboken, N. J., and Newport News, Va., and adjacent large camps. If delousing is done on this side only, the indications will not be met. If infested troops are placed on ships, crews will become infested, and infestation spread to others, due to crowded conditions on transports. On arrival in the United States infestation will spread to inspectors and others coming in contact with them on trains, cars, and boats carrying them to their respective camps. General infestation of civil communities in the United States will occur unless thorough delousing is done on the other side before troops are embarked, and again after arrival in the United States.

4. Information has been asked for by cable concerning the facilities available or procurable in France for delousing of returning troops. No reply has yet been received. If facilities are not available, they must be supplied from this side with as little delay as practicable. It is recommended that necessary orders be issued that no troops be returned from Europe hereafter until thoroughly deloused prior to embarkation; further ample facilities should be provided for universal delousing at ports of debarkation in the United States of all troops immediately upon arrival in the United States.

5. It is recommended further that instructions be communicated to the commanding generals, ports of embarkation, Hoboken, and Newport News, that all military personnel arriving at their respective ports from Europe from this time on be promptly deloused after arrival before being released and permitted to leave for other stations. It is understood that extemporized facilities can handle returning casualties at the ports of Hoboken and Newport News, and while this arrangement is not wholly satisfactory it is the best that can be done until facilities are provided for delousing on the other side.

Realizing the importance of this matter, a meeting was called by the General Staff at which were representatives from the Surgeon General's Office, Bureau of Medicine and Surgery of the Navy, United States Public Health Service, General Staff, construction division, and Quartermaster General's Office.

It was the opinion of the conference that delousing should be performed in Europe before troops embarked for home, this being very essential from the standpoint of prevention of louse-borne diseases. However, the Surgeon General, who had recently returned from an inspection in France, stated that there were not sufficient facilities abroad to do this work thoroughly, and even if the equipment were there it was more than likely that it never could be made 100 per cent efficient. The conference, therefore, indorsed the recommendation of the Surgeon General that facilities for delousing be established at all ports in the United States which would be used for debarkation of troops. It was further recommended that all troops be placed in detention for 14 days prior to embarking from Europe.⁵¹ It was believed at the time that these steps were most important for protecting the health of the citizens of the United States, and that the delays which might be occasioned by such procedures were of no importance as compared with the extreme desirability of preventing the introduction of contagious diseases and dissemination of vermin among the civilian population. As a result of this conference, the following cablegram was sent to General Pershing on November 26, 1918:⁵⁴

To prevent introduction louse-borne diseases in United States essential that perfect delousing of troops and casuals be performed before embarking. Sterilizers will be sent as soon as possible if necessary. In the meantime, use such facilities as you can procure. Also necessary place all troops under observation in detention for fourteen days before embarkation.

(Signed) MARCH.

In brief, the plan decided upon was that all troops were to be detained at foreign ports for two weeks and deloused before embarking; that they were to be examined and if necessary deloused on transports; and that universal delousing was to be practiced at debarkation camps in the United States.^{b 52}

Information was then obtained from the chief of embarkation regarding the ports to be used, the points to be designated as debarkation camps, and the probable number of troops to be debarked in any port at one time.⁵³ New York, Newport News, Boston, and Charleston were designated as debarkation ports, and Camp Devens, near Boston; Upton, Mills, Merritt, Dix, near New York; Lee, Hill, Stuart, Eustis, near Newport News; and Jackson, near Charleston, as debarkation camps. Arrangements were to be made for handling 10,000 troops a day at New York, 5,000 at Newport News, Va., and 2,500; troops a day at Boston and Charleston. In compliance with instructions from The Adjutant General the Surgeon General recommended in the following letter the construction of delousing plants at all of the above-mentioned points which were not already being provided for:⁵⁴

NOVEMBER 29, 1918.

From: The Surgeon General of the Army.
To: The Chief of the Construction Division.
Subject: Delousing plants.

1. In indorsement of the War Department, dated November 26, 1918, this office is directed to take up and arrange the necessary details for the procurement and placing of equipment with the construction division for certain delousing plants. From information gained from the chief of embarkation, copy of letter attached hereto, it will be necessary to erect delousing plants at Camp Devens, Merritt, Mills, Upton, Stuart, Hill, Lee, Dix, and Jackson.

^b See Chap. XII, Sec. II, this volume.

2. The Secretary of War had previously approved the construction of delousing plants at various camps, but their construction was stopped on November 11. Since then the construction of delousing plants at Camps Merritt, Mills, Hill, and Stuart has been resumed.

3. In addition to the plants now under construction at Camps Merritt, Mills, Hill, and Stuart, it is recommended that large-size delousing plants, capable of accommodating 2,600 men in 10 hours, be erected at Camp Devens, Upton, Lee, Dix, and Jackson. A smaller plant, capacity 800 men in 10 hours, must be provided for Camp Eustis.

4. As universal delousing of all troops returning to this country will be required at the debarkation camps, it is urged that this construction be expedited in every way possible.

For the Surgeon General:

D. C. HOWARD,
Colonel, Medical Corps.

It is appropriate to state here that much delay had attended the efforts of the sanitary authorities, prior to the armistice, to obtain the construction of

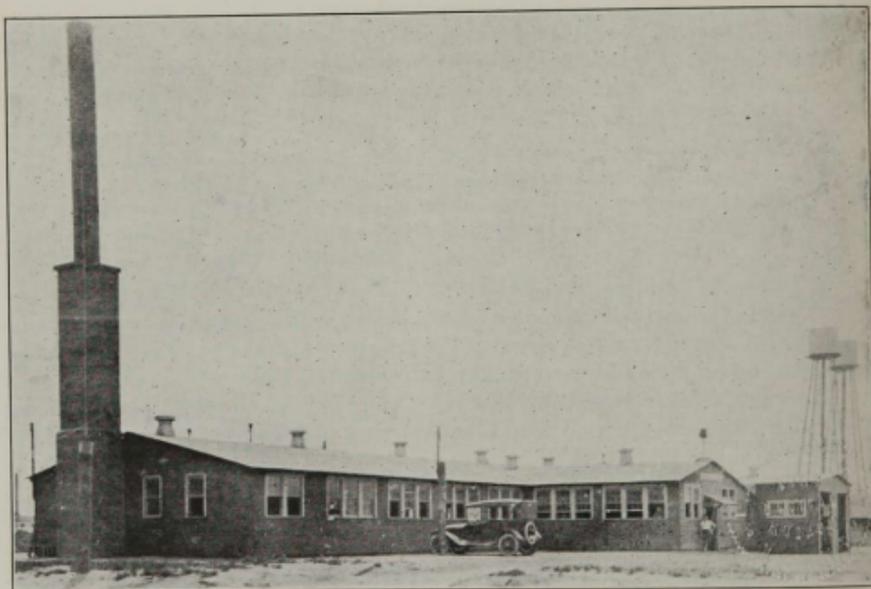


FIG. 80.—Delousing plant at a debarkation camp, Camp Mills, Long Island

delousing plants at the camps in the immediate vicinity of the ports of embarkation, viz, Hill, Stuart, Newport News; Merritt, and Mills, New York. Since large fixed steam sterilizers, such as were contemplated for the permanent plants, were difficult to obtain on rush orders, improvised plants were now rapidly provided at the more important points of debarkation, so far as this had not been done already, and the construction of the permanent establishments was expedited. The improvised plants were roughly housed and used batteries of portable sterilizers on wheels, many of which were available for issue as they were then in stock at Army supply depots.

Since the facilities at European ports were not adequate for perfect delousing, as the next step it was supplemented by examinations and delousing on transports. The following directions were issued to transport surgeons:⁵²

(1) All troops were to be examined for vermin by a medical officer soon after

sailing. (2) This procedure was to be repeated in six days. (3) All troops were to examine their clothing daily for lice. (4) All cases of vermin infestation were to be treated on board. (5) Medical officers were to examine cots, blankets, etc. (6) Report was to be made to the port surgeon regarding the results of the foregoing procedures.

On arrival in the United States all troops were again put through the delousing process at debarkation camps⁵² (Devens, for Boston; Upton, Merritt, Mills, Dix, for New York; Lee, Stuart, Morrison, Army supply base, Norfolk, for Newport News; Hill, Eustis, and Jackson, for Charleston), which were located comparatively close to the ports of arrival. For delousing nurses and other female civilians facilities were provided in debarkation hospitals either in or very near to the port.⁵² Like arrangements were made for all male



FIG. 81.—Improvised delousing plant at Camp Mills, Long Island

civilians traveling on troop ships. Arrangements were made to prevent friends, relatives, and others from meeting transports at the docks, and the organizations on board were immediately moved to the debarkation camps. Furloughs and leaves of absence were not granted until after the process of delousing was completed.

In order to follow up the effectiveness of the above procedures, all hospitals in the interior were required to report to the Surgeon General any infestation found among patients arriving from port hospitals, and all camp examining boards were to note the degree of infestation found in troops at the time of the physical examination made prior to separation from the service. Reports of the result of vermin examination as conducted at the debarkation camps were submitted to the Surgeon General's Office, whence any of special significance were referred to the chief surgeon, A. E. F., for his information.

ADMINISTRATIVE DETAILS OF DELOUSING ON DEBARKATION

The actual delousing of returned soldiers presented many difficult problems. The first had to do with keeping troops away from civilians upon their arrival in the United States. Friends and relatives were anxious to meet their returning loved ones at the piers. The danger of the resulting contact was foreseen, and orders were issued preventing anyone from going on the piers except medical and administrative officers and Red Cross personnel. Likewise, troops were not allowed to parade in the various cities on their arrival until they had been deloused in camp.

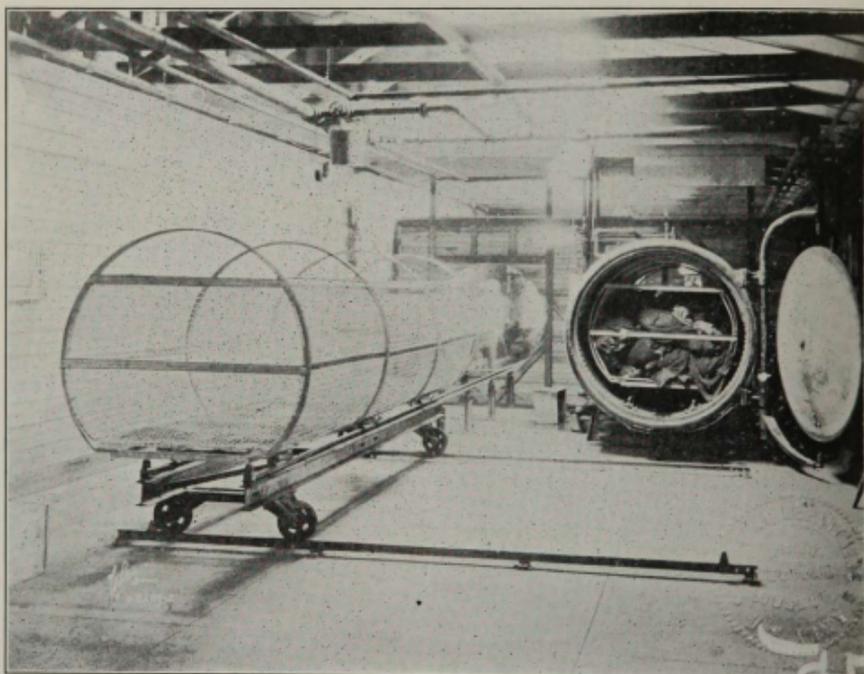


FIG. 82.—Steam sterilizer. Note transfer tracks

The possibility had to be considered of spreading infestation on trains running between the ports and the debarkation camps. Although lice ordinarily do not leave the host, nevertheless there was a possible danger of an occasional louse being deposited in a railway coach. All cars were carefully cleaned mechanically by vacuum cleaners after each trip. This subject assumed little importance save at the post of Charleston whence troops had to be sent directly to Camp Jackson.

The main difficulty was encountered when the troops reached the debarkation camps, where it was essential that they be deloused as quickly as possible to prevent congestion and in order that demobilization of units might finally be promptly accomplished. The facility with which troops could be handled depended in large part upon the nature of the camp and its delousing equip-

ment. The ideal plan was to have the camp divided into a "clean" and "unclean" area, and upon arrival to place troops in "unclean" barracks and following delousing to transfer them to "clean" barracks. Pressure for space was so great that this was rarely actually accomplished. All barracks were kept clean and are not believed to have been a factor in the spread of lice. At times to handle the large number of troops debarked at practically one time it became necessary to place three shifts of men in the delousing plants so that the work could go on continuously. Although it was the view of the Surgeon General that delousing was a function of the Quartermaster Department (see par. 7, letter of August 9, 1918, already quoted), it became necessary at most camps to man the plants with officers and enlisted men of the Medical Department. Ultimately, with the discharge of Medical Department enlisted men, they were, in whole or in part, replaced by employees of the utilities.

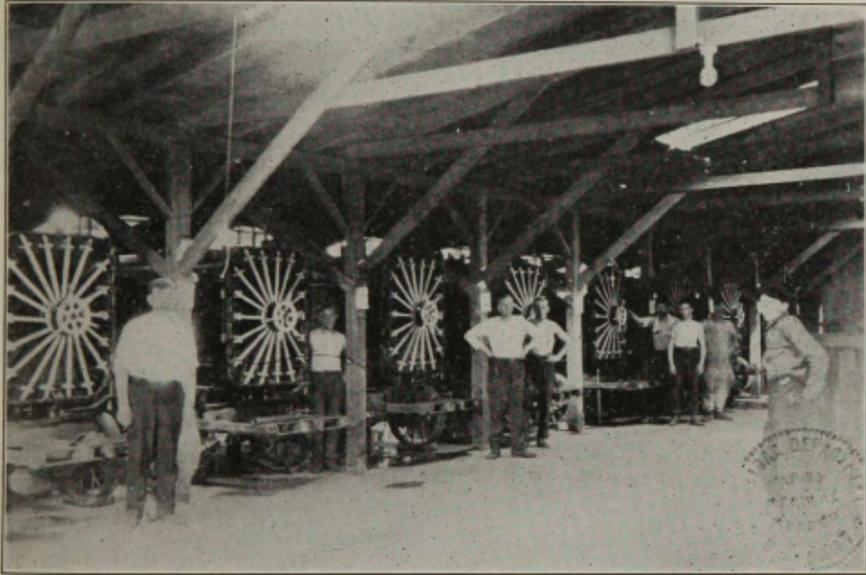


FIG. 83.—Sterilizer room in improvised delousing plant, Camp Mills

PRINCIPLES GOVERNING DELOUSING PROCEDURES

The question as to the delousing agent to be employed was of the utmost importance. Fumigation methods were disregarded because of their uncertain action, particularly on nits. Heat was considered the method of choice, steam being employed rather than dry heat for the reasons set forth below.

Three factors which should be considered in a study of delousing procedures: (1) The destruction of lice. (2) The destruction of eggs. (3) The destruction of the virus of louse-borne disease, which may be present in the body of the louse and possibly in the egg. If it had been possible to determine whether the lice were infective or not, less stringent measures would have been necessary. Since this was impossible, it was safer to assume that all lice were carriers of disease-producing organisms.

The virus of relapsing fever is a spirochete, that of typhus fever is thought to be a bacillus, and that of trench fever, although unidentified, is known to be destroyed at 70° C. in a period of 30 minutes. A perfect delousing agent should be one that will destroy these organisms as well as lice and eggs. For the destruction of bacteria dry heat at 150° to 160° C. is necessary, a temperature which would disintegrate woolen materials. Nuttall says,⁴⁵ "Hot air at higher temperature exerts an injurious effect on woolens, thus 104° C. acting for four hours, while but slightly yellowing white flannel, does not affect its tensile strength, but if exposed at 127° C. for one-half hour flannel yellows, then becomes brittle. At higher temperatures hot air is liable to overdry fabrics, so that they become brittle." In discussing the relative merits of hot air and steam, Nuttall says:⁴⁵ "Steam is greatly superior to hot air as ordinarily employed when it comes to disinfection of material harboring pathogenic bacteria. Stagnant hot air is inadequate for the purpose, unless a high temperature is used, and this injures the articles exposed. Therefore, since steam accomplishes both the destruction of bacteria and lice it has the advantage of fulfilling a double purpose."

The American Red Cross commission on trench fever notes that⁵⁵ "On account of the practical importance of the thermal death point of the trench-fever virus in connection with the sterilization of clothing, experiments were undertaken to determine the temperature at which the virus is destroyed in the infected louse excrement. It was found that the virus resists a temperature of 60° C. moist heat for 30 minutes. Obviously, therefore, a temperature of 55° C. for 30 minutes, which destroys the louse and its ova, does not suffice to destroy the virus of trench fever, which may be present on the underclothing of trench-fever patients."

The second point in favor of steam is that its penetration is much better than that of dry heat. This has been shown by the experiments of Koch, Gaffky, and Loeffler.⁵⁶ Hiss and Zinsser⁵⁷ note that, apart from the actually greater efficiency of moist heat when compared with dry heat of an equal temperature, an advantage of great practical significance possessed by moist heat lies in its greater powers of penetration. An experiment carried out by Koch and his associates illustrates this point clearly.

Agent	Temperature-applied (° C.)	Time of application (hours)	Temperature (° C.) reached within mass of linen			Result
			20 thick-nesses	40 thick-nesses	100 thick-nesses	
Hot air.....	130-140	4	86	72	Below 70	Incomplete sterilization.
Steam.....	90-105.3	3	101	101	101.5	Complete sterilization.

In discussing the value of dry heat, the surgeon at Hoboken, N. J.,⁵⁸ reported that exhaustive experiments with the use of dry heat for delousing were carried out under the direction of his office, and the conclusion was reached that this method was imperfect and impractical.

RESULTS OF VERMIN EXAMINATIONS MADE ON TRANSPORTS AND AT PORTS OF EMBARKATION

Table 28 shows the results of vermin examinations conducted during the voyage on transports arriving at Newport News, Va., and also the results of examination of the same troops after debarkation at Newport News. The table indicates that only a part of the infestations were found by medical officers on the ships. It further indicates that the universal delousing practiced at foreign ports was not perfect, thus emphasizing the wisdom of repeating the delousing process in the United States.

TABLE 28.—Degree of infestation found on certain troop ships⁴⁹

Name of transport	Port of embarkation in Europe	Date of arrival in United States, 1919	Number of troops	Per cent of lousiness found—	
				On ships during voyage	In camp at Newport News
U. S. S. New Jersey.....	Brest.....	Feb. 1	1,005	2.6	.8
U. S. S. Vermont.....	do.....	Feb. 8	1,004	.4	2.8
Rijnclam.....	St. Nazaire.....	Feb. 9	1,830	2	1.5
Princess Matoika.....	do.....	Feb. 11	1,900	2.6	.7
Pastores.....	Bordeaux.....	Feb. 15	186	6	3.2
Kroonland.....	St. Nazaire.....	Feb. 18	2,888	.17	.86
Poehontas.....	Bordeaux.....	Feb. 19	2,743	.03	.58
Georgia.....	Brest.....	Feb. 22	1,062	.18	.37
Huron.....	St. Nazaire.....	Feb. 24	2,808	.76	.34
Rhode Island.....	Brest.....	Feb. 28	1,031	3.3	4.7
Virginia.....	do.....	do.....	1,046	8.7	9.3
Michigan.....	do.....	Mar. 3	1,039	2.3	3.8
Martha Washington.....	Bordeaux.....	Mar. 8	2,578	0	.03
Buford.....	do.....	Mar. 9	1,220	1.5	4.9
Nansemond.....	St. Nazaire.....	Mar. 11	5,328	1.8	1.9
De Kalb.....	do.....	Mar. 12	1,209	1.7	.9
Aeolus.....	do.....	Mar. 13	3,575	.8	.19
Zeelandia.....	do.....	do.....	1,817	.6	.38
New Jersey.....	Brest.....	do.....	778	5.7	3.7
Ohio.....	do.....	Mar. 15	1,074	9.9	5.6
Louisiana.....	do.....	Mar. 18	992	1.4	2
South Carolina.....	do.....	do.....	1,026	2.8	2.4
Santa Teresa.....	St. Nazaire.....	Mar. 19	1,820	1.8	.2
Rijnclam.....	do.....	Mar. 20	2,965	.3	.35
Princess Matoika.....	do.....	do.....	3,303	.8	.3
Finland.....	do.....	Mar. 23	3,455	.43	.49
Kroonland.....	do.....	Mar. 24	2,934	.3	.23
New Hampshire.....	Brest.....	do.....	1,245	.08	.72
Pastores.....	do.....	Mar. 26	1,534	.65	1.2
Kansas.....	do.....	Apr. 1	1,221	.5	.08
Georgia.....	do.....	do.....	1,146	.7	.3
Grant.....	do.....	Apr. 2	5,037	.28	.3
Rhode Island.....	do.....	Apr. 8	1,025	1.8	1.36
Rijnclam.....	do.....	Apr. 25	2,921	.2	.24
New Hampshire.....	do.....	May 4	1,311	.15	.8
Madawaska.....	St. Nazaire.....	May 6	2,650	2.6	.22
Connecticut.....	Brest.....	do.....	1,282	2.6	.8
Martha Washington.....	Panillae.....	May 19	3,103	0	.45
Powhatan.....	St. Nazaire.....	May 20	2,406	.16	.04
Virginia.....	Brest.....	do.....	1,359	0	.51

RESULTS OF EXAMINATION OF CERTAIN MILITARY PERSONNEL ON ARRIVAL IN THE UNITED STATES

These examinations when made were conducted at the debarkation camps, but since universal delousing was practiced regardless of results, search for vermin was not required at all these camps. Some ports made careful examinations with a view to obtaining statistics regarding the degree of infestation among troops arriving in the United States. Table 29 shows the results among troops, patients, and civilians arriving at Newport News, Va. This table indicates that with the advent of warm weather and as better facilities were provided for delousing at foreign ports, lousiness was reduced; also, that lice upon patients were more common than among troops for the corresponding period.

TABLE 29.—Degree of infestation in personnel arriving at Newport News, Va.⁴⁹

Month	Number of troops	Number of patients	Number of civilians	Per cent infested troops	Per cent infested patients	Per cent infested civilians
1918						
December.....	3,704	5,896	234	1	10	0
1919						
January *.....	21,536	5,646	0	6	8	0
February.....	30,657	4,412	59	0	0	0
March.....	41,528	6,545	0	1.04	1	0
April.....	15,040	2,368	0	.5	.5	0
May.....	45,820	4,498	0	.3	0	0

* One contingent of troops showed 42 per cent infestation.

Tables 30 and 31 give the results of inspections of returning troops arriving at Hoboken, N. J., and at Camp Mills, N. Y.

TABLE 30.—Degree of infestation in troops arriving at Hoboken, N. J.⁴⁹

Month	Number examined	Number infested with <i>P. capitis</i>	Number infested with <i>P. corporis</i>	Number infested with <i>P. pubis</i>	Per cent infested (all types)
1918					
December.....	23,754	3	204	155	1.5
1919					
January *.....	25,590	0	1,760	352	8.2
February ^b	42,492	4	1,060	220	3
March.....	112,105	3	1,630	2,322	3.6
April.....	112,952	7	1,807	1,355	2.8

^a In January a certain contingent of men showed 42 per cent infestation.

^b In February a certain contingent of men showed 21 per cent infestation.

TABLE 31.—Degree of infestation in troops arriving at Camp Mills, N. Y.⁴⁹

Month	Number inspected	Number infested with <i>P. corporis</i>	Per cent <i>P. corporis</i>	Number infested with <i>P. pubis</i>	Per cent <i>P. pubis</i>	Number infested with scabies	Per cent scabies
1918							
December.....	23,364	204	0.87	153	0.67	150	0.64
1919							
January.....	25,398	1,678	6.6	372	1.46	78	.3
February.....	18,865	758	4.01	169	.89	56	.26
March.....	43,839	845	1.92	677	1.54	230	.52
April.....	55,489	457	.84	678	1.04	156	.28
May.....	71,274	237	.33	881	1.09	178	.24
Total.....	238,210	4,179	1.75	2,930	1.22	848	.35

In order to show the divergence in results obtained at examinations made in different camps among troops arriving in the same month, all such arrivals being at New York, the following table is given for the month of April, 1919:

TABLE 32.—Differences in degree of infestation found at certain New York camps during same month (April, 1919)⁴⁹

Camp	Number inspected	Per cent <i>P. capitis</i>	Per cent <i>P. corporis</i>	Per cent <i>P. pubis</i>	Per cent scabies
Mills.....	48,178	0	0.75	1.20	0.26
Merritt.....	32,854	0	.024	2.60	.009
Upton.....	29,641	.003	4.87	.10	.56
Hoboken (casuals).....	2,279	0	1.14	.96	.42

The diverse results obtained at these camps were probably due to a variety of causes. The degree of infestation among the commands in France doubtless varied materially, depending upon the character of service and the attention given to the presence of lice at the station or in the organization. Probably some commands were deloused more completely than others before embarkation. The efforts made to detect and destroy lice while en route to the United States, of course, were not equal on all ships, and units which had been negligent in this regard in France very possibly continued to be careless during the voyage. Finally, the thoroughness of the vermin examination at the debarkation camps in this country was not the same at all times and in all places. Note, however, in this case all the camps were under the same medical administration.

Table 33 has been prepared to show the results of vermin examinations of a limited number of soldiers as conducted at a port in France, repeated on the transport, and as again carried out at a camp in the United States. The figures might be taken to indicate either that vermin inspections are very unreliable or that infestation rapidly spreads under the conditions existing on shipboard. Probably both factors were concerned. Note after these men had been examined twice by medical officers, 3.8 per cent were found vermin infested in camp.

TABLE 33.—Results of repeated vermin examinations during a period of three weeks ⁴⁰

Number examined	Number found infested with lice		
	At St. Nazaire, Jan. 16, 1919	On U. S. S. Susquehanna, Jan. 18, 24, 30, 1919	At Camp Mills, Feb. 3, 1919
154	0	4	2
149	0	2	10
152	0	1	2
154	0	3	11
150	0	3	6
142	0	1	0
146	0	0	3
144	0	4	11
236	0	(*)	9
1,427	0	18	54

* No report.

An analysis of the results of vermin examinations, as shown above, indicates how unreliable such procedures may be. The hypothesis that in a command only those who are found vermin infested should be deloused is, therefore, fallacious. The practical conclusion reached was that when infestation is at all prevalent, universal delousing of all men should be practiced, little reliance being placed upon the results of inspections.

Troops arriving from various foreign points showed infestation irrespective of the port from which they debarked. Organizations coming from England were infested as well as those from France. The results of certain inspections are shown in Table 34.

TABLE 34.—Prevalence of lousiness among men sailing from various foreign points ⁴⁹

Port	1918				1919							
	December		January		February		March		April		May	
	In-spected	In-fested										
Winchester	17,996	112	481	26								
Liverpool	1,162	27	298	41			364	2				
Brest	4,196	221	22,158	1,835	14,609	870	25,181	943	26,664	596	47,915	776
Bordeaux			2,440	148	2,296	23	3,561	66	9,677	96	8,516	56
Marseille					1,478	8	7,983	265	2,652	71	6,388	85
St. Nazaire							5,005	104	14,277	361	5,788	175
Le Havre					482	26	1,745	42	367	3	856	11
Pamillac									1,852	8	1,819	15

Officers were deloused only when found infested, but all officers were required to be examined at the delousing station. Table 35 illustrates the advisability of examining officers, the table showing the results found at one camp during two months.

TABLE 35.—Results of examination of commissioned officers ⁴⁹

Date	Number examined	Number infested with—			
		<i>P. capitis</i>	<i>P. corporis</i>	<i>P. pubis</i>	Scabies
December, 1918	710	0	7	17	4
January, 1919	694	0	6	15	3

In nurses and female civilians arriving in the United States no cases of investation were found in 3,156 examined during January, February, and March, 1919, at Hoboken, N. J.

Vermin infestation among overseas patients arriving at the debarkation hospitals was often more common than among troops arriving at the camps. This was probably due to the difficulty of completely disinfesting certain patients. In many instances it was found that vermin were carried in the dressings and casts. On arrival in the United States all ambulatory patients were deloused prior to being sent to the wards. The admitting department usually was so arranged that walking patients passed from the receiving room to the property room, thence into the barber shop and the bathroom, and finally into the examining room. The patient appeared before the examining medical officer in a cleanly condition and was sent on to the ward. All bed-ridden cases were bathed and cleansed in the wards. Clothing of patients was steam sterilized and stored.

Tables 36 and 37 show the number of infestations among patients arriving at Newport News and Hoboken. By reference to Table 29 a comparison between the degree of lousiness encountered in patients and troops arriving at the same time of the year can be made.

TABLE 36.—*Vermin infestation among patients received at debarkation hospitals in New York* ⁴⁰

Date	Number of patients examined	Per cent of infestation
1918		
December.....	5,896	10
1919		
January.....	5,646	8
February.....	4,412	2.5
March.....	6,545	1
April.....	2,368	.5
May.....	4,498	0

TABLE 37.—*Vermin infestation among patients received at debarkation hospitals at Newport News* ⁴⁰

Date	From France			From England				
	Number examined	Number infested with—			Number examined	Number infested with—		
		<i>P. capitis</i>	<i>P. corporis</i>	<i>P. pubis</i>		<i>P. capitis</i>	<i>P. corporis</i>	<i>P. pubis</i>
1918								
December.....	5,638	54	650	170	3,102	21	119	40
1919								
January.....	8,165	20	321	57	2,093	4	29	8
February.....	8,758	19	42	14	572	2	18	4
March.....	17,493	66	148	69				
April.....	15,166	62	18	37				

It will be noted that with the advent of warm weather and the establishing of better delousing facilities at foreign ports vermin infestation gradually disappeared in patients.

Table 38 shows the results as regards presence of vermin which were obtained during examinations of soldiers who were about to be discharged from the service. Under the heading of "infested" are included the three types of lice. These examinations were not made with special reference to lousiness and the garments were not inspected at all, so presumably some cases of slight infestation were overlooked.

TABLE 38.—*Numbers found vermin infested at physical examination prior to demobilization* ⁴⁵

Months	Number examined	Number found infested
1918		
November.....	81,594	2
December.....	447,684	33
1919		
January.....	442,719	15
February.....	223,386	12
March.....	240,528	10
April.....	280,632	15
May.....	375,160	15
June.....	408,962	29
Total.....	2,500,665	131

RESULTS OF DELOUSING

A study of the foregoing tables clearly indicates the soundness of the policy adopted by the Surgeon General in handling the louse problem, viz, universal delousing before leaving Europe and after arriving in America. If delousing at foreign ports alone had been relied upon, a large number of vermin-infested men would have been scattered throughout the United States after discharge from the Army. Had delousing been practiced only on this side, the infestations would doubtless have increased greatly in number and degree during the voyage, with the probability of spread to the crews of the ships and with added difficulty in handling the situation at the debarkation camps.

On referring to Table 38 it will be seen that from November, 1918, to June, 1919, among 2,500,665 men examined physically and discharged from the service



FIG. 84.—Entrance room, Camp Mills delousing plant. Coat hangers on wall

only 131 infested individuals were found. This includes all three types of lice, most of the infestations being *Pediculus pubis*. Considering that overseas organizations started from active field service with 90 per cent infestation in some months, the final result achieved is gratifying.

Not all of these two and one-half millions men were overseas troops, however, some having served only at home. Although typhus fever and trench fever were prevalent in Europe, not a single case of a louse-borne disease was brought into the United States by returning troops.

The following account of the operation of the delousing plant at Camp Mills, Long Island, gives a very good idea of the operation of delousing plants of the disembarkation camps of the several ports of disembarkation.

CAMP MILLS (HOBOKEN) (REPORT UP TO JUNE 18, 1919)⁵⁹

While this station was serving as an embarkation camp all louse-infested troops were treated by their own organization under supervision of the camp surgeon. In July, 1918, a small delousing plant was erected in the detention camp for the handling of such men. The following instructions were issued by the camp surgeon:

Lice.—Organization surgeons will make every effort to eradicate lice from their commands. At each daily inspection of troops they will make careful search for cases of lice infestation, in compliance with G. O. 51, port of embarkation. All men infested with lice will be sent without delay, under charge of N. C. O., to the delousing station at the detention camp for treatment. All clothing and bedding, including personal clothing, blankets, bed sacks, and barrack bags, will be sent with the men for sterilization. In cases of body lice, all men in the same tent, together with their clothing, will be sent. A list giving names, rank, organization, and kind of lice infestation (whether body, pubic, or head lice) will accompany the men sent.

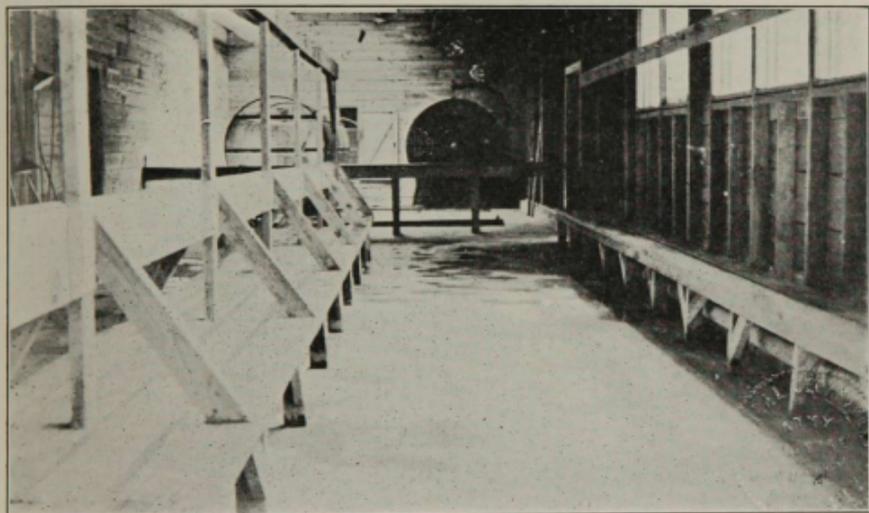


FIG. 85.—Disrobing room, Camp Mills delousing plant

Two delousing stations were at this camp for the treatment of troops returning from abroad. The first contingent of overseas troops arrived on December 4, 1918, and up to June 1, 1919, a total of 238,219 troops had been deloused. The improvised plant was equipped with shower baths, a dressing and drying room, and 20 portable steam sterilizers. The large permanent plant, with a capacity of about 5,100 per day, was completed and running on February 16, 1919. It was first operated continuously, using three shifts of eight hours each. Eight officers, 19 noncommissioned officers, and 207 other enlisted men were employed to run the plants, with 7 officers, 1 noncommissioned officer, and 18 enlisted men added for medical inspection. Subsequently the operation was carried out by two shifts of civilian laborers under the control of the quartermaster, but supervised by the camp surgeon. In order to meet

certain local conditions, additions were made to the permanent plant so that the normal capacity became 6,600 men per day and this could be increased under pressure to 7,150.

The delousing process was carried out as follows: Upon entering the door each soldier was given a barrack bag. He then passed into the dressing room, taking a seat and placing his clothing and blankets on the floor in front of him. The men were called to attention and given careful instructions in regard to arranging their garments in the bag. The blankets were folded twice, once lengthwise and once crosswise, and laid on the floor. The overcoat was folded once lengthwise inside out, collar turned up and sleeves laid flat, and placed on top of blankets. The blouse was folded in the same manner and laid on top of the overcoat, and the breeches, folded together lengthwise, were placed

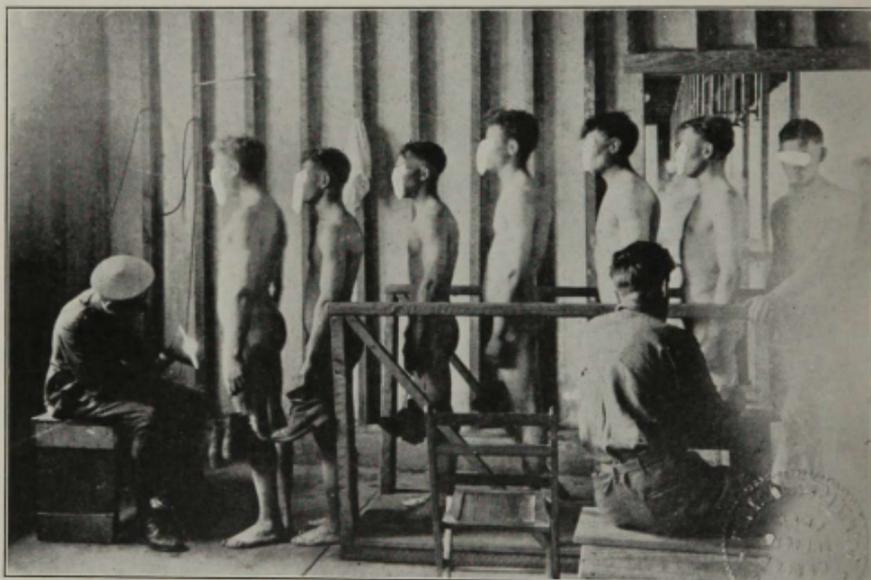


FIG. 86.—Examination by medical officer, Camp Mills delousing plant. All names checked off

upon the blouse. The blankets and clothing were then rolled, beginning at the end toward the tail of the overcoat, so that the collars would come in the large part of the bundle. The ends of the blankets were not folded over the garments. The roll was then carefully placed in the barrack bag. All other clothing (socks, shirt, underwear, etc.) was placed in the bag last. This method of handling the clothing largely avoided the wrinkling which is so common when care is not taken. Shoes and valuables were carried by the individual. The metal identification tag of the soldier was fastened to the bag before delivery at the sterilizer room. Anything not required to pass through the sterilizers, such as toilet articles, rubber and leather goods, etc., was checked by the organization officers at the barracks before the men report at the plant. The camp authorities assumed no responsibility for loss of money, property, or valuables while the men were going through the process, the care thereof



FIG. 87.—Shower room in improvised delousing plant, Camp Mills



FIG. 88.—Drying room in standard delousing plant, Camp Mills

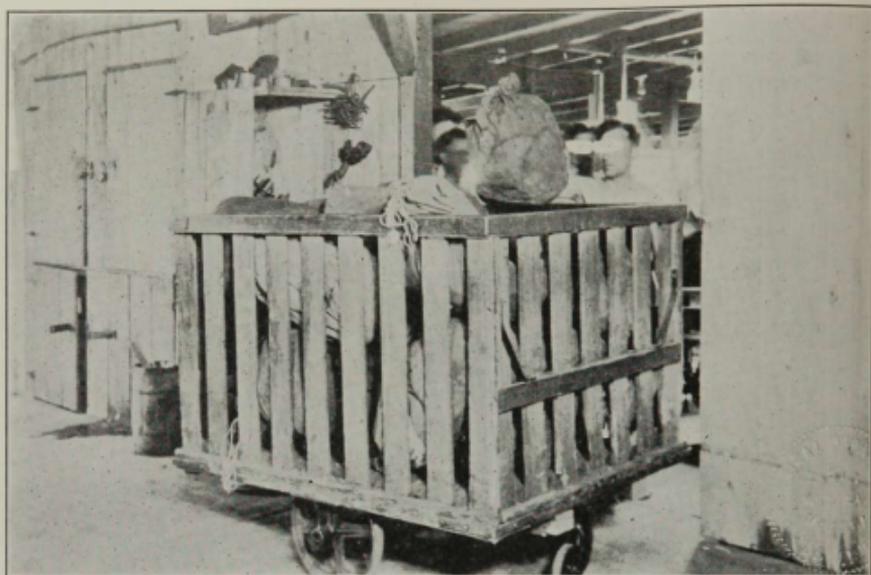


FIG. 89.—Method of carrying barrack bags to disinfecter in improvised delousing plant, Camp Mills

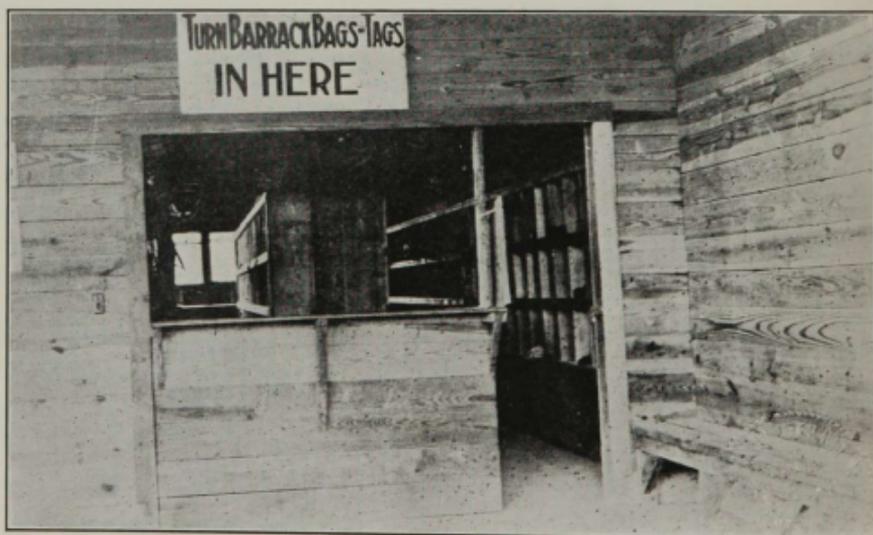


FIG. 90.—Exit room, Camp Mills delousing plant

resting with the commanding officer of the organization. The regulations required that an officer from the organization accompany each group through the delousing station. After the bags were left at the sterilizing room the men then passed the medical inspector, their names were checked on the roster of their organizations, all findings of the inspector were recorded, and note was made of the absentees. Clearance for an organization was given only when all men present with it had been deloused. After the men passed the medical inspection each was given a towel and entered the bathroom, where the hairy parts were "painted with a solution of kerosene oil and soap. The men then passed to the showers. If inspection disclosed crab lice, the pubic hair was shaved before going to the bathroom. Upon leaving the bath the men passed on to the waiting room where they were given a bath robe while awaiting the return of their clothing. The exit from the dressing room led to the "exchange clothing service" of the camp property officer. All unserviceable garments were exchanged as the men left the plants.

Officers' uniforms were exposed to live steam for 15 minutes. Such clothing was placed on a hanger in the disinfector and steam turned on, the door being closed but not locked and the steam not under pressure. All lice and eggs were killed by this process and no shrinkage and wrinkling occurred. This method was employed to prevent any injury to officer's uniforms and proved satisfactory.

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CHAPTER XVIII

SANITATION OF TRANSPORTS

The practice of sanitation on the transports used to convey our troops to and from Europe during the World War was inevitably difficult, if not actually only an approximation, by reason of the fact that the necessity for creating a great transport fleet came just at a time when the world was experiencing its most acute shortage of tonnage.¹ Before taking up the consideration of the details which such a situation implies, however, it is deemed expedient to show briefly what organization provisions obtained in our Army for transporting troops overseas when we entered the World War.

PRE-WAR ORGANIZATION OF THE ARMY TRANSPORT SERVICE

The United States Army Transport Service was organized as a special branch of the Quartermaster Corps for the purpose of transporting troops and supplies by water. In time of peace the transport service was under the supervision of the Quartermaster General, with the exception that such matters as related to medical attendance were under the supervision of the Surgeon General of the Army. Under war conditions, however, and upon the establishment of ports of embarkation, the transport service at such ports was to be under the supervision of the commander of the port of embarkation, whose duties in part were defined as follows:²

(1) To make all detailed arrangements for the embarkation of troops. (2) To see that the ships furnished him by the Quartermaster Corps are properly fitted out for use as transports. (3) To operate and maintain military traffic between his port and the oversea base through a superintendent of transport service who is a member of his staff. (4) To command all the administrative groups assigned to the port of embarkation and to be directly responsible to the War Department for the efficient and economical direction of their operations.

Of the general organization of the personnel for each home port the following offices may be mentioned as being pertinent to the present subject: That of the general superintendent; the medical superintendent. Provisions also existed for a transport surgeon on each transport.

The medical superintendent, an officer of the Medical Department, stationed at the home port, was the adviser of the general superintendent in sanitary matters and in the administration of the medical service on board. Upon the arrival and prior to the departure of each transport he made personal and minute inspection of it and submitted his recommendations relative to food supply and sanitation to the general superintendent. He made or caused the transport surgeon to make the necessary inspection of persons embarking or disembarking to determine whether or not any had infectious disease, and he either detained or made proper disposition of persons having infectious diseases.²

The transport surgeon, under the direction of the medical superintendent and the commanding officer of troops, was held responsible for the proper

equipment and supply of the hospital, for the proper and thorough sanitation of the ship, for the satisfactory service of the hospital attendants, and for the care and treatment of the sick and injured among the ship's officers, crew, casual passengers, and for all patients in hospital. In so far as troops on board were concerned, when medical officers were on duty with them, which was almost without exception the case, the responsibility for determining when any of the troops needed hospital care was that of medical officers on duty with troops; likewise theirs was the responsibility for caring for sick and wounded troops not requiring hospital treatment.

Troops ordered for service beyond the sea were inspected prior to departure from their station with the purpose of eliminating those unfit by reason of disability or infectious disease. Also, all such troops were vaccinated, if not already protected against smallpox.²

Immediately after completion of embarkation a suitable officer was detailed as police officer by the commanding officer of troops. He had general charge of the police of all parts of the ship occupied and used by the troops, especially the parts used in common, such as baths, wash rooms, and latrines.²

In the routine on board, in so far as sanitation was concerned, immediately after reveille the bedding of each enlisted man, except that bedding which was to go on deck for airing, was to be neatly folded and placed at the head of the bed. Advantage was to be taken of each fair day to air the bedding of the men on the lines for that purpose, according to a schedule prepared by the police officer.²

Bathing, according to facilities, was to be enforced through a system of assignment of hours for the organizations, prepared by the police officer.²

TRANSPORTATION OF TROOPS DURING THE WORLD WAR

To appreciate adequately the difficulties which beset the authorities in their efforts to maintain sanitation on transports, it is only necessary to recall the fact that, though but 194,000 troops had reached Europe from the United States by the end of the year 1917, prior to the day of the signing of the armistice over 2,000,000 had been sent to the American Expeditionary Forces.¹ Of these 1,000,000 sailed between July 1, 1918, and the end of the following October. To transport such an unprecedented and, indeed, un contemplated number¹ necessitated an ever-increasing expansion of transport facilities, with which plans for the satisfactory application of sanitary measures could not quite keep up.

The expansion thus effected, though it was done by the War Department, was not entirely as had been contemplated in the pre-war organization of the Army Transport Service. At the outset of our overseas operations it was contemplated to man cargo ships and certain troop ships obtained from the Shipping Board with Army transport crews. However, in the proclamation issued by the President, the German interned vessels were designated to be manned by the Navy and operated for the Army.³ In view of this action and the fact that the Navy had certain personnel trained and ready for the operation of vessels then being assigned, it seemed desirable, in order to avoid a divided responsibility and to obtain the maximum efficiency of operation, to have all vessels, both cargo and troop, manned by the Navy.

The association of the Army and the Navy in the function of transporting troops overseas was based on regulations prepared by the Joint Army and Navy Board, approved by the President on November 22, 1917.⁴ These regulations prescribed that when the Navy Department operated transports belonging to or chartered by the War Department such transports would be controlled by the Navy Department; also, provisions were made for continuing control by the War Department over certain transports procured and officered and manned by it, as had previously obtained. Thus is explained the fact that, of the troops transported to Europe and back, almost as many more were transported in ships assigned to the Cruiser and Transport Service of the Navy as in ships of the Army Transport Service. Therefore, the Navy Medical Department was responsible for sanitation as applied to approximately one-half the American Expeditionary Forces, while these forces were on sea.

Three types of vessels were used in transporting the troops to Europe and back: Vessels constituting an integral part of the Navy;⁵ vessels assigned to the Navy, officered and manned by it, and under its control (these made up the cruiser and transport force); ships controlled by the United States Army Transport Service, comprising commercial transports and a few United States Army chartered transports.⁶ Commercial transports were obtained variously and comprised vessels having a regular run between New York and European ports, between other American ports and Europe, between Canadian ports and Europe, and between foreign ports and temporarily diverted to this service (as between Europe and the Orient, Australia, or South America).⁶ Many difficulties were encountered in connection with the use of these commercial transports: Some were well equipped for the purpose, while the great majority were either cargo or modified cargo vessels transformed for the emergency into troop transports and fitted up as such.

TROOP CAPACITY OF TRANSPORTS

Three basic factors governed the troop capacity of vessels used in transporting our Army to Europe: The scarcity of ships for the purpose; the necessity for speed in landing in France the greatest number of men in the shortest possible time; the relatively short duration of the sea trip, during which, it had previously been determined, the forces transported would of necessity have to contend with discomfort. Therefore, berthing space was not commensurate to air space or floor space; on the contrary, it had no relationship with the sanitary measures which were being established for safeguarding the men while in camp.

Repeated but ineffective efforts were made, particularly by the surgeon, port of embarkation, Hoboken, N. J.,⁷ acting in the capacity of medical superintendent for the major part of troop transports, to establish some standard which would fix the troop carrying capacity of transports. Since the conditions on transports were so varied, however, such a standard that would be applicable in general could not be fixed;⁷ for example, some of the ships sat high in the water with the troop deck well above the water line; others were low, their troop decks below the water line. And, whereas, in one case, ventilation would be possible by using portholes, thus materially influencing berthing space, in another, this would be impossible.

As early as August 8, 1917, the surgeon, port of embarkation, Hoboken,⁷ recommended that a board of officers be appointed to make a survey of each vessel with the view of fixing its troop-carrying capacity, but such suggestions had to be disregarded.

On nearly all the transports medical officers reported on the crowded condition of the troop compartments, but the complement of the troop assigned was steadily increased in nearly every instance.⁵ Indeed, part of the explanation for the large numbers of troops carried in American ships is to be found in the fact that under the pressure of the critical situation on the Western Front ways were found to increase the loading of our own transports by as much as 50 per cent,¹ despite the fact the ships already were overcrowded. This increase in capacity was practicable only during the warm months of the year, of course, for since every possible space already was used for berths, sleeping in them was made possible only by dividing the troops into shifts. Thus one shift slept while the other remained on deck. On the U. S. S. *Agamemnon*, during one of its trips when 5,000 troops were aboard, the doubling up of the troops was arranged as follows:⁵ All troops were divided into two watches, known as day and night sleepers, the sleeping hours being from 9 p. m. to 5 a. m. and from 9 a. m. to 5 p. m. This left two daily periods of four hours each during which it was possible to clean thoroughly all troop compartments.

During the pandemic of influenza in the fall of 1918 overcrowding on troop transports was reduced, but it is impossible to say what the extent of the reduction was that was brought about by the influenza, because factors other than sanitation were affecting the flow of our troops to Europe.⁶ On September 24, 1918, the surgeon, port of embarkation, Hoboken, N. J., addressed a letter to the commanding general of that port,⁶ in which the fact was stressed that influenza was practically pandemic in this country. At that time, however, it had hardly become epidemic in either one of the embarkation camps. Also, the statement was made that pneumonia seemed to complicate the influenza, and the warning was made that through such a complication there might be disaster in the event of an epidemic on board ship. It was recommended that the crowding on transports be reduced by 30 per cent, and that the hospital accommodations be doubled. The commanding general concluded to support the recommendation for the extension of hospital facilities, but in view of the military situation approved a reduction of only 10 per cent carrying capacity. This recommendation, as modified by the commanding general of the port, was communicated by him to the War Department by telephone, and his view prevailed. Shortly thereafter a cable message from the American Expeditionary Forces, reporting 100 deaths on the steamship *Olympic*, a chartered transport, was referred to the surgeon, port of embarkation, Hoboken, for remark and recommendation, whereupon he reiterated his recommendation as to a 30 per cent reduction in the troop-carrying capacity of transports, and that the reduction be made immediately.⁶ The reduction eventually reached about 70 per cent, but, as was stated above, it can not be said that it was due to reasons of sanitation any more than to any of the other factors then determining the flow of troops to the American Expeditionary Forces.⁶

BERTHS

Though a number of the transports, particularly those obtained early in the World War, were fitted with troop berths comprising metal piping between which canvas was stretched, the berth generally adopted consisted of a laterally curved metal frame, so hinged to stanchions as to permit folding it upward, thus facilitating police of the berth compartment.³ Chains from the stanchions to the outer side of each berth prevented it from dropping below the horizontal. Instead of canvas bottoms, these berths had bottoms of coarsely meshed wire, attached to the frames by means of spiral springs.

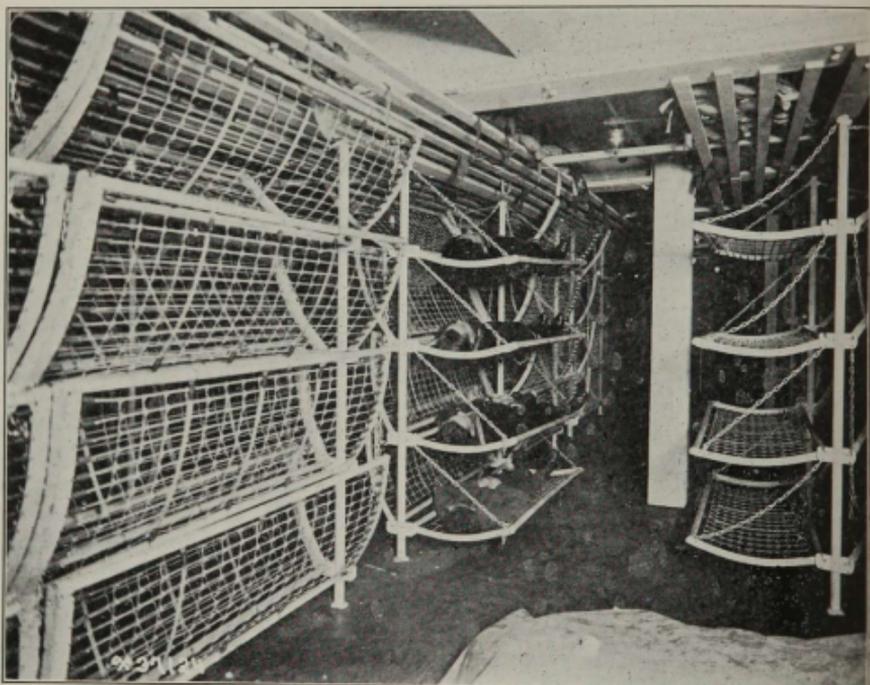


FIG. 91.—Type of metal berth installed on transports

No bedding for enlisted men was supplied by the transports. Each soldier embarking carried with him his complete field equipment, and used his own bedding while on a transport.

Hammocks were used in addition to berths. Usually hammocks were placed where it was not practical to instal berths, the proportionate number varying, of course, with the transport. On the *Caronia*, for example, a ship chartered from the British, the major portion of the troops slept in hammocks,⁵ as was the case with many of the commercial transports.⁵ On the other hand, of 130,305 accommodations provided by the Army Transport Service on 56 transports, 6,803 were hammocks³—a fraction over 5 per cent. As an example of the locations used for installing hammocks: On the U. S. S. *Alaska*, 140 hammocks were swung over the mess tables,⁵ an objectionable practice by

reason of the fact that, when the men climbed into their hammocks they used the tops of the mess tables for the purpose, and when they became seasick during rough weather they proved a source of disgust to others.

American troops had a dislike for hammocks, but troop transports fitted up with them were reported to be by far the most sanitary, especially as regards vermin and the incidence of disease.⁵

VENTILATION

Ventilation of troop compartments varied considerably according to the ship and such contingencies as bad weather. On some ventilation by natural draft was depended upon; on others forced ventilation by artificial means was used.⁶ Where wind sails were used, and dependence was placed on open hatches, the system failed in rough weather, when, perforce, there was no other place for troops to go than to their compartments. A serious drawback also obtained as regards portholes, for during the continuance of submarine warfare portholes necessarily were closed at night to prevent showing lights to the enemy.

Ventilation by means of fans and pipes was of two kinds: Supply and exhaust, though the supply or blower form of ventilation was the type usually adopted when forced ventilation was installed on transports.

As in the case of other appropriate installations of a hygienic nature, ventilation to an adequate degree was not obtained; it was only the best that circumstances permitted.⁵ In so far as the cargo ships are concerned their proper ventilation was one of the most difficult of the undertakings connected with their conversion to troop-carrying purposes.⁵ In some cases the electric plants were too small to permit the installation of additional leads, and in others the boiler capacity already had been appropriated for other auxiliaries installed. Additional fans and cowls were supplied wherever it was possible to do so, and wind sails were rigged up. The Navy medical inspector attached to the staff of the cruiser and transport force supplied the following data to the Army Transport Service regarding ships averaging 10-knot speed: Each occupant of the upper 'tween-deck spaces required 3 inches of cowl-discharge-pipe area, and each occupant of lower-deck spaces required 3.4 square inches of cowl discharge to furnish a minimum of 2,000 cubic feet of air per man per hour. Whenever the large troop compartments had two hatches the ventilation was good, the forward one usually acting as an intake and the after one as an exhaust. On the converted cargo ships latrines and wash rooms were ventilated easily, since they were located in deck houses whose doors and air ports communicated directly with the open. As regards the ventilation of the converted passenger ships, this was attended with much difficulty. The existing systems were inadequate for the crowded troop spaces, and new air conduits had to be built, the fans for many of which were obtained only after long delay.⁵

MEDICAL PERSONNEL

The medical personnel differed on each of the above-mentioned classes of transports.⁶ Naval transports had regularly assigned medical personnel, which was supplemented by the Army medical personnel attached to the troops aboard. Commercial transports, whose regular runs were between American or Canadian and European ports, had a permanent medical personnel and hospital

and medical equipment available for troops aboard. On the other commercial transports, however, hospital equipment, such as instruments, was not available for the needs of troops except on such vessels as those on which the civilian ship surgeons were acting in the capacity of contract surgeons, United States Army, their contracts being renewed each voyage. Many other troopships being without medical personnel or definite hospital equipment, it became necessary to assign to each such vessel an adequate personnel and adequate medical supplies and to have space set aside for hospital purposes. Whenever possible the shipping companies concerned made the necessary arrangements; otherwise this was done by the authorities at the port of embarkation, Hoboken. Frequently on a commercial troopship a medical officer of the Army was assigned as transport surgeon and the hospital was equipped throughout with Army medical supplies. These supplies were furnished as a standardized unit based on the needs of 1,000 men. The transport surgeon in such cases performed the duties of ship surgeon and furnished medical attendance to the ship's crew. In all cases there was a difference of opinion between the port authorities and the transport people as to what constituted a proper Army medical personnel, and in practically no case was it possible to obtain a satisfactory adjustment as to the status and number of this personnel.⁶

The most satisfactory arrangement was effected whereby the ship surgeon in the employ of the shipping company, acting in an advisory capacity to the United States Army transport surgeon, rendered services to the Army medical personnel attached to the troops aboard, thus making possible the use by the Army of all hospital facilities aboard the ship. This arrangement was effected when authority was obtained for compensating the ship surgeon for his work, payment being made after each trip.⁶

MESSING FACILITIES

When passenger and cargo ships were converted into purely troop carriers, the arrangements for the care, the preparation, and the serving of food were not overlooked. Inevitably, however, the satisfactoriness of the arrangements varied widely. On some ships they were excellent, while on others it appeared that the marine designer responsible had only the idea of utilizing all available space for berthing, with little thought of food and messing problem.⁹

The following regulations, in so far as they are pertinent, were to be observed, as regards the messes and the character of the food:⁴

MESSES

The following messes shall be established, when practicable, on each ship of the transport service and on each hospital ship: (a) Saloon mess; (b) ship's officers' mess; (c) ship's petty officers' mess; (d) sailors and firemen's mess; (e) troop mess; (f) hospital mess.

* * * * *

CHARACTER OF MEALS

The Quartermaster Corps will provide suitable and proper meals for the various messes except the hospital mess. The transport surgeon is responsible for the hospital mess and will procure his supplies therefor as far as practicable from the quartermaster agent.

The general superintendent will in general terms prescribe the bills of fare for the various vessels.

In accordance with the bills of fare prescribed, meals for the saloon mess, the ship's officers' mess, and the ship's petty officers' mess will be prepared from the articles of food carried by the transport, with the restriction that the total cost of the food consumed in those messes shall not exceed \$1.75 cents, and 50 cents a day, respectively, for each person five years of age or over subsisted therein.

Food for the sailors' and firemen's mess will be prepared from the articles of subsistence stores aboard, the total cost of the food consumed not to exceed 40 cents per man per day. * * *

Food for troops traveling on United States Army transports will be prepared from the articles of subsistence stores which compose the ration for troops in garrison, varied by the substitution of other articles of authorized subsistence stores, the total daily cost per man of the food consumed not to exceed 20 per cent more than the current cost of the garrison



FIG. 92.—A corner of the galley on a converted cargo ship. The construction work had been completed when this photograph was made but the galley had not been cleaned up. The photograph shows boiler, coffee urns, and "coppers."

ration, except on Thanksgiving Day and Christmas, when 60 per cent increase over the same current cost is authorized.

All orders affecting the messing of troops will be given to the quartermaster agent, through the master, by the commanding officer of the troops direct, or through the officer in charge of the mess. The first meal on board for troops will be served at the next regular hour after embarkation.

Stores not consumed in one mess will be utilized in some of the other messes aboard the transport.

No meals, luncheons, or refreshments will be served to passengers, ship's officers, or crews of transports in their staterooms or quarters, unless under written orders of the transport surgeon. These instructions will not apply to officers and crew on duty at night.

* * * * *

In so far as the food itself was concerned, however, it is to be recalled that, excepting the foreign, chartered transports, the Navy controlled our troop transports. The Navy ration supplied on the transports controlled by the Navy was in general satisfactory, though prepared and served under conditions of great difficulty.⁵ The food problem that pertained to transports chartered from foreign nations is treated in the second section of this volume. The service of food was generally by the cafeteria plan, that on the U. S. S. *Mau*i being a good example.⁵ Three meals a day were prepared. Fifteen minutes before mess call was sounded, all troops went below to their respective compartments and then were brought on deck in company formation under the supervision of their company commanders. There they were formed in

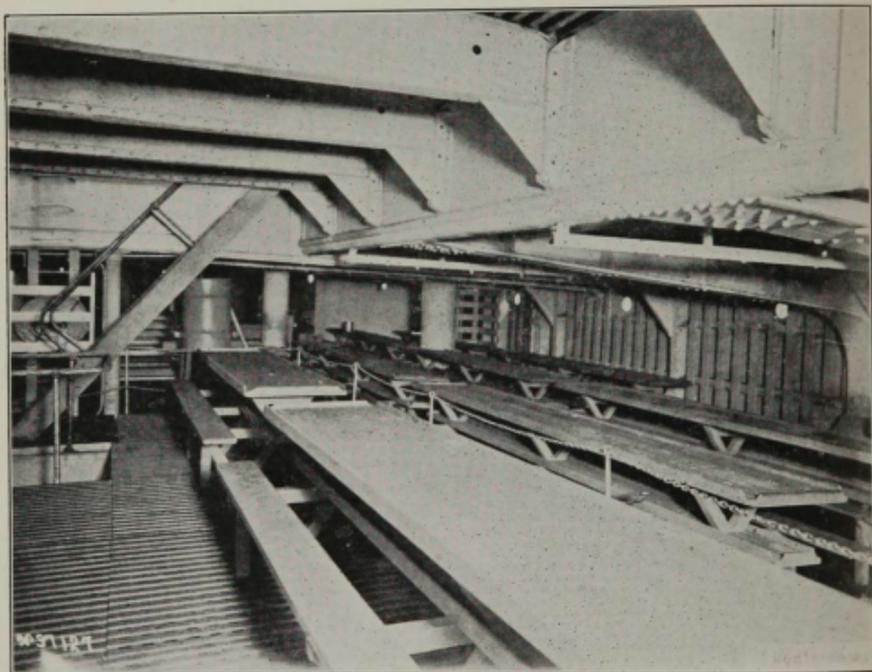


FIG. 93.—Mess hall for troops on a converted cargo ship

double rank on the lee side and marched below into No. 2 hatch, entering the forward end of the mess hall through the port and starboard doors. Service stations, in charge of a naval petty officer, were located at each such entrance; details for serving food were selected from among the troops. Each soldier, after having his meal ticket punched, and having received his food, went to the farthest end of the mess hall, the capacity of which was 500. From 10 to 15 men were detailed to keep the troops moving and to direct them to places at table. Following the completion of his meal each soldier gathered up his refuse and deposited it in garbage cans located on both sides adjacent to the mess kit washing stations in the after end of the mess compartment. Washing troughs, located on port and starboard sides, each contained two compartments,

one having hot soapy water, the other hot rinsing water. The water was kept constantly hot by means of steam plungers directed into the water. The men separately washed their mess kits in these troughs, then passed out at the after end of the mess hall, thence up to the passageway to the open deck. This plan worked very satisfactorily, and under favorable conditions 3,000 men were served in 1 hour and 30 minutes.

The washing of mess kits aboard troopships varied within wide limits, however, and though many had facilities similar to those described above they were not utilized to the same advantage. With the thought in mind of determining the influence of mess-kit washing on the acute infectious disease rate among certain overseas troops arriving at Newport News, Va., the surgeon of that port caused to be made an investigation of mess-washing conditions on a number of transports.⁹ It proved that on some transports excellent arrangements for mess-kit cleansing and disinfecting were provided. These consisted largely of stationary tubs which were provided with steam coils for heating the wash water. Another arrangement comprised troughs of water, into the bottoms of which live steam entered, thus providing water of a boiling temperature. Occasionally, however, it was found that the trough system was unsatisfactory in that the steam entered only at one end of the trough, thus creating a situation where the heated end of the trough would have boiling water, and at the opposite the water would be only warm. Here, the personal element largely entered into the problem; that is to say, though the facilities were adequately provided, it nevertheless remained in the hands of the troops en route as to whether or not proper use were made of them. As to the relative merits of scalding soapy water and warm soapy water, in the prevention of sputum-borne diseases by hand-to-mouth transference, opinions of investigators vary. Lynch and Cumming⁹ endeavored to show that when mess kits were not washed in scalding, soapy water the incidence of respiratory diseases on transports was three times higher than when mess kits were washed in scalding, soapy water. Subsequent investigations, however, tended to prove that, in so far as respiratory infections are concerned, it mattered little whether dishwater was warm or scalding, provided it was adequately soapy.¹⁰

Because of the quantity needed for the purpose, salt water necessarily was used for washing mess kits. Particularly was this true while the transports were at sea. The hygroscopic properties of magnesium chloride and other salts contained in sea water prevented the mess kits from drying thoroughly, thus keeping them sticky and promoting rust formation.⁵ When in port, fresh water was used, but then there was always the danger from use of contaminated harbor water before the salt-water connection was broken.⁵

FRESH WATER

For all troop needs, except bathing, fresh water in an amount of not less than five gallons per capita per day was supplied.⁵ This was stored in tanks, and when obtained from ashore it was chlorinated,¹¹ though some of the ships possessed distilling plants.

Fresh water for drinking purposes was provided in suitable scuttle butts^a in crew and troop spaces,⁴ in the proportion of 1 to every 100 men carried.⁵

^a Sanitary drinking fountains.

BATHING

Bathing, according to facilities, was to be enforced.⁴ The police officer was to draw up an assignment of hours for the organizations of the command on the transport.

Shower baths, varying in number according to the transport, were used; for example, on the U. S. S. *Agamemnon*, 47 shower heads were available for about 3,500 men, and on the U. S. S. *Alaskan*, 35 for about 2,100 men.⁵ Each man received from one to two baths during a transoceanic trip.

Salt water, of course, was supplied for the showers. Its temperature was regulated so as to have it sufficiently hot for the purpose. In summer, when sea water at ordinary temperature could be used with comfort, it was customary on some transports, the *Agamemnon*, for example, to select a space on the boat deck where, by means of a hose, large numbers of men could be bathed.⁵ This practice was especially desirable in view of the fact that in summer transports carried 50 per cent more men than their respective designated capacities, and the relatively few shower heads would have been hopelessly inadequate.

Liquid, salt-water soap was available in adequate quantity.⁵

In the wash rooms basins were provided in the number of 1 to each 15 troops.⁵ These were arranged in double rows on benches, to which faucets led, from which fresh water was drawn as needed.

LATRINES

In all types of transports, whether a converted passenger or cargo ship, the latrines had to be increased largely in number.⁵ In general, 22 inches of seating space were provided for each 30 men. The latrines consisted usually of semicircular troughs, with wooden seats, which on November 20, 1917, were directed to be made of hardwood.⁵ Some troughs were metal; others, porcelain lined. The porcelain-lined troughs were preferable in that they could be kept clean much more easily than could the metal troughs. Flushing was accomplished by the intermittent flushing system. This was satisfactory when the tanks were sufficiently large and the sanitary pump developed the necessary amount of force.⁵

HOSPITAL FACILITIES

In the conversion of the ships, early obtained, to transport purposes, adequate and appropriate space was not allotted to the medical department on certain of them.¹¹ Criticism, however, based on experience in actual service, resulted in the correction of many defects whenever the vessels were available for alteration without delaying sailing dates, or at the same time that repairs essential to buoyancy and propulsion were undertaken. The necessity for hospital space on transports varied, dependent upon whether or not the transport was outward or homeward bound; that is to say, when en route to Europe it carried, in theory at least, only well men who had been subjected to a rigid preembarkation physical inspection, and therefore its contingent sick would be expected to be not much over the same rate on land. On the other hand, the necessity arose for using transports for conveying sick and wounded from Europe to the United States. The efforts of the Medical Department of the

Army to secure ambulance ships—six at the minimum were requested—and again specific request for three definite ships to accommodate from 500 to 600 beds, were without effect, as all available vessels were assigned primarily to troop transport eastward.⁵ Under the circumstances the only solution to the problem was to use ships that carried troops eastbound for the return of our sick and wounded. And in so doing normal troop compartments inevitably were used for certain classes of sick and injured that otherwise would have been provided space in the ship's hospital proper.

The capacity of hospitals on transports varied widely, the minimum being found on some of the foreign chartered transports, as would naturally be expected in view of the fact that they were chartered for relatively short periods only. On the *Caronia*, for example, the troop capacity of which was 4,200, the hospital had 20 bunks,¹² or less than one-half of 1 per cent. On the other hand, the U. S. S. *Leviathan*, a converted passenger boat and controlled by the Navy, had 160 beds in its sick bay.⁵ Since it carried an average of 10,000 troops each trip,³ its ratio of beds for sick and its designated carrying capacity approximated $1\frac{1}{2}$ to 100. When the cargo ships were converted to troop transports, following the signing of the armistice, excellent sick bays were provided capable of caring for 2 per cent of the sick. This had been the accepted percentage for the prearmistice period,¹³ except during the early part of the year 1918, for which the surgeon, port of embarkation, Hoboken, N. J., had recommended that accommodations be provided for sick on each transport at the rate of 3 per cent of the command, such ratio to continue operative during the continuance of the then prevalent contagious diseases, and upon their cessation it was to be reduced to the normal 2 per cent. In view of the fact that nearly all illness occurring on transports among the troops who went overseas consisted of contagious diseases,¹³ the measuring stick for determining the adequacy of ship's hospitals was the incidence of such diseases. Of course, other considerations enter here, such as provisions for the prevention of contagious diseases on troopships by means of preembarkation detention and inspection, and the proper isolation of such diseases following their occurrence on troopships. The first consideration has been treated in Chapter XIX of this section; reference is made below to isolation facilities.

Despite the best practicable plans on the part of embarkation authorities to deliver to transports only men who were clean and free from disease, such an ideal could not always be accomplished; consequently, men in the period of incubation of some infectious disease, presenting no symptoms or, through zeal, minimizing and concealing first subjective signs of sickness, escaped preembarkation detection and got aboard only to start an epidemic in their organizations. Particularly was this true of diseases with short periods of incubation; for example, influenza. Under such circumstances, the hospitals of transports inevitably soon overflowed, necessitating the extemporaneous conversion of troop compartments to hospital purposes. The following instance, though an extreme one, shows the experience on the U. S. S. *Leviathan* on her eastward voyage at the height of the pandemic:⁵ When the *Leviathan* left her dock at

Hoboken, N. J., September 29, 1918, 260 officers and 8,873 enlisted men, comprising 10 different organizations, were aboard. Before the following morning all available beds in the sick bay were filled with sick, and by that night 700 cases of influenza had been identified. The number of cases for the voyage was 2,000, with 91 deaths. Of the 129,364 troops conveyed to Europe during the pandemic of influenza and up to December 11, 1918, 11,385, or 8.8 per cent, contracted influenza en route.⁵ Taking the experiences of the transports as a whole, however, it is seen that the incidence of disease among troops more nearly approximated the percentage of bunks in the sick bay; that is to say, the average percentage of sickness among troops on a number of transports was slightly less than $1\frac{1}{2}$.⁵

As to the location of the sick bay, wherever there was an adequate superstructure that was the place of election for the sick bay; as a matter of fact, it was situated in one of the upper 'tween-decks in the majority of instances.⁵ Its component parts comprised in general two main wards, medical and surgical; isolation wards, varying in number from two to three; an operating room, with the occasional addition of a room for pus cases; a dispensary; necessary instruments, apparatus, and equipment to permit the sick bay to function properly; toilets, and baths supplied with hot and cold running water. Bunks of the standee type usually were arranged in double tier.

The location and the number of the isolation wards were matters of importance: It was very desirable to have the isolation wards distinctly separate from the main part of the sick bay, and preferably on a deck above, as was the case on the U. S. S. *Leviathan*.⁵ Also, as was stated above, since nearly all illness occurring on troopships going abroad consisted of contagious diseases, it was necessary to have a sufficient number of isolation wards to care for the several kinds of contagious diseases likely to arise on transports.

MEDICAL DEPARTMENT ACTIVITIES ON TRANSPORTS

Earlier in this chapter mention was made of the general duties of a transport surgeon as distinguished from those of medical officers attached to troops on board, in conformity with transport regulations. It may be restated briefly that the medical personnel permanently assigned to a transport virtually operated as a hospital unit, and to the hospital, medical officers attached to troops on board transferred such sick as required bed treatment in hospital. This was true irrespective of whether the transport was controlled by the Army or Navy. Though on both Army and Navy transports the transport surgeon was held fully responsible for the sanitation of the ship,⁴ ¹¹ while a transport was conveying troops the enforcement of hygiene in such places as troop compartments, baths, and toilets was placed in the hands of medical officers accompanying troops, under the general direction of the senior of such medical officers.

The following instructions issued by the surgeon, port of embarkation, Hoboken, N. J., on March 8, 1918, indicate the conduct of the surgeon of troops on the various kinds of transports used by us:

OFFICE OF THE SURGEON, PORT OF EMBARKATION,
Hoboken, N. J., March 8, 1918.

INSTRUCTIONS TO SURGEONS OF UNITED STATES TROOPS ON TRANSPORTS

1. The surgeon, United States troops, will detail a medical officer to act as sanitary inspector, and the sanitary regulations for transports will be observed.
2. The surgeon, United States troops, will assign medical officers to hold sick call for each organization, twice daily, at the sounding of sick call.
3. The sanitary inspector immediately upon embarking will superintend the sanitation of latrines, urinals, and the swabbing of the several decks. He will be held responsible for the sanitation of all troop quarters.
4. There will be a medical officer of the day throughout the voyage who will answer all sick calls. His station will be at the dispensary during his tour of duty.
5. Hospital Corps men will be detailed to the dispensary as assistants. A litter will be kept at the dispensary, and when a soldier is sick in quarters and unable to walk he will be brought to the sick bay for examination and transfer.
6. A Hospital Corps man, familiar with the paper work of the Medical Department will be detailed by the surgeon, United States troops, to the office of the hospital on United States naval transports.
7. On naval transports, the surgeon, United States troops, will submit to the senior naval medical officer, as soon as possible after arrival on board, a complete roster of his organization; e. g., medical officer, members of Army Hospital Corps, and in the case of base hospitals, the female Nurse Corps and civilians.
8. On United States Army transports and United States naval transports, the dispensary will fill all prescriptions for sick on board. On commercial transports, the expendable medical units supplied to organizations will be used exclusively. Vaccines and sera for Army use will be furnished by ship surgeon who has same in his charge.
9. When a patient is transferred to the care of the medical officer of a transport for hospital treatment, the following-named papers in proper form must accompany him: Form 52, M. D. U. S. A. (duplicate); diagnosis and transfer ship (one copy) (for Navy only); service record.
10. The Army medical officer will see that effects of patients are attended to by patients company commanders. Each patient's life preserver must be sent to the ship's hospital with him.
11. Company commanders will be notified when a man has been admitted to the ship's hospital and that his service record, properly indorsed, should be transferred to the custody of the ship's medical officer.
12. Except in cases of actual emergency, patients will not be admitted to the ship's hospital until the above instructions have been complied with.
13. On commercial transports no responsibility for the care of troops rests on the ship surgeon. All medical supply in his care is expendable. Sick in hospital will be treated by Army medical officers only.
14. The foregoing instructions have been approved by the commander, cruiser force for United States naval transports, subject, however, to modification and instructions that may be given by the commanding officer of the ship. Immediately upon reporting on a naval transport the senior surgeon with troops will communicate with the senior medical officer of the transport and arrange with him as to the performance of medical and sanitary activities on board ship.

J. H. KENNEDY,
Colonel, Medical Corps, Surgeon.

Since on transports influenza was encountered to a greater extent than any of the other communicable diseases, a general description of the methods adopted to combat it among troops on transports will include practically all the measures for the prevention of communicable diseases in general. In thus reviewing these measures it is thought better, in the interests of completeness, to begin with the troops in the ports of embarkation.

When a body of troops reached one or the other of the embarkation camps at the port of embarkation, Hoboken, N. J., it was placed immediately in quarantine.⁶ A daily examination of the men was made and, in the event one was found suffering from influenza, he was sent immediately to hospital, and all immediate contacts were sent to the detention camp. The men in detention camp were examined and their air passages sprayed daily with an antiseptic solution. The physical examination of all troops included a daily taking of their temperatures; any man found with a temperature above normal was sent to hospital. Upon the receipt of orders for embarkation, no troops were permitted to proceed among whom there was an increasing incidence of influenza or a marked prevalence of the disease. Upon arrival at the piers the men were paraded preparatory to moving to the ship, a continuous examination of them being made by a medical officer who passed from one end to the other of the line of troops. Any man suspected of being sick, or who even appeared fatigued, was removed from the line and sent to hospital. This examination continued daily until the transport concerned left its dock. Even then, harbor boats, under control of the Medical Department, were kept within call until the transport passed out of the bay, so that in case of the occurrence of influenza in the meantime, patient and immediate contacts could be removed immediately from the boat.

Current instructions concerning the control of communicable diseases on land were applicable, in so far as they could be made so, on transports. The principle of these included the searching out of the sick, isolation of patients and immediate contacts, the use of masks in the respiratory communicable diseases. As to detection on the voyage, a formal daily inspection of the troop spaces was the rule in compliance with transport regulations, the captain or the executive officer of the ship being accompanied by the ship's surgeon, the commanding officer of troops, the senior medical officer on duty with troops, and others. Sick call was held twice daily in conformity with the instructions for surgeons, United States troops, quoted above. In addition, physical inspection of all the troops was made twice daily to detect sick men who otherwise would not be reported. Generally speaking, the isolation of a moderate number of cases of infectious diseases was provided for on the transports, as indicated above in the description of ship's hospitals. The control of such cases could therefore be effected, though not without great strain,⁵ except when their numbers were large such as during the influenza epidemic. The isolation of immediate contacts, however, was an entirely different matter. The interpretation of the War Department, in reference to who were to be considered contacts, was that all persons in the same room or car with the patient at the time of the appearance of the communicable disease were to be so considered.⁷ In the application of this principle on transports there was nothing to do except to remove the patient to hospital and then place under quarantine the compartment or room of the vessel from which taken.

General preventive measures included requiring all troops to sleep arranged alternately in the head-to-foot manner, and daily spraying of troop decks with an antiseptic solution. The lavish use of disinfectants about the decks was deprecated by the Surgeon General of the Navy,⁵ except when they were used merely to reinforce the ordinary means of insuring cleanliness.

Complete fumigation of ships was to be accomplished by the formaldehyde process, whenever practicable on the completion of a trip and when a transport was lying at the Hoboken docks in company with other transports.⁵

In December, 1918, a special order was promulgated to the Cruiser and Transport Service of the Navy, concerning precautions to be taken on transports against typhus fever, as follows:⁵

In order to prevent the introduction of louse-borne disease into the United States and to conform to the practice of other services returning troops, the following instructions are published for guidance:

A vermin inspection will be made by medical officers of all personnel on board as soon as possible after departure from European port. The inspection will include a thorough examination of the seams of clothing worn. The vermin inspection will be made by medical officers under the supervision of the senior medical officer in charge.

All troops will be directed to examine their clothing daily for lice. A period of 15 minutes will be set aside daily for such an examination. This examination will be under the supervision of a medical officer. All vermin infestation will be reported to him.

After a period of six days following embarkation, another vermin inspection of all personnel on board will be made by medical officers.

Should a transport carry male civilian passengers, the same procedure will be carried out with them as for troops. Female passengers will be instructed to examine their clothing daily and promptly report any vermin infestation to a medical officer.

All cases of head lice will be treated by cropping the hair of the head with hair clipper, followed by a bath.

Pubic lice will be treated by shaving followed by a bath.

Clothes lice will be treated by cropping the hair of the head, axillary and pubic regions with a hair clipper, followed by a bath. In all instances a bath will consist of washing with warm water and using soap made as follows:

Boil 1 part of soap chips in 4 parts of water and add 2 parts of kerosene oil or 4 parts of gasoline. This jellies when cold. One part of this soap jelly is added to 4 parts of warm water.

Where clothes lice or "cooties" are found, all clothing will be sterilized. When transports are provided with sterilizers, all clothing will be sterilized by exposure to steam for 30 minutes, followed by 10 minutes vacuum. When no sterilizers are provided, the clothing will be placed in a "hot box" or drying room at 150° F., and exposed 20 minutes. In no instance should leather material such as shoes, puttees, or hats, rubber, celluloid, or money be sterilized. If shrinkage of wool material occurs, the sterilizer is not being properly used. The steam should be superheated and under pressure of 15 pounds per square inch.

The medical officer will examine the sleeping quarters each day for vermin, paying particular attention to the cots and blankets.

On arrival in the United States the senior naval medical officer will furnish in writing to the medical debarkation officer who boards the ship at quarantine: (a) The dates that vermin inspections were made of personnel aboard ship. (b) Whether daily vermin inspections were made by troops. (c) The strength of the command by organizations, the number of cases of head lice, body lice, and pubic lice found in each organization and description of treatment employed. (d) Whether lice were found on examination of cots or blankets.

All transports will be disinfected on the return voyage by washing and spraying the sleeping quarters with chlorinated lime or cresol.

In order that these orders may be carried out, it is necessary that provisions be made for hair clipping, shaving, and bathing. Also that one or two hot boxes be provided for those transports that have no sterilizers.

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CHAPTER XIX

PHYSICAL EXAMINATIONS ON ENTERING SERVICE

It is not necessary to point out that the physical material which goes to make up an army has an important bearing on its military efficiency. This has been recognized for centuries. The economic importance, however, of at once selecting physically fit material has never been given due weight.

The ultimate selection of physically fit material for the Army devolves upon the Medical Department, and, as a matter of fact, constitutes one of its most important duties.¹ The subject in question can be discussed properly here only in its medical aspects and in its military aspects from the medical standpoint. Yet important questions of policy were also involved in securing men for the World War Army, and these should also be taken into account. Contrary to the case in most of our previous wars, service in the World War was for the period of the war and not for a limited number of days or months.²

PHYSICAL STANDARDS FOR OFFICERS

Physically unfit officers had been generally weeded out of the Regular Army and the National Guard before the World War.

During the World War, the physical standards were essentially the same for all officers, with the exception of fliers, for whom they were especially high as well as unique in certain particulars. They may be studied in connection with the subject of aviation and will not be discussed here. Speaking of officers generally, not including aviators, the standards for physical examination were lowered somewhat during the war as compared with peace standards, particularly for certain older candidates for commissions who possessed notable special qualifications. That war standards were not generally up to peace standards is proved by the fact that many candidates for commissions who had served as officers during the war were physically rejected for the Regular Army after the war was over and peace standards had been reestablished. Yet, as previously asserted, the physical standards for the majority of officers during the war were the same, and were based on those for enlistment in the Regular Army with, as it proved, a rather wide latitude so far as minor defects held disqualifying for the peace army were concerned, but which at the same time were not considered to constitute a serious interference with the performance of all duties in war.

No records are available to show the percentage of officer candidates physically rejected during the war or the defects in those accepted which finally resulted in separations from the military service on account of physical disability.

PHYSICAL STANDARDS FOR ENLISTED MEN

Physical standards for men during the war were on quite a different basis. For the greater part of the war there was one standard for voluntary enlistment and another for the larger selective service group.³ As will be seen later, the

latter, generally speaking, were lower than the former. Furthermore, considerable changes were effected in the physical standards for this group as the war continued.

The year 1918 had seen the end of the war, but in 1919 a new peace army (Regular) was again in process of creation. New physical standards obtained for this new Regular Army as compared with the one before. In the interests of completeness these will be discussed here, as well as those for the Army which actually fought the war.

VOLUNTARY ENLISTMENTS

During certain parts of the World War, as will be seen in the following pages, voluntary service prevailed in the Regular Army, the National Guard, the Enlisted Reserve Corps, and in small part in the National Army.

REGULAR ARMY

In considering the Regular Army as constituted during the World War, it is not necessary in the present connection to go back of its reorganization as provided for by the so-called National Defense Act. This act of Congress was approved by the President on June 3, 1916. It authorized an army composed of certain specified units, the peace quota of each unit being prescribed by law, with the provision that the President in his discretion might, in the event of emergency, increase the strength so allotted by certain designated numbers. It was also provided that the total enlisted force of the line of the Regular Army, excluding the Philippine Scouts and the enlisted men of the Quartermaster Corps, of the Medical Department, and of the Signal Corps and the unassigned recruits, should not any any time, except in the event of actual or threatened war or similar emergency in which the public safety demands it, exceed 175,000 men.

This act further directed that enlistments should be for a period of 7 years, 3 in active service and 4 in the Enlisted Reserve Corps. Also provision was made that certain qualified men, after one year's service, might be transferred to the reserve. A previous act of Congress had also provided for an Enlisted Reserve Corps, and at the beginning of the World War a small number of men were already in this corps, all of whom, immediately after the declaration of war, were recalled to the colors, the Regular Army thus then comprising some such reservists as well as the men serving under the colors at the time.

The act of June 3, 1918, in addition, provided that no person under 18 years of age be enlisted without the consent of parents or guardians. The War Department, in Circular No. 2, November 1, 1916, had placed the maximum age for enlistment at 35 years. Until May, 1917, the ages between which men could be enlisted on their own volition were 18 and 35 years, while for those under 18 the consent of parent or guardian was required.

An act of Congress, approved May 18, 1917, authorized the President to increase all organizations of the Regular Army to the maximum enlisted strength provided for by the National Defense Act of June 3, 1916. This act also permitted the President to raise by voluntary enlistment additional organizations for the Army. It was under the provisions of the act of May 18, 1917, that the

enlistment of men was continued after the authorized strength of the Regular Army, as provided by the national defense act, had been reached. The maximum age for voluntary enlistment was increased from 35 to 40 years by this legislation. When it became apparent during the month of March, 1917, that this country must enter the Great War which was being fought abroad, there was a considerable increase in the number of men applying for enlistment in the Regular Army. Now men from all walks of life sought immediate entrance into the military service. The average number of enlistments monthly from July 1, 1915, to February 28, 1917, had been 2,864, while during March, 1917, 6,374 men were enlisted in the Regular Army.⁴ Upon the declaration of war with Germany on April 6, 1917, there came a second marked increase in the rush of citizens to serve the country voluntarily as soldiers. During the months of April, May, and June, 1917, a total of 100,052 men enlisted in the regular Army.⁴

During the first months of the war enlistment in the Army, Navy, and Marine Corps was freely open to any registrant (draft) upon presentation to a recruiting officer of a certificate by his local board to the effect that his class and order numbers were so low that he was not within the current quota of his local board.⁵ As a matter of fact, the Selective Service Regulations (Form 999, P. M. G. O.) issued on November 8, 1917, provided that the voluntary enlistment in the Regular Army of anyone who had registered would be permitted until December 15, 1917. During the last few days in which the enlistment of registered men was so authorized there was a great rush at all of the recruit depots and many thousands were accepted for the Regular Army. After this date registrants (draft) were not accepted for enlistment in the Army, but recruiting was continued actively until August 9, 1918, for men above and below the registration ages, particularly with a view to securing the large number of specialists in the different vocations needed by the newly formed special and technical units. During the period from July 1, 1917, to April 30, 1918, 230,059 men were actually enlisted for the Regular Army, and in May and June of that year there were 53,377 enlistments for the Regular Army, National Guard, National Army, and Enlisted Reserve Corps.⁶ No special campaign for voluntary enlistments was conducted by the Army at this time, but from a force of 127,151 on the 1st of April, 1917, the Regular Army increased to a strength of 355,685 enlisted men by the end of December, 1917, when enlistment of men of draft age was discontinued.⁷ Under the provisions of General Orders, No. 73, War Department, August 7, 1918, all the land forces of the United States, however raised, were merged into one Army—the United States Army. Thereafter, until demobilization of the temporary forces, the Regular Army as such did not exist. During the entire period of the war there were enlisted for the Regular Army 408,313.⁸ The total number of men, therefore, who served the country during the war through voluntary enlistment in the Regular Army was about 530,110.⁸

NATIONAL GUARD

In addition to those who enlisted in the Regular Army, many voluntarily joined the National Guard, also a purely volunteer force, which eventually

was mobilized at various camps throughout the country. Enlistments for the National Guard were conducted with the same standard of physical requirements as that pertaining to the Regular Army. This standard also applied to the guard as a whole, for it was reexamined on entrance into the Federal service. Acceptance of men for these organizations ceased on December 15, 1917, except as indicated in preceding paragraphs. According to the Provost Marshal General, 461,000⁷ men saw service in the National Guard during the war through voluntary enlistment.

NATIONAL ARMY AND ENLISTED RESERVE CORPS

Over and above those who voluntarily joined the Regular Army and the National Guard, a large number of men were enlisted directly for the National Army and for the Enlisted Reserve Corps.⁷ Many of these were individuals who desired to serve in the organizations composed of quotas from their homes. Others were students in technical schools who, by enlisting in the Reserve Corps, were permitted to complete their courses, with a view to possible commission at a later date. The number of men who enlisted in this manner is placed by the Provost Marshal General at 189,606.⁷

All together, approximately 1,100,000 men served in the United States Army during the World War by reason of voluntary enlistment. This represents about 28 per cent of all those who served with the colors.

No figures are available to show the number of men who attempted to enlist during the war; in consequence, no rejection percentages can be worked out for comparison with peace figures.

PROVISIONS FOR MAKING PHYSICAL EXAMINATIONS

So far as the Regular Army was concerned, before the war the country had been divided into recruiting districts.⁹ General recruiting stations were operated in the cities designated as the headquarters of these districts, with various substations in the other principal cities and in the towns of the district. All general recruiting stations were commanded by officers of the line of the Army, or at all events by officers not doing professional physical examining of recruits. These officers, or their assistants, however, made a preliminary physical examination of all candidates for enlistment. All accepted candidates were then sent to designated recruit depots or, much less commonly, to other military stations for final physical examination by medical officers, this resulting in enlistment or rejection of the applicant. In addition, reenlistments were generally made at military stations by medical officers acting as recruiting officers, as well as some enlistments. Recruit depots had medical boards, but while something was done in the direction of dividing physical examinations among specialists at depots, at this time the Regular Army did not afford sufficient experts for the purpose. This does not mean, however, that recruits were not well examined. The contrary was actually the case. Like methods were followed in recruiting the new Regular Army in 1919.

The Adjutant General's Annual Reports for 1909 to 1915, inclusive, show that 83 per cent of all applicants for enlistment at general military stations were rejected by the line officers in charge. No records of the causes for

rejection were kept. During this same period 15.71 per cent of applicants were rejected at recruit depots and 11.8 per cent on medical examination at stations other than recruit depots.

No particular changes in methods for the physical examinations of recruits for the Regular Army were made at once with the World War, though in many instances the two examinations practically merged into one—the professional. In the hurry at the beginning of the war to enlist these, our first forces, it was not possible generally to select specialists for different phases of the physical examination. Later, more was accomplished in this direction and, as shown elsewhere, with the recruitment of the new Regular Army after the war, carefully constituted physical examining boards being in existence with all the specialties represented, physical examinations were then made practically universally by specialists.

At the larger recruit depots, which in normal times handled from 30 to 50 applicants for enlistment a day, with the war, over 1,000 men in the 24 hours often were received and examined. The work of making the physical examinations required many additional medical officers, and early in April, 1917, many members of the Medical Reserve Corps were assigned to active duty and ordered to the recruit depots. The space required for the physical examination had to be greatly increased by securing additional quarters and sometimes by the construction of temporary buildings. The examining pavilion built at Jefferson Barracks, Mo., was particularly notable in this respect.^a

National Guard organizations were brought up to strength very largely by local volunteers. Generally speaking, as these examinations were not so concentrated either in point of place or of time, not so much difficulty was encountered here in making the necessary physical examinations. Specialists were not commonly available, but on the whole the physical examinations were well made.

National Army and Enlisted Reserve Corps physical examinations were made in many different ways, depending on the particular circumstances, but generally speaking the standards of the Regular Army were maintained.

No data are available to show the merits or demerits of the physical examination system followed for volunteers as compared with that for selective service men. It had been the general opinion before the war that our Regular Army was exceptionally good physically, and that if the National Guard, through force of circumstances, hardly measured up to its physical standard, yet, on the other hand, notable improvements were occurring here year by year, and that on the whole, immediately before the war, few physically unfit men were being accepted.

A reexamination of Regulars and some National Guard in the summer of 1917 unfortunately did not wholly confirm the view in reference to there being only a small percentage of physically unfit in the old Army. As a matter of fact, this reexamination revealed a fairly high percentage of soldiers with disabilities necessitating discharge. Presumably a large proportion of them were old reenlisted men, not vigorous enough for field service, or individuals who had contracted disabilities since enlistment.

^a For details, see next chapter.

PHYSICAL STANDARDS FOR VOLUNTEERS

WAR STANDARDS

These were all based on those for the Regular Army. General Orders, No. 66, War Department, April 18, 1910 (basic), together with Circular No. 2, War Department, November 1, 1916 (height and weight more specific), and Circular No. 26, War Department, May 18, 1909 (old vision standard still maintained when G. O. No. 66 was issued), promulgated the physical standards for enlistment in the Regular Army which were in effect at the outbreak of the war, and which continued in force for voluntary enlistment until June 5, 1918, when Special Regulations, No. 65^b were issued. Routine voluntary enlistments for the volunteer forces, however, were suspended in December, 1917. The minimum standards for general acceptance as regards applicants 21 years of age and over were as follows: Height, 64 inches; weight, 128 pounds, 120 in special cases; chest measurement at expiration, 30 inches; mobility, 2 inches; vision, minimum, 20/40 for the right eye and 20/100 for the left eye (except for certain staff corps), provided that no organic disease existed in either eye. The same standards applied below the age of 21 save that height and weight were lower.

Special Regulations, No. 65, mentioned above, applied to the Army as it then existed as a whole. This regulation will therefore be discussed more in detail in the next chapter.

POST-WAR STANDARDS

The signing of the armistice was followed by the rapid discharge of drafted forces and those enlisted for the emergency only. Yet, as an aftermath of the war considerable bodies of regular troops were maintained in Germany and in Siberia. To provide these troops, as well as to maintain the regular establishment at its required strength for home duty and for service in tropical possessions, it became necessary to recruit practically a new army. In a sense this procedure was essentially part of the World War. At all events the influence of wartime physical standards was so marked in its recruiting that brief consideration is merited here.

Enlistments for the Regular Army were resumed in March, 1919, and continued thereafter.

The physical standards were prescribed by Special Regulations, No. 65, originally issued June 5, 1918, reissued somewhat changed November 8, 1918, and modified by letter of instructions from The Adjutant General March 6, 1919, which is given in full below. Standards that applied immediately after the war were written in technical language, intended for use of medical officers only. Realizing the difficulty under which line recruiting officers were laboring in making physical examinations with such a technical standard as a guide, the Surgeon General prepared a set of instructions for the guidance of line officers regarding the physical examination of applicants for enlistment.³ These instructions were written in plain, nontechnical language, and not only described the method of making a physical examination, but listed all causes for rejection which a line officer could reasonably be expected to detect. They were issued

^bSee Vol. I, Appendix, 701 et seq.

by The Adjutant General's Office on December 26, 1919, as a supplement to Special Regulations, No. 65. In consequence their use was subsequent to the period covered by this history (ending December 31, 1919).

As illiteracy was not a bar to enlistment, it became necessary to devise some method whereby line recruiting officers could form an estimate of the mental caliber of illiterate and non-English speaking applicants for enlistment. Hence, upon request of The Adjutant General the section of psychology in the Surgeon General's Office prepared a test known as the "Recruit psychological examination," which was printed and distributed for use at all general recruiting stations in the United States.¹⁰ As no data are available regarding the results obtained during the period covered by the history, nothing further will be said in regard to the test in question.

The basic standards of physical examination governing entrance into the Army subsequent to the signing of the armistice were contained, then, in Special Regulations, No. 65, November 8, 1918, and Special Regulations, No. 65, was a duplicate of Form 75, P. M. G. O., June 5, 1918, which is sufficiently discussed in Chapter XX. But upon the resumption of voluntary enlistments in March, 1919, the Surgeon General recommended certain alterations in the standards set forth in Special Regulations, No. 65, these being necessary to make the regulations applicable to the conditions of voluntary enlistment as distinguished from the conscription plan for which they originally had been prepared. The changes were published as a supplement to Special Regulations, No. 65, in the form of a letter, as follows:

THE ADJUTANT GENERAL'S OFFICE,
Washington, March 6, 1919.

To all department commanders, division and camp commanders, chiefs of bureaus, commanders of independent units, all officers of the general recruiting service, and the commanding general American Expeditionary Forces.

1. Special Regulations, No. 65, W. D., revised November 8, 1918, will govern the determination of physical standards for acceptance for voluntary enlistment (see pars. 3 and 4) with the exceptions hereinafter noted. In the absence of the draft machinery the burden of the local board examination, prescribed in S. R. No. 65, revised, paragraph 5, falls upon the local recruiting officer.

2. All registrants examined under the draft laws were classified into four groups, A, B, C, and D. Groups B and C consisted of remediable and special and limited service cases, but in the present application to voluntary enlistment all such cases being in the same class as Group D, i. e., to be rejected as unfit for service. (See par. 4, Special Regulations, 65, revised).^c On a basis of this interpretation of these standards, all cases coming under the classification included in the following paragraphs shall be considered as unfit for military service: Paragraphs 14, 26, 31, 35, 38, 41, 44, 48, 53, 54, 60, 65, 66, 74, 78, 79, 83, 84, 105, 115, 128.

3. Examination for malingering pertaining to visual and auditory defects (pars. 16 to 29) are of minor importance for the present purpose. With voluntary enlistment the question of malingering rarely arises. On the other hand, care must be taken to prevent the acceptance of men who have defects which they are trying to conceal. This is particularly important in excluding epileptics, drug addicts, insane, bed wetters, and those with defective vision and hearing.

4. The sections, paragraphs, and subparagraphs of S. R. No. 65,^c revised, which apply to men for unconditional acceptance (Group A) are modified to read as follows:

Section V, paragraph 30, subparagraph B. Acute primary sinusitis is cause for rejection. Subparagraph i. Aphonia is cause for rejection.

^cSee Vol. I, Appendix 701 et seq.

Section VII, paragraph 37, subparagraph c. Cases of pediculosis may be accepted for immediate service provided the means are at hand for immediate delousing. Secondary syphilitic lesions of the skin are cause for rejection. Ringworm, unless slight, is cause for rejection.

Section IX, paragraph 43, subparagraph c. Fracture of the coccyx, if accompanied by pain and tenderness, is cause for rejection. Paragraph 47, subparagraph b. Disease of the sacro-iliac joints is cause for rejection.

Section XIII, paragraph 64, subparagraph c. Scar pain, if severe, is cause for rejection.

Section XVII, paragraph 104, subparagraph e. Hay fever is cause for rejection. Subparagraph d. Acute bronchitis is cause for rejection. Subparagraph g. Acute pleurisy with effusion is cause for rejection. subparagraph h. Fracture of rib or ribs is cause for rejection. Subparagraph k. Syphilitic periostitis of rib or ribs, sternum, or clavicle is cause for rejection.

Section XIX, paragraph 127, subparagraph a. Infection with the plasmodium of malaria is cause for rejection.

Section XVI, paragraph 82, subparagraph c. Hysterical paralysis or muscular spasm is cause for rejection.

5. Section XV, paragraph 77, is revoked in so far as it applies to voluntary enlistments, and the following is substituted therefore:

Applicants for enlistment who are found on examination to present the following conditions, shall be rejected.

(a) Gonococcus infections, acute or chronic, including gonorrhoeal rheumatism.

(b) Syphilis when demonstrable by history or physical examination (not to include Wassermann test).

(c) Chaneroids.

(d) Buboos.

(e) Absence of both testicles due to removal or atrophy.

(f) Acute cystitis.

(g) Varicocele, if large and painful.

(h) Hydrocele, if large.

(i) Undescended testicle, if lying in the inguinal canal.

(j) Amputation of penis if such as to interfere with micturition.

6. Section XVI, paragraph 38, is revoked in so far as it applies to voluntary enlistments.

Section XIII, paragraph 64, subparagraph e, is revoked, in so far as it applies to voluntary enlistments.

7. In the event that the applicant presents temporary or remediable defects, which may reasonably be expected to be curable in a short period or by an operation, he should be informed that he may present himself to the recruiting officer at a later date for reconsideration of his case after cure has been effected. Accepted applicants received at recruiting depots, recruit depot posts, or other designated stations for enlistment who are found to have temporary illnesses or minor defects remediable by operations which the applicants desire to have performed may, in the discretion of the commanding officer, be held for necessary treatment with a view to subsequent enlistment if the disqualification is removed.

8. In the blank space at the bottom of page 3 of service records for each soldier enlisted under new enlistment law, notation will be made to show whether soldier enlisted for one year or three years.

9. Department commanders will publish these instructions to all concerned under their jurisdiction.

By order of the Secretary of War:

R. J. HERMAN, *Adjutant General.*

Subparagraph e, paragraph 85, Special Regulations, No. 65, classifies the moron state as a cause for rejection, while paragraph 89 defines a moron as an individual whose mental development is that of a child not over 8 years of age as measured by the Binet-Simon test. It will be seen that, according to this ruling, any applicant demonstrating a mental age of over 8 years was

regarded as mentally suitable for military service. Since this assumption was obviously not true in many cases, upon the recommendation of the Surgeon General the following amendment to Special Regulations, No. 65, was issued:

WAR DEPARTMENT,
THE ADJUTANT GENERAL'S OFFICE,
Washington, January 19, 1920.

To all bureau chiefs, all department commanders, commanding general, American forces in Germany, and commanding officers of excepted places, including all offices of the general recruiting service.

1. Special Regulations, No. 65, War Department (standards of physical examination), revised November 8, 1918, and modified March 6, 1919, by letter A. G. O., No. 341.41, will govern the determination of physical standards of acceptance for voluntary enlistments with the following exceptions:

Section XVI, paragraph 85, subparagraph e, delete the words "(see paragraph 89)."

Section XVI, paragraph 89, entire paragraph revoked.

2. The question as to whether or not an applicant is of a suitable mental age for enlistment will be left to the judgment of the individual medical examiner.

3. Department commanders will publish these instructions to all concerned under their jurisdiction.

By order of the Secretary of War:

(Signed) W. V. CARTER, *Adjutant General.*

It will be noted that the modifications of Special Regulations, No. 65, place all applicants for enlistment in two classes: first, those conforming to the standards for general military service; and, second, those to be rejected as unfit for military service. The Groups B and C (selective service), which consisted of remediable and special and limited service cases,¹¹ were all now classed as unfit for the regular service. Venereal diseases constituted a cause for rejection.

Comparison of the new physical standards with those of pre-war times shows a decided change downward.³ There was a lowering in the requirements for height, weight, and chest measurements, and for vision and hearing. The minimum weight before the war for men over 21 years of age was 128 pounds, except in the case of specially active and vigorous candidates, when it might be reduced to 120 pounds; it was now 110 pounds. The minimum height for applicants over 18 years old had been reduced from 64 to 60 inches. Chest circumference had been lowered from 32 inches to 31 inches, except in special cases. The former minimum visual requirements for the line of the Army and Signal Corps were 20/40 for the right eye and 20/100 for the left eye, without glasses; now they were, for any branch of the service, 20/40 in one and 20/100 in the other eye, without glasses, or 20/100 in each eye if correctable with glasses to 20/40 in either eye. Auditory acuity of 20/20 in each ear was formerly required; the standard was now reduced to 10/20.

Dental requirements were now somewhat higher than formerly. The minimum requirements were six masticating (molar and bicuspid) and six incisor (incisor and cuspid) teeth, so opposed as to serve the purposes of incision and mastication. Formerly the requirements were four serviceable double (bicuspid or molar) teeth, two above and two below, so opposed as to serve the purposes of mastication. However, teeth restored by crowns or dummies attached to fixed bridgework were now considered as serviceable teeth, which was not the practice before the World War.

POST-WAR SPECIALIZATION BY PHYSICAL EXAMINERS

As recruiting for the new Regular Army commenced during the active period of demobilization, as stated elsewhere, it was possible in the camps for the boards of specialists engaged in demobilization to make the physical examinations for enlistment. As the medical personnel of recruit depots was also engaged in demobilization examinations prior to resumption of recruiting, the examining boards at these depots were in like manner utilized in testing applicants for enlistment. Hence, we find that in most instances recruits were now examined by a number of medical officers, this practice conforming to the principles in force at recruit depots during the 10 years preceding the World War, though specialization was now carried out to a much greater degree than was the pre-war custom. This is considered to have been an improvement over an examination by a single medical officer, such as was usually made for enlistment before the war at all stations except recruit depots. Upon the recommendation of the Surgeon General, the following instructions were issued; they were strictly complied with wherever personnel and facilities permitted:

Circular No. 435.

WAR DEPARTMENT,
Washington, September 23, 1919.

PHYSICAL EXAMINATION OF APPLICANTS FOR ENLISTMENT

In connection with Circular No. 118, War Department, 1919, the following instructions relative to the physical examination of applicants for enlistment are published for the information and guidance of all concerned:

The physical examination of all applicants for enlistment in the Regular Army will be made, as far as practicable, by well-balanced groups of medical officers, consisting of a number of specialists, when available, instead of having the entire examination made by one medical officer.

It is recognized that it will be impracticable in many posts and camps, owing to the present shortage of medical officers, to provide an examining group in which *all* special branches of medicine are represented, and that at certain isolated posts and stations the entire physical examination must be made by one medical officer. It is desired, however, that the "group" scheme of examination be followed so far as local conditions permit. If fully qualified specialists are not available, medical officers present best qualified in the requisite specialties should be assigned to this duty. It is thought that at the larger camps and posts it will be possible to organize an examining group somewhat as follows:

- One general examiner, including surgery, orthopedic, skin, hernia, venereal, diseases etc.
- One internist (tuberculosis, cardiovascular, etc.).
- One eye, ear, nose, and throat examiner.
- One dental examiner.

Also, when available a neuropsychiatric examiner should be included in the group. When not available, his part of the examination should be conducted by one of the other examiners.

Medical officers selected as members of an examining group, as above outlined, should act as examiners in addition to other routine duties in which they may be assigned. In all posts and camps, excepting demobilization centers, physical examinations should ordinarily be made at the hospital, where the necessary facilities exist for conducting the most thorough examinations and where specialists may be available for this work without interfering with their other duties.

(342.15, A. G. O.)

By order of the Secretary of War:

Official:
P. C. HARRIS,
The Adjutant General.

PEYTON C. MARCH,
General, Chief of Staff.

On resumption of voluntary enlistments the following military stations functioned as recruit depots: Fort Slocum, N. Y.; Jefferson Barracks, Mo.; Columbus Barracks, Ohio; Fort Thomas, Ky.; Fort Logan, Colo.; and Fort McDowell, Calif.³ These are the stations which were used for the same purpose before the war. Camp Travis, Tex., and Fort Oglethorpe, Ga., were designated as recruit depot posts. Fifty-six thousand eight hundred and sixty-eight applicants for enlistment were examined at recruit depots from March 1, 1919, to December 31, 1919. Of this number, 43,234, or 76 per cent, were passed through the three principal depots, namely, Fort Slocum, N. Y.; Jefferson Barracks, Mo., and Columbus Barracks, Ohio.¹² At each of these three large stations a full board of specialists was maintained at all times. Efforts were made to keep a full board at the smaller depots and the depot posts, but this was not always practicable; however, a group consisting of an internist, an officer experienced in eye, ear, nose, and throat work, a psychiatrist, a dentist, and a general examiner were on duty at each recruit depot during practically the entire period to December 31, 1919. It was not possible to secure sufficient cardiovascular and lung specialists to supply all depots.

The following table is given as an illustration of the work at each recruit depot from March 1, 1919, to December 31, 1919. The recruit depot posts Camp Travis and Fort Oglethorpe are omitted:¹³

	Number examined	Number accepted	Number rejected	Percentage rejected
Fort Slocum.....	18,687	12,841	4,611	24.6
Jefferson Barracks.....	12,610	11,208	1,412	11.1
Columbus Barracks.....	11,937	9,012	1,574	13.1
Fort McDowell.....	5,526	4,363	958	17.3
Fort Logan.....	4,638	3,854	619	13.3
Fort Thomas.....	3,470	2,841	609	17.5
	56,868	44,119	9,783	17.2

It will be noted that a wide variance exists in the percentage of rejections at the individual depots; especially is this marked in the case of the three principal ones, Fort Slocum, Jefferson Barracks, and Columbus Barracks. It is difficult to offer a thoroughly satisfactory explanation. It is thought to have been in part due to the difference in the general physical make-up of the applicants, the ones received at Fort Slocum being inferior to those at Jefferson Barracks and Columbus Barracks; in still larger part that it should be ascribed to the difference in the physical examinations given at the three stations.³ The greatest number of rejections at Fort Slocum were for neuropsychiatric conditions.³

A summary of the various causes for rejection at the recruit depots during the same period, based upon a total of 65,868 examinations, is here given:^{12,13}

Condition	Number rejected	Percentage rejected	Condition	Number rejected	Percentage rejected
Neuropsychiatric.....	2,199	3.8	Ophthalmological.....	431	0.7
Cardiovascular.....	1,076	1.8	Dental.....	243	.4
Otolaryngological.....	880	1.5	Developmental.....	249	.4
Veneral.....	639	1.1	Miscellaneous physical causes.....	513	.9
Tuberculosis.....	611	1	Under age.....	463	.8
General surgical and skin.....	516	.9	Causes other than physical.....	1,504	2.6
Orthopedic.....	473	.8			

It will be noted that the percentage of rejections for ophthalmological and for developmental conditions (height, weight, and chest measurements) are very low, no doubt because practically all candidates with height, weight, and visual defects were eliminated at the recruiting stations and never reached the recruit depots. Since the standards with reference to these conditions were definite and easily understood by a layman, theoretically none of this type of cases should have escaped detection at recruiting stations. The ratio of rejection for dental defects was also low, probably for the same reason. The large percentage of neuropsychiatric rejections, 3.8, was to be expected, since a line officer could not diagnose such conditions unless they were extreme, whereas at the recruit depot the applicants were examined by skilled psychiatrists.

Records are at hand covering the examination of 48,255 applicants for enlistment at military stations other than recruit depots during the period from March 1, 1919, to December 31, 1919.¹² Of this number, 44,873 were accepted and 3,375, or 7 per cent, rejected. The marked difference between this percentage of rejections at recruit depots, 17.2 per cent, and the percentage at camps, 7 per cent, was due to the fact that a considerable proportion of the men examined at camps were those applying for reenlistment on completion of their current terms of service. Naturally a much lower rate of rejection would obtain in this class of men. A summary of the causes for rejection of 48,255 men examined at stations other than recruit depots is as follows:

Condition	Number rejected	Percent-age rejected	Condition	Number rejected	Percent-age rejected
Developmental.....	491	1	Venereal.....	221	0.45
General surgical and skin.....	384	.8	Otolaryngological.....	192	.39
Ophthalmological.....	386	.8	Tuberculosis.....	119	.25
Orthopedic.....	326	.68	Miscellaneous physical causes.....	181	.37
Cardiovascular.....	339	.7	Under age.....	84	.17
Neuropsychiatric.....	296	.61	Causes other than physical.....	314	.65
Dental.....	236	.48			

It will be noted that there is but little coincidence between the rates in this group and those shown in the list of rejections at the recruit depots.

From March 1, 1919, to December 31, 1919, 176,299 men applied for enlistment at general recruiting stations throughout the country. Of this number, 88,647, or 50.2 per cent, were rejected there, while 87,652, or 49.8 per cent, were accepted and forwarded to recruit depots or other stations.¹³ Of the applicants reaching the recruit depots, approximately 80 per cent were enlisted, 17 per cent were rejected, and 3 per cent either left the recruit depot, declined to enlist, or were held for further observation prior to enlistment.¹² Hence, of a total of 176,299 applicants for enlistment at general recruiting stations, only approximately 70,000, or 39 per cent, were finally enlisted.

As mentioned before, The Adjutant General's reports from 1909 to 1915, inclusive, showed that 83 per cent of all applicants at general recruiting stations were rejected by the line officers in charge, and that no records of the causes of such rejections were kept. The reports from March, 1919, to December 31, 1919, showed that only 50 per cent were so rejected. This presumably indicates that, because of the urgent need for men, less discrimination was now

being used at general recruiting stations in the selection of applicants than was formerly the case. During the period 1909-1915, 15.71 per cent of applicants were rejected at recruit depots, while from March, 1919, to December 31, 1919, 17.2 per cent were rejected. The percentage of rejections for the entire Army, exclusive of general recruiting stations, for the period 1909-1915, inclusive, was 11.8, while for the period March, 1919, to December 31, 1919, it was 12.7.

REFERENCES

- (1) A. R. 1386, 1913.
- (2) Bulletin No. 32, W. D., May 24, 1917.
- (3) Annual Report of The Surgeon General, U. S. Army, 1920, 212.
- (4) Annual Report, Adjutant General's Office, 1917, 37.
- (5) Selective Service Regulations (November 8, 1917, Sec. 151 (a)).
- (6) Annual Report, Adjutant General's Office, 1918, 211.
- (7) Second Report, Provost Marshal General to the Secretary of War, Government Printing Office, Washington, 1918, 223.
- (8) Figures compiled from records of the World War Division, A. G. O.
- (9) Army Regulations, Article LXVI.
- (10) Third Indorsement, S. G. O., July 25, 1919. On file, Record Room, S. G. O., 342.1 (Ineligibles) and S. G. O., 702.4.
- (11) Selective Service Regulations (Form 999 P. M. G. O.), 1918, 3 and 98. Also: Telegram, December 1, 1917, from The Adjutant General's Office to all recruiting stations, recruit depots and depot posts. On file, Record Room, S. G. O., 341.1.
- (12) These figures are based upon the monthly tabulations of recruiting statistics. On file, S. G. O., 702-1.
- (13) Memorandum from The Adjutant General's Office, April 7, 1821. On file, Record Room, S. G. O., 342.1 (Ineligibles) and S. G. O., 702.4.

CHAPTER XX

PHYSICAL EXAMINATIONS ON ENTERING SERVICE—Continued

SELECTIVE SERVICE MEN

Choosing men for the Army under the selective service act was governed by different physical standards from those for voluntary enlistments, and different agencies were involved in making the physical examinations.

A provost marshal general was in charge of the draft in the Civil War¹—our only previous experience with drafting men for our Army—and this office was re-created at the beginning of the World War, being made responsible for all matters having to do with securing men under the selective service act.² The Provost Marshal General determined in the first instance which men of the general population within the prescribed limits of age were physically fit for soldiers.³ The men so selected by the local agents of the provost marshal general subsequently went to military camps, after which only strictly military agencies were concerned with them.

So far as the local agents mentioned were concerned, and these were purely civilian, their actions were governed by instructions issued by the Provost Marshal General.³ These instructions related to physical standards to be maintained as well as to other matters.

On arrival in the military camp concerned, selective service men were reexamined by military medical officers whose actions in respect to the physical standards to be maintained were governed by War Department and promulgated through its general orders, or, as a matter of fact, very often by Surgeon General's circulars, some of which were approved by the Secretary of War.

For convenience, and to make more clear a very complicated subject, the following table has been made:

TABLE 39.—*Evolutionary periods in physical examination of drafted men*

Draft periods	Administration and methods		Physical standards prescribed	
	By Provost Marshal General's office	At camps	From Provost Marshal General's office	At camps
First period, pioneer stage ending Dec. 14, 1917.	<ol style="list-style-type: none"> 1. Local board examination. 2. District board examination. 	<ol style="list-style-type: none"> 1. Primary examination by regimental surgeon. 2. Secondary examination of cases referred to specialists. 3. Survey of all by T. B. board. 	<ol style="list-style-type: none"> 1. Form 11, P. M. G. O. (July 2, 1917). 2. Form 11, P. M. G. O. (revised to August 25, 1917). 3. Bulletins from time to time. 	<ol style="list-style-type: none"> 1. S. G. O. instructions. 2. Form 11, P. M. G. O. (revised to Aug. 25, 1917). 3. G. O. 66, 1910.
Second period, intermediate or transitional ending June 4, 1918.	<ol style="list-style-type: none"> 1. Local board examination. 2. District board examination. 3. Secondary examination if referred to medical advisory board. 4. Medical aides. 5. Medical advisory board to P. M. G. O. 	<ol style="list-style-type: none"> 1. Primary examination by general examiners in depot brigade. 2. Secondary examination when referred to specialists. 	<ol style="list-style-type: none"> 1. Part VIII, S. S. R., Nov. 8, 1917. 2. Changes Selective Service Regulations No. 3 (January 28, 1918). 3. Manual medical advisory boards (Form 64, P. M. G. O., Feb. 14, 1918). 	<ol style="list-style-type: none"> 1. S. G. O. instructions. 2. G. O. No. 66 (1910) 3. Part 8, S. S. R. 4. Changes Selective Service Regulations No. 3 (Jan. 28, 1918). 5. Manual medical advisory boards (Form 64, P. M. G. O., Feb. 14, 1918).
Third period, coordination and standardization ending Nov. 11, 1918.	<ol style="list-style-type: none"> 1. Local board examination. 2. District board examination. 3. Secondary examination by medical and advisory boards. 4. Medical aides to governors. 5. Medical division in P. M. G. O. 	<p>Single examination, by board composed of all necessary specialists, at one session only.</p>	<ol style="list-style-type: none"> 1. Form 75, P. M. G. O. (July 19, 1918, changed as regards height, weight, chest expansion). 2. Form 75, P. M. G. O. second edition, September 27, 1918. 	<p>Special Regulations No. 65, A. G. O. (July 19, 1918, changes as regards height, weight, chest expansion). S. R. No. 65 was identical in text with Form 75, P. M. G. O.</p>

This not only shows the situation respecting administration and methods, but also notes the various orders in vogue prescribing physical standards. Aside from it, however, probably the best way to make clear the working of the selective service act is to describe first the Provost Marshal General's organization, so far as it is pertinent to the present subject, and then that of the Surgeon General; this plan will be that adopted, chronological order being preserved in each case; later, physical standards and results attained will be discussed.

PROVOST MARSHAL GENERAL'S ORGANIZATION

LOCAL BOARD EXAMINATION

The following is quoted from the selective service law which was enacted by Congress early in the World War:³

Such draft as herein provided shall be based upon liability to military service of all male citizens, or male persons not alien enemies who have declared their intention of becoming citizens, between the ages of 21 and 30 years, both inclusive. * * * And the President is hereby authorized to exclude or discharge from said selective draft and from the draft under the second paragraph of section one hereof, or to draft for partial military service only those liable to draft as in this act provided, persons of the following classes: * * * (Here are specified certain officials, those in the military service, employees of the United States mail, etc., pilots, marines, etc., certain industries necessary for the maintenance of the military establishment, etc.), and those found to be physically or morally deficient. The President is hereby authorized in his discretion to create and establish throughout the several States the subdivisions thereof, and in the territories and the District of Columbia, Local Boards. * * * Such boards shall be appointed by the President and shall consist of three or more members, none of whom shall be connected with the military establishment. * * * Such boards shall have power, within their respective jurisdiction, to hear and determine, subject to review as hereinafter provided, all questions of exemption under this act, and all questions or claims for including or discharging individuals or classes of individuals from the selective draft.

According to the instructions issued in May and June, 1917, by the Provost Marshal General, who was charged with the duty of administering the act in question, the normal composition of local boards was five members, of whom one should be a physician.⁴ Provision was made later in Selective Service Regulations for the appointment of one or more physicians as additional medical examiners, even though a licensed physician was already a member of the board.⁵ The board decided as to physical fitness in each case, but the findings of the examining physician, whether a member of the board or not, were used as the basis of the board's decision in this respect. From the beginning the registrant had the right of appeal to a district board which possessed the power of final decision.⁶ At a later date provision was made that certain cases should be referred to a medical advisory board, but even then the final decision still rested with the district board.⁷

Local boards sent accepted registrants to camps where in many cases, as will be seen later in detail, they were found physically unfit by camp surgeons and were returned in due course to their homes. This did not end the matter, however, and men rejected by a camp surgeon not infrequently were sent again with a certification of fitness from the local board concerned to the same camp on a succeeding call. Another method consisted in sending such men to another camp where perhaps the camp surgeon was thought to be more lenient in his decisions regarding rejection.

The resulting confusion in this respect was finally corrected. While Selective Service Regulations of November 8, 1917, definitely ruled that local boards should place each man rejected at camp in the exempt "class V,"⁸ Selective Service Regulations, September 16, 1918, required that a case so rejected be placed in "class I,"⁹ to be immediately called for reexamination when, if the disability for which the individual was rejected at camp was found, classification as determined at the camp should stand; whereas if it were not found, the man would be referred to the medical advisory board for careful reexamination; the findings would then be returned to the local board and forwarded to the district board, whose decision determined the final classification. The latter ruling proved satisfactory to all concerned, and as a result complaints and recriminations by local boards and camp examiners, so common in such cases in the earlier part of the war, almost entirely ceased.

In the early part of the war (first draft) local boards were required to determine only whether each registrant was or was not fit for the military service in accordance with the physical standards prescribed by the Provost Marshal General. Yet, this does not mean that their task was a light one. On the contrary, for the first draft the local board physicians were actually required to examine about 2,500,000 men in order to secure approximately 500,000 for sending to camp, this because the physical examination was made prior to the determination as to exemption on industrial or other grounds.¹⁰ As will be seen they were relieved of this unnecessary burden later.

In the earlier part of the war the local agencies mentioned above, local and district boards, constituted the draft machine save for the Provost Marshal General's Office itself, which, as explained, was in general charge and promulgated the various instructions destined to govern the actions of the local agencies concerned.

A new agency was created when medical aides to the governors of the States were provided for in November, 1917, and commissioned in the Medical Reserve Corps.¹¹ The duty of a medical aide was defined as follows:¹²

His duties consisted in the establishment of close relation with all examining physicians of his State, in meeting the examiners for the purpose of discussing medical problems of the draft, and for the clearing up of doubtful points; in visiting local and medical advisory boards, to observe their work and advise their members; in recommending replacement of weak examining physicians, arranging for additional examiners, and hastening the operation of physical examinations where such were delayed; in studying the causes of rejection at camps with a view to the detection of inefficiency in examiners; in the performance of such other duties in connection with physical examinations of drafted men as might be required of him.

The appointment of these officers was dictated by certain difficulties in the first draft. After this new policy was adopted, not only did the governor of each State possess a chief medical officer, through whom all orders, changes, and interpretation of changes could be sent to local board physicians, but these local physicians, in turn, had a sponsor who could understand the grounds for some of their peculiar difficulties, and who was in a position to help remove the causes thereof. From one camp—and this may be true of many others—the chief medical examiner supplied to the medical aides of two States a daily

report of camp rejections, stating the causes and giving any additional data that might be considered of value to the local board examiners. The medical aides made use of such material in bulletins for distribution to all members of the local boards. It will readily be seen that by this and similar means, many of the former misunderstandings could be solved. Altogether the plan of appointing medical aides may be considered as having been a complete success.

MEDICAL ADVISER TO PROVOST MARSHAL GENERAL

At the beginning of the war, no medical agency existed in the Provost Marshal General's Office. The practice at that time was for that office to request the Surgeon General's Office from time to time, as seemed necessary, to fix physical standards for the draft, and these were then published by the Provost Marshal General to the civilian agencies directly responsible for securing selective service men.¹³ There is no record to show that the Provost Marshal General had any medical experts in his office until February, 1918. Before this, considerable confusion had existed, especially in reference to the promulgation of exactly the same physical standards by the Provost Marshal General and by The Adjutant General at the instance of the Surgeon General.¹⁴ Sometimes the Surgeon General issued instructions direct, but the situation was the same. Not infrequently, therefore, the local boards and the camp examiners were actually operating under different physical standards.

The latter part of July, 1918, an experienced officer of the regular Medical Corps was appointed to serve as adviser to the Provost Marshal General.¹⁵ This was followed by the creation of a medical division in his office about August 1, 1918.¹⁵ To this reorganization were due many of the changes which finally brought about the unification of standards for use by military surgeons and by the physicians on the Provost Marshal General's boards. As has been explained, prior to this time there was a lack of coordination among the Provost Marshal General, The Adjutant General, and the Surgeon General relative to physical standards and their promulgation. Instructions from the Provost Marshal General were not received by medical officers at camps in many instances, and if they had been so received would not have been held binding on officers of the Army. The Army looked to The Adjutant General and the Surgeon General for instructions and not to the Provost Marshal General, as has previously been explained. Physicians on local boards and medical officers in camps thus were sometimes working at cross purposes and with divergent physical standards to guide them. The mistake in the beginning lay in the failure properly to coordinate and promulgate orders to the Army at the same time that similar instructions were being issued by the Provost Marshal General for the guidance of local draft boards. This condition of affairs was corrected later in the war mainly by the medical adviser to the Provost Marshal General, who saw to it, by consultation with the Surgeon General's Office, that simultaneously with the issuance of instructions to local boards similar instructions were transmitted to the Army through the proper channels, thus making possible full coordination of all concerned.

SURGEON GENERAL'S ORGANIZATION

Here we will also start with description of the agencies which actually carried on the examination and then work back to the directing agency—the Surgeon General's Office itself. This rather unusual method was adopted advisedly in order to preserve chronological sequence.

CAMP EXAMINERS

Plans for physical examinations of selective-service men were thought out well in advance of their arrival at their camps, and special instructions concerning the various features of the work were prepared early in the professional divisions of the Office of the Surgeon General. As a matter of fact, the organization of special physical examining boards preceded the draft, their earliest employment, however, being for the reexamination of officers and men in the Regular Army and in the National Guard. The War Department circular first authorizing the appointment of such special boards is here given in full, though as issued it pertained to the reexaminations mentioned above, the plan applied equally from their beginning to camp examinations of drafted men.

Circular.

WAR DEPARTMENT,
Washington, July 16, 1917.

1. Boards of examiners consisting of specially selected officers of the Medical Reserve Corps will be sent to all the larger camps of the Army as far as practicable for the purpose of examining the commands for tuberculosis. The size of a board sent to a given camp will be governed by the size of the camp, but not less than three officers will ordinarily be sent to any camp. A detachment consisting of noncommissioned officers and privates or privates, first class, Medical Department, will be ordered to the camps in which examinations are to be conducted for the purpose of assisting in the clerical and other work of the examinations. Suitable quarters will be provided by the camp authorities for these medical officers and for the enlisted men of this detachment, and also places in which the examinations can be conducted. The men composing an organization (company), will so far as practicable, be examined consecutively. A nominal list of each organization will be furnished the examiners at the time of the examination of the organization. Men found by the examiners to be affected with tuberculosis will be reported to the commanding officer through the camp surgeon. The examiners will be instructed by the commanding officer as to the manner in which such reports will be made. When action under the provisions of paragraph 161, Army Regulations, is necessary, a disability board will be appointed from the examiners or, in case of large commands, as many boards consisting of three members each may be constituted as appear to be necessary for the most rapid execution of the work. In order to save time and to avoid the unnecessary repetition of physical examinations, the recommendations of the examiners as to discharge on account of tuberculosis will not be subject to revision by the camp surgeon.

2. Expert examiners in other specialties, such as psychiatry, orthopedics, cardiovascular diseases, etc., will likewise be assigned to the larger camps for duty. It is not contemplated that such specialists shall necessarily examine all the members of a command. They will act either as members of the medical staff of the organization, with more or less permanent assignment to it, or in certain cases they may visit a command for relatively brief periods to act as consultants with the camp surgeon or to give instructions in their specialties to the medical officers of the command. Medical officers who are attached to the medical staff of a command as regular members of it do not differ as to their status from other medical officers. In case, however, the medical officer or officers shall have been sent on temporary duty for the purpose of conducting a methodical examination of the command for tuberculosis, or for instructing the medical officers, or for rendering expert advice in a specialty, the character of the service which the officer or officers in question are expected to render will be indicated

in orders from the War Department. Officers visiting military stations on duty of this kind and such enlisted men of the Medical Department as may be ordered to assist them will be subject to no other detail while acting under such assignment. The specialists will be governed in their professional work by instructions from the Surgeon General of the United States Army. They will render all reports through the camp surgeon for transmission through official channels. The commanding officer will facilitate the work of the special examiners by indicating the men whose examination is desired, arranging for the instruction of medical officers, etc., and the examiners will conduct their examinations in such a way as to interfere as little as possible with the regular work of the command. Officers who plan and conduct the physical training of military organizations will confer with the expert in cardiovascular diseases (diseases of heart and blood vessels) if one is present, with reference to the manner in which courses of physical training may be most advantageously carried out.

By order of the Secretary of War.

TASKER H. BLISS,

Major General, Acting Chief of Staff.

Official:

H. P. MCCAIN, *The Adjutant General.*

The War Department provided for examinations of selective-service men by the assignment in due time to the various camps concerned of medical officers to serve as regimental surgeons, and by the detail of groups of carefully selected physicians who were accredited specialists not only in tuberculosis but in cardiovascular, eye, ear, nose, and throat, orthopedic, nervous and mental diseases, respectively.¹⁶ Ample notice had been given by the War Department regarding the expected arrival of the draft quotas in camp. The total strength of the first draft had been fixed at 687,000.¹⁷ These were to come in waves, 1 per cent on each day of the 5th, 6th, 7th, 8th, and 9th of September, 1917 (5 per cent in all; 40 per cent beginning September 19; 40 per cent beginning October 3, and the remaining 15 per cent as soon thereafter as practicable. Insofar as the September quota is concerned, the above schedule was carried out with the following exceptions: As to the first call (September 5), the calling of drafted men to Camp Upton was delayed until September 10 because the construction of the cantonment had not sufficiently advanced to accommodate the men at the earlier date; the calling of drafted men to Camp Meade was delayed until September 19 because of delay in completing the water supply there. As regards the second call (September 19), at Camp Upton, one-half the men went there on September 19, the remainder on September 28; at Camps Meade and Dix the movement of some men was delayed until September 26.¹⁷ Thus it may be seen that the camp physical examination of the September, 1917, quota of drafted men, with an average of between 20,000 and 30,000 men for each of the National Army cantonments, was no small task.

REEXAMINATION OF DRAFTED MEN ON THEIR ARRIVAL AT CAMP

According to Memorandum No. 3, S. G. O., August 22, 1917, this examination was to be made under the direction of the division surgeon, with the least practicable delay after the arrival of drafted men at the mobilization camps and was to consist of a preliminary examination and a final examination. The preliminary examination was to be conducted when practicable at the regimental infirmaries by the regimental medical officers, and such other medical examiners as might be detailed by proper authority. All individuals recommended for

rejection and all doubtful cases of every sort were to be reported by name to the division surgeon for further examination. The final examination was provided for in the following extract from Memorandum No. 3, S. G. O., August 22, 1917:

At each cantonment, specialists have been detailed to conduct final examinations, * * * drafted men whose physical condition has been reported to the division surgeon as in doubt, or deserving of discharge, at the preliminary examination, will be referred to the medical examiners of the specialty concerned. * * *

Specialist boards were employed in the National Army cantonments and elsewhere to carry on this final examination of selective service men.¹⁶ The tuberculosis boards did not rest with the review of cases referred to them from the preliminary tests, but made complete tuberculosis surveys of practically all drafted men at a later date, according to the method previously used during the examination of officers and men in the Regular Army and the National Guard. The methods pursued by the other specialist groups varied, but so far as the records show in no instance was there a general reexamination of entire commands other than by the tuberculosis boards. The results in the case of tuberculosis were very good, except for the fact that work started too late and from necessity was not completed until January or February, 1918, this not being in accord with the requirement that the final examination should be made with the least practicable delay after the arrival of the men in the cantonments.¹⁶ Another defect lay in the provision that tuberculosis boards should not be strictly under the authority of the division surgeon. This is indicated in the last sentence of paragraph 1, War Department circular, July 16, 1917, quoted above. This arrangement in actual practice raised a good many difficulties, but the greatest weakness in the system of preliminary and final examinations was found in the fact that the specialists, though best fitted by experience and training to do the work of physical examination so far as their particular specialties were concerned, had no opportunity (except in the tuberculosis survey) to pass on any men other than those referred to them by the regimental surgeons who carried out the preliminary examinations. The local boards had exempted scarcely 30 per cent of the first draft on account of physical disability¹⁷ and the camp examiners who made the preliminary tests were probably not more experienced, nor, at the outset, better acquainted with Army requirements than were the physicians of local boards. Then, too, obscure cardiovascular, psychiatric, and orthopedic conditions, in the rush of examining a thousand or more men a day, were just as likely to be passed over in camp as they were by the local boards. It was inevitable, therefore, that in many cases men were not discovered to be physically unfit until the final camp examinations. Men found physically unfit at the preliminary camp examination were discharged with fair promptness, but on rejection by specialist boards on reexamination were held in camp for long periods, notwithstanding representations on the part of division surgeons that these men had been thoroughly examined and should be returned to their homes. A general reexamination of all such cases was ordered in six camps, the reason assigned being that rejections were considerably higher in them than the average in other camps, which was given as 2 per cent.¹⁸ The replies of the camp surgeons indicate that they were unwilling to change their recommendations, except in the case of one who reversed his decision in

three instances.¹⁸ This policy of retaining physically unfit men as we now know did not make for military efficiency. In a number of the National Army camps, the "sloughing off," as it has been called, of physical defectives from the divisions when they were ordered to prepare for immediate overseas service, was so great as to seriously impair their efficiency.

The following letter from The Adjutant General to the Surgeon General dated April 17, 1918, serves as an illustration of official recognition of this state of affairs:¹⁹

It has been the experience in the past that coincident with orders directing divisions to prepare for overseas service, there begins a process of "sloughing off" men for various reasons. These men have been in training for many months when, on the eve of their departure, they are eliminated. The evil of this need only be mentioned to be appreciated, for not only has this training been wasted, but there is a loss of money, food, and clothing.

Every effort must be made to remedy this evil. Therefore all physical examinations, while in the service, must be according to a *flexible but uniform standard*, whereby all subjects permanently unfit for overseas active service will be *promptly* eliminated, retaining only such as give promise of development into fit soldiers for abroad. This applies from the men's first examination in the depot brigade to the last examination prior to sailing.

You will take immediate steps to convey proper instructions to all medical examiners to carry out the above.

A second letter dated May 8, 1918, is to the same effect:²⁰

1. This is but one of many instances that have been brought to the attention of the War Department which show that *first* examinations by duly established medical agencies have been of indeterminate value in that they have failed to disclose whether or not the drafted men are physically fit.

2. After a *through first* examination it should be possible to group men into two classes—the *fit in their general make-up* and the *unfit*. The classification of the former should not be changed except through sickness or injury.

3. The examination, for the purpose of determining the aforesaid classification, should be made within the first two weeks after men arrive in camp; thereafter the Medical Department should be willing to abide by the result of this *examination*.

STATUS OF MEN FOUND PHYSICALLY DISQUALIFIED AT CAMPS

Since the drafted man was considered a soldier from the date specified by the local board for his departure to a mobilization point, it follows that registrants on arrival at camp were already in the military service and that such disposition as was indicated thereafter in each case must be made under the rules applying to the Army. The methods of discharge for an enlisted man are stated in paragraph 139 of Army Regulations, 1913. The inducted or drafted man was included under such rules by authority of the selective service law, May 18, 1917.²¹

All persons drafted into the service of the United States and all officers accepting commission in the forces herein provided for shall, from the date of said draft or acceptance, be subject to the laws and regulations governing the Regular Army except as to promotions * * *.

Therefore the physical examination in camp, based on the ordinary rules governing the Army, could not in any sense be considered a revision of the findings of the local boards, even though the results thereof were recorded on Form 14 or Form 1010, P. M. G. O., and the induction was not accomplished until that form had been finally completed over the signature of the command-

ing general of the camp. Yet the completion of the physical record (Form 1010, P. M. G. O.) by the medical officers at camp, with the physical classification of the registrant approved or disapproved by the camp or division surgeon, and his status fixed as "accepted" or "rejected," over the signature of the local commander, gave the procedure an appearance of finality in the rejected cases, and it is not strange that some persons, who possessed only a superficial knowledge of the selective service act, should have felt that such cases were finally settled. This view was obviously erroneous, as has been pointed out in the preceding paragraph.

DISCHARGE OF REJECTED MEN

Registrants rejected for service almost at once upon arrival at camp were rarely discharged by the certificate of disability method (Form 17, A. G. O.) as laid down in paragraph 159, Army Regulations. The process usually employed was called "Discharging from the draft on Form 638, A. G. O." The conditions leading to such discharge were considered at the time as "not in line of duty." In the case of men with defects or disabilities, who were accepted at camp through oversight and who, on discovery of the defects, were discharged after their induction papers had been completed in camp, the regular disability procedure was used and whether or not in "line of duty" was variously interpreted at different periods. The rulings of the Bureau of War Risk Insurance were finally accepted as the guide in such matters.

CHANGES IN METHODS OF EXAMINATION AT CAMP

The method of examination outlined above¹⁶ was not followed in detail in every camp, even at the outset, but so far as records are available they go to show that in all camps the principle of a preliminary and a final examination was invariably complied with, even if both were made on the same day and in the same building, as was true early in some instances. That this method of examination could not be depended on as an adequate means of eliminating the unfit has already been shown.

In several camps early attempts were made to overcome the difficulties which had been encountered in examining the first draft, and at one camp at least most of the errors of the older method were avoided by a reorganization of all agencies previously used in eliminating the physically unfit.²² The arrangement at this camp was such that the process of selection was carried out in its entirety, not only effectively, but also immediately upon the arrival of the drafted men, while at the same time the responsibility for rejection or acceptance was placed in the hands of trained specialists, not alone for a small group of referred cases (as had been the former practice), but for every one of the drafted men received in the camp. The procedure here was planned with a view to avoiding the faults of the original method of preliminary and final examinations, while retaining its better features. The scheme of organization consisted in concentrating all specialists in one group, both those in the camp and at the base hospital, adding sufficient officers as examiners in general surgery, medicine, and for genitourinary conditions, and placing an administrative head over the whole unit. This was the only physical examining unit and was designed to select the fit and to eliminate the unfit at one session,

at the same time having all the men examined by specialists. The method employed at the camp mentioned was promulgated to other camps by the Surgeon General.²² (See also: Volume I, 952.)

CHANGE IN SURGEON GENERAL'S OFFICE

In the earlier part of the war, matters having to do with physical examinations were centered in the division of sanitation of the Surgeon General's Office; the final physical examination, however, was carried on by specialists under the technical direction of the various professional divisions of the office. In the absence of any coordinating authority, this arrangement led to a good deal of confusion as so many agencies were directing matters on one subject, that of physical fitness of selective service men. As a matter of fact, even in the camps themselves, as the various specialists reported to their own divisions in the Surgeon General's Office, coordination was very lacking.

With a view to prompt and effective correction of the deficiencies in the conduct of physical examinations, noted above, the Surgeon General decided to place the full control of all matters relating to physical examinations and physical standards in the division of sanitation of his office, and at the same time to limit the functions of the professional divisions to purely technical advice in so far as concerned physical standards and physical examinations in camp.²³ The responsibility being thus definitely fixed and centralized, it became relatively an easy matter to reorganize the conduct of physical examinations, both in the Surgeon General's Office (coordination) and in the camps (execution), and to bring order out of the immediately preceding chaos. The professional sections continued to be consulted freely on the selection of examiners and on the professional aspects of physical examinations, but all instructions to camp surgeons and to examining boards from this time on were issued in the name of the Surgeon General by the chief of the division of sanitation.

This was the first step. The second step was to change the entire plan of physical examinations by combining the preliminary and final examinations previously required into a single examination which, made on one day, would include all general and special examinations necessary for a complete survey of the registrant. To this end, on April 29, 1918, the following telegram was dispatched to all camp surgeons and other senior surgeons of commands:²⁴

Under authority Adjutant General's Office April seventeen nineteen eighteen the following instructions will govern. The physical examination of all drafted men on their arrival at camps, cantonments, recruit depots and other stations will be made and completed under the direction of the division surgeon or other senior surgeon of the command with the least practicable delay after their arrival. Except in doubtful or deferred cases the examination of any individual drafted man should be completed on one day by a special examining board designated by the division surgeon consisting of medical officers including all necessary specialists. This single examination will take the place of all preliminary and final examinations previously prescribed by this office. Smallpox vaccination and the first dose of triple vaccine will be administered and all required blank forms including identification records will be completed on the day of examination.

GORGAS.

This method of examination was recommended to the Surgeon General by the division of sanitation, which based it on the organization and procedure of medical examiners at recruit depots during the pre-war period. It should be noted that the efficiency of physical examinations at the recruit depots in the 10 years immediately preceding the World War had never been surpassed in the history of recruiting for the Army. This was demonstrated by the decrease in discharges for disability which followed the inauguration of the then new method of recruiting promulgated by G. O. 162, W. D., September 20, 1906, which had been highly developed by experienced and enthusiastic regular medical officers. The system tried out on a large scale at Camp Lee, Va., during the early spring of 1918,²² was similar to this pre-war method. The telegram of April 29,²⁴ coupled with the memorandum of May 1, 1918,²² initiated a fundamental change in policy as regards the examining of registrants, and marked the beginning of a new era in this work. The new plan, plus the improved and unified physical standards adopted soon after, laid the foundation for prompt and effective examinations in the camps. No doubt was left as to the status and authority of the division surgeon, or other senior surgeon, regarding all matters relating to the physical examination of drafted men, and his jurisdiction was clearly extended over the specialist boards.

The third step in the changing of the plan of conducting physical examinations, which followed in logical sequence, was the breaking up of all specialist boards:²⁵

The method of examining drafted men by means of a single board of examiners, containing all necessary specialists, as prescribed by telegram S. G. O., April 29, 1918, and by letter A. G. O., August 2, 1918, has obviated the necessity for the boards of tuberculosis examiners, boards of cardiovascular examiners, and boards of psychiatric examiners. These three boards are hereby dissolved. All medical officers ordered to report to commanding officers for duty on such boards are hereby assigned to duty, at their present stations, as tuberculosis examiners, cardiovascular examiners, and neuropsychiatric examiners, respectively.

Such officers and all other officers assigned to camps as special examiners will be detailed by local authority for duty on the special examining board designated for the examination of drafted men, and may also be assigned for such other duties, particularly instruction work in their specialties, as will not conflict with the primary function of performing the respective special examinations of drafted men for which they are designated in the special orders assigning them to station.

The fourth and final step was the discontinuance of the multiple and voluminous technical reports required of specialists in camp by the respective professional sections of the Surgeon General's Office. In their stead a single combined monthly report was required of the camp surgeon or other senior medical officer of the command. The matter was finally and effectively disposed of in the following manner:²⁶

1. All instructions from this office requiring that reports regarding the examination of drafted men be sent to this office, or to any of the divisions or sections in this office, by special examiners (formerly designated as tuberculosis boards, cardiovascular boards, and neuropsychiatric boards), or by other members of the special examining boards for drafted men provided for in telegram this office April 29, 1918, are hereby revoked. No reports regarding examination of drafted men will be made to this office except the monthly report of the camp surgeon called for below. In this connection attention is invited to letter A. G. O., August 22, 1918, (342.15 Misc. Div.), copy attached.

2. The camp surgeon will render monthly a report of the examination of drafted men made during the month. This report in duplicate will be mailed not later than the 10th of the following month to the Surgeon General, attention division of sanitation. The report will contain the information indicated in the attached form of report and may in addition transmit, as exhibits, any other data which the camp surgeon may desire to submit.

3. All previous instructions from this office requiring that routine or special professional reports on any matter from any specialist assigned to a camp be sent to this office, or to the respective divisions or sections of this office, are hereby revoked. The phraseology "assigned to a camp" is not intended to include officers stationed at the base hospital pertaining to the camp in question.

The effect of the changes which have just been discussed can be demonstrated statistically. The following statistics showing the rejection of registrants for September, October, and November, 1918, were compiled from the monthly reports made to the Surgeon General, by camp surgeons,²⁷ as required by letter of September 21, 1918. The figures for 1917, are taken from the Provost Marshal General's report on the first draft. The increased percentage of rejections in the 1918 period probably is in part an indication that the camp examination was being performed more thoroughly as a result of the change in method. However, there is another factor which must be considered. The rejections in 1917 include only the preliminary rejections, and it is well known that many thousands of men after induction, and following delayed final physical surveys, were ultimately discharged on certificates of disability. These did not appear as "rejections" in the Provost Marshal General's figures, to which class in reality most of them properly belonged. Based on the figures given, the percentages of rejections for the two years are not therefore strictly comparable, those of the Provost Marshal General being too low.

TABLE 40.—Physical examinations and rejections at 14 National Army cantonments during a part of 1918, as compared with a similar part of 1917

Camp	September, October, and November, 1918			September, October, November, and December, 1917		
	Number examined	Rejected		Number examined	Rejected	
		Number	Per cent		Number	Per cent
Custer.....	9,234	1,935	20.95	17,487	1,660	9.49
Devens.....	5,694	692	12.15	36,082	4,281	11.87
Dix.....	8,429	1,448	17.18	19,804	1,573	7.97
Dodge.....	14,964	1,251	8.35	20,505	690	3.36
Gordon.....	12,504	2,126	17.00	19,935	1,556	7.80
Grant.....	18,770	2,337	12.45	26,658	1,148	4.30
Lee.....	23,879	4,208	17.62	36,938	920	2.49
Lewis.....	12,485	1,628	13.04	46,313	5,095	11.00
Meade.....	5,060	528	10.43	35,971	2,245	6.24
Pike.....	17,462	1,198	6.86	24,389	1,819	7.46
Sherman.....	1,967	203	10.42	9,850	1,012	10.27
Taylor.....	8,658	1,138	13.14	27,903	2,143	7.68
Travis.....	8,692	685	7.88	32,746	993	3.03
Upton.....	485	74	15.26	31,423	2,318	7.38
Total.....	148,283	19,453	13.12	387,004	27,453	7.10

COORDINATION OF MEDICAL DEPARTMENT ACTIVITIES WITH ACTIVITIES OF THE QUARTERMASTER DEPARTMENT AND PERSONNEL DIVISION OF THE ADJUTANT GENERAL'S OFFICE

Improvements as time went on were shown not only in better methods for making physical examinations, but also in other important directions. One of the most important was closer cooperation between the camp medical departments and the other camp military agencies concerned in handling the draft. As it chanced, the first properly constructed building was not in a National Army camp, but at one of the recruit depots of the Regular Army (Jefferson Barracks, Mo.),²⁸ where large numbers of drafted men were being inducted. There a large frame examining pavilion was constructed, located near one of the permanent post buildings, the two being connected by closed corridors. These structures housed all the activities connected with receiving, recording, bathing, examining, vaccinating, equipping, insuring, and assigning drafted men. The registrants first entered a room where the preliminary papers were prepared, and thence passed to the bathing section. The undressing room and shower baths were in a convenient location, so that the men stepped immediately from the drying room through a corridor into the examining room. The space available for physical examination was ample and as free as practicable from noise and confusion, sound-proof partitions being built in order to provide quiet rooms for careful observation of heart and lungs and for other special cases. Vaccination against typhoid and smallpox was carried out in this same building. After completion of the work pertaining to the Medical Department the men passed through another corridor into the equipment room of the Quartermaster's Department, where they were issued uniform clothing and equipage, each man being carefully fitted, particular attention being paid to shoes. The soldier's induction papers were then completed in another room of the same building and he was assigned to an organization. Much time and labor were thus saved. The process in this depot is described in detail because there is no record of similar construction. In several cantonments, however, barrack buildings, after various alterations, were connected by means of corridors, and the same, or a very similar, method of handling registrants was practiced. In camps where the activities of the different departments were so concentrated, the results proved very satisfactory.

PLANS FOR A SUITABLE EXAMINING PAVILION

The necessity for a building specially designed for the purpose of properly conducting physical examinations became more and more apparent at all large stations after the organization of camp examining boards. On July 1, 1918, this matter was brought to the attention of the War Department by the following letter from the Surgeon General to The Adjutant General:²⁹

1. Reports of sanitary inspectors and camp surgeons indicate that the proper physical examination of recruits at large camps and cantonments is much hampered because of the lack of any suitable building for carrying out the work. In many places the examination is made in an Infantry barrack, borrowed for the purpose, and which in some instances is in a different location for each draft increment. At least two camps borrow the Knights of Columbus building. In other places a regimental infirmary building is used. Neither of the two latter buildings is sufficiently large for the purpose, and a company barrack is not

arranged in the best manner for systematic, rapid, and careful work. In some other camps the examinations are made in several small buildings to the great detriment of speed and system.

2. Formerly examinations were made in comparatively small numbers by regimental surgeons at regimental infirmaries. Gradually it became obvious at all camps that the work should be centralized and that an examining board should be formed, this board to contain all required specialists. This method of examining by a board is now prescribed by instructions from your office. The need of a suitable building is pressing and will be still more so with the advent of cold weather. The provision of a building designed to furnish reasonable comforts, decencies, and protection from exposure during the physical examination will go far toward producing a favorable impression on incoming drafted men.

3. It is recommended that at each National Army and National Guard camp, where drafted men are to be sent in any considerable numbers, there be constructed an examining pavilion. This pavilion should be of approximately the size of the standard two-story infantry company barrack, but a different interior arrangement is necessary. With it there should be provided a lavatory similar to a company lavatory, except that there should be more showers and fewer toilets and less wash-basin space. Attached to the lavatory should be a room where men undress and leave their civilian clothing. Suitable shelving should be provided for holding the clothing. The lavatory should be connected with the examining pavilion by a covered corridor (provided with heating facilities for winter) in order that unclad men may go directly from the bath to the examining room. The whole pavilion and lavatory should be amply heated by steam in order that naked men may stand about several hours without discomfort. Arrangements should be made so that either under the same roof, or in a building connected by corridor, the men may be equipped with their uniform clothing immediately after examination. Accepted men should not put on their civilian clothing after they have been examined. This system is used in a high degree of satisfaction at certain camps and recruit depots. From the standpoint of a convenience it is highly desirable that the building used by the personnel officer should be in close proximity to the pavilion for physical examination.

4. Rough plans for a suitable pavilion are attached. Certain details are of much importance. The lower story should have beaver board ceiling in order that the noise of movements on the upper floor will be less readily transmitted to the lower floor. The walls of the tuberculosis examining room, the cardiovascular room, and the ear room should be double and the interspace filled with sawdust, or other similar material, so as to render the rooms free from the transmission of noise from the outside. The windows in the eye room and in the ear, nose, and throat room should be provided with inside shutters which can be closed to exclude light. Numerous drop-light fixtures will be needed in these rooms, as indicated in the attached plan. Also numerous wash basins are needed throughout the building to enable examiners to wash their hands after special examinations and to enable the drafted men to wash their hands after taking finger-print records. These basins are indicated in the attached draft.

Because of the satisfactory results accomplished by coordinating the various activities connected with the induction of drafted men, the personnel division of The Adjutant General's Office, and the Quartermaster Department were equally interested with the Medical Department in the construction of a proper building for housing all the activities concerned. Plans were finally prepared for a special building after repeated consultation between the chiefs of three departments. In October, 1918, these plans were approved and orders were being prepared for the necessary construction in the various camps when the signing of the armistice put a stop to new undertakings of this character.³⁰ It will be observed that the room for vaccination was placed next to the last. It was found that when the men were inoculated against typhoid immediately on completion of the physical examination, some of them would begin to feel indisposed before the procedures carried out by the Quartermaster Department and personnel division had been completed.

PHYSICAL STANDARDS

The first physical standards fixed for selective service men, those used for the first draft, were published in Form No. 11, P. M. G. O., July 2, 1917. These were prepared by the division of sanitation of the Surgeon General's Office and were distributed in published form by the Provost Marshal General to local boards. The pamphlet in question comprised four and one-half pages of material, including physical standards and instructions. The physical requirements prescribed by Form No. 11 were definite as to height, weight, and chest measurement, and for hearing, vision, hernia, the genitourinary organs, etc. The minimum height was fixed at 61 inches; weight, at 110 pounds; chest measurement at expiration, 30 inches; vision, 20/40 for the better and 20/100 for the poorer eye; hearing 10/20 with both ears; gonorrhoea, acute or chronic, as not disqualifying, but syphilis was. Instructions given in respect to heart and lung conditions were very meager as compared with the order of 1910 prescribing physical standards for volunteers; the same may be said in regard to foot conditions. In Compiled Rulings, No. 6 (c), P. M. G. O., August 8, 1917, several changes in Form No. 11 were promulgated, viz, reduction in weight as compared with height; artificial denture allowed as a substitute for natural teeth; men might now be accepted for the line of the Army when unable with either eye to read correctly all the letters on the 20/40 or 20/100 line provided they were able to read some of the letters on the line below; men might also be accepted with perforation of the ear drum if hearing was not below 10/20. Compiled Rulings, No. 8 (d), P. M. G. O., August 17, 1917, authorized a minimum weight of 110 pounds. Compiled Rulings, No. 10 (e), P. M. G. O., August 27, 1917, called particular attention to flat-foot and offered an interpretation regarding the meaning of the term "clearly and unmistakably disqualify." All of these rulings were based upon recommendations or decisions of the Surgeon General. Form No. 11, P. M. G. O., with modifications to August 27, 1917, was distributed to camp surgeons at the end of August, 1917; it contained the changes above noted. Though from very early in the war a flood of memoranda and circulars having to do with special phases of the physical examination at camp poured from the Surgeon General's Office, save for Memorandum No. 3, S. G. O., as far as it went, the first comprehensive publication on the subject entitled "Instructions for the Physical Examination of Drafted Men in the National Army Cantonments" was prepared by the Surgeon General under date of August 25, 1917, and published over his signature "for the convenience of medical examiners." This pamphlet included the numerous memoranda and circulars just mentioned which were originally issued at different periods through June, July, and August, 1917.

While this pamphlet of instructions was sent to the camp surgeons "for the convenience of medical examiners," it actually was interpreted locally in many instances as a set of physical standards, except on questions of height, weight, chest measurement, vision, and hearing, which it did not cover and for which it is probable the Regular Army standards were sometimes used as guides.

The situation was further complicated by a footnote on the first page of Memorandum No. 3, S. G. O., which stated that "The physical standards for

this examination are contained in Form 11, P. M. G. O. (copy inclosed), and in special memoranda and circulars inclosed." As a matter of fact, Circulars Nos. 20 and 21 (dealing with tuberculosis and cardiovascular conditions) had all the force of War Department orders, being approved by the Secretary of War.

In effect, the situation was now as follows: Drafted men were examined by local board physicians under fixed requirements for vision and hearing (modified by subsequent rulings which allowed various interpretations), minimum standards for grinding teeth, and definite height, weight, and chest measurements; men with venereal disease were to be accepted. For the camp examiners the standard of fitness in cardiovascular and tuberculous conditions was very definitely fixed, and according to Circular No. 23 the standards for mental and nervous conditions were fixed, whereas Form No. 11, P. M. G. O., under causes for rejection stated merely "Mental: Lack of normal understanding." In some camps General Orders, No. 66, War Department, 1910, was used as the standard in connection with the Surgeon General's instructions of August 25, 1917. Conditions could not have been much more chaotic. This was due apparently to lack of teamwork. An officer in the division of sanitation of the Surgeon General's Office prepared the material for Form No. 11, P. M. G. O., and for the general instructions contained in Memorandum No. 3, S. G. O., whereas most of the other memoranda and circulars originated in the specialist sections of the Surgeon General's Office. The latter were all issued by the Surgeon General, and furthermore two of them were approved "by order of the Secretary of War," although the requirements therein laid down were very different in some respects from the standards of Form 11, P. M. G. O.

It was never contemplated that the high physical standard which had obtained for the Regular Army before the war was to be maintained for selective service men, and, as a matter of fact, very early a tendency was manifest to lower still further the standard for the latter. The committee on anthropology of the National Research Council, in August, 1917, presented to the Council of National Defense a report recommending decided lowering in the height and weight standards on the ground that this would extend the provisions of the selective service act in a more normal way to the mixed population of the country and also with a view to increasing the number liable to military service. Extracts from these recommendations are here given:³¹

To revise the physical requirements in recruiting new armies is demanded by consideration of the diversified characteristics of the many nationalities and races involved.

Stature requirements: The present minimum requirement of stature in any branch of the Army or Navy is 5 feet 4 inches. In the case of mountain artillery, it is 5 feet 8 inches. The minimum requirement for the English infantry and some other branches of the service prior to the present was 5 feet 2 inches, and is has not been reduced. On the Continent the minimum differs with the nationalities, but it is as a rule lower than that of the United States. In many of these nationalities the average height of the adult male does not reach barely equals, or only slightly surpasses the minimum requirement for the soldier of the United States. Many of these nationalities are well represented in this country. They include Italians, Greeks, French, Mexicans, Jews, many of the Slavs, Magyars, Roumanians, and Lithuanians and even Germans. Should the present minimum in stature for the United States Army and Navy be rigidly adhered to, from one-fourth to one-half of the men belonging to or descending from the nationalities mentioned would be excluded by this rule alone, thus resulting in serious disadvantages, chief among which would be that of placing a disproportionate burden in the formation of the Army on the naturally taller native American.

In view of the above facts, and as small stature in the large majority of cases signifies normal fluctuations and not any weakness or degeneration, and as has been repeatedly proven by the bantam regiments of England and other short stature troops of the European countries, the committee recommends that the minimum stature requirements for the new United States Army may be reduced, for all branches of the service, to 60 or at most 62, inches; and that corresponding with this the minimum weight requirement be reduced from 128 to 120 pounds. The maximum weight, circumference of chest (minimum 32 inches) and chest expansion (minimum 2 inches) of the present requirements need no modification.

Recommendations of this character, supported by such authority, very likely were largely responsible for the common opinion that physical standards might be safely reduced. It can readily be seen how great an effect such a modification of the standards would have in the direction of increasing the percentage of available men among certain racial groups. In 1917, there was a general feeling that young men of the age specified for the first draft, viz, between the ages of 21 to 30 years, inclusive, should be the only class called to the colors. These were the ages prescribed by the selective service act of May 18, 1917. The reasons generally adduced were that this group consisted largely of single men and that their business as well as family ties were relatively unimportant economically. This as a matter of fact is the age group from which most of our volunteers come both in war and peace. It should be noted in this connection that no change was made in the age rendering men liable to draft until August 31, 1918, when Congress made the age limits 18 to 45, both years inclusive.³² The latter age limits applied until the end of the war.

For the facts respecting physical standards, one must not only read the text of the Provost Marshal General's instructions on the subject, but one must also know how it was intended that these instructions be interpreted and how they actually were interpreted. Their interpretation usually gave the benefit of the doubt on the side of acceptance, and this likewise was provided for in the Provost Marshal General's instructions. The suggestive force of section 16 in "Rules and Regulations Prescribed by the President for Local and District Boards" (May 18, 1917) is an illustration of this; "* * * the doubt shall be resolved in favor of such person's physical qualification for military service, and he shall be held to be physically qualified for such service."

While some of the Provost Marshal General's instructions stated in the introduction that fitness to perform the duties of a soldier under the rigors of modern warfare was the criterion for acceptance, these statements did not accord with the latitude permitted by the more specific instructions in the text.

Physical standards prescribed for foot conditions, defective vision, and for several other defects and disabilities were modified by qualifying clauses and by various instructions, apparently on the presumption that the local board physicians were liable to be deceived by the registrants, who must not be allowed to get the notion that they could practice deception on the local board by these or similar forms of malingering. Physicians were warned in Form 11, P. M. G. O., that the nonpathologic flat-foot is a common condition among certain classes of men; and again, in Changes, Selective Service Regulations, No. 3, it is stated at the end of the section prescribing the standard for lower extremities (sec. 184): "Reject no foot cases."

From the first, selective service men suffering from venereal diseases were accepted, save primary and secondary syphilis, and the latter were also deemed acceptable by instructions published as early as November, 1917. No data are available to show how many men with such diseases were accepted early in the war.

Form No. 11, P. M. G. O., was wholly revised on November 8, 1917, the new standards being embodied as Part VII, "Physical examination," in a large Provost Marshal General's pamphlet entitled "Selective Service Regulations." While these standards do not conform to those in the Surgeon General's "instructions" of August 25, 1917, nevertheless the revision was a great improvement on Form No. 11, P. M. G. O., in that it was much more definite. This was particularly true as to cardiovascular conditions and tuberculosis. Mental and nervous conditions were also now defined and definite causes for rejection were stated. The minimum visual requirement was made definite, 20/100 in either eye without glasses if correctible to 20/40 with glasses in at least one eye. The registrant was required to have at least 8 serviceable, natural masticating teeth, either bicuspids or molars, 4 above and 4 below opposing, and 6 serviceable natural incisors or canines, 3 above and 3 below opposing. One molar above and one below on one side must occlude. This requirement for masticating teeth was above that for the Regular Army, but "teeth restored by crown or fixed bridge work" were accepted as "serviceable natural teeth," and this had not been the practice for the Regular Army. In one respect this revision was downward, namely, as regards syphilis in the primary and secondary stages, which was no longer considered disqualifying.

The Selective Service Regulations of November 8, 1917, introduced a questionnaire for all registrants; and a grouping in five classes according to order of liability for service. It was wisely decided now that physical examinations should be made only of men in Class I, those subject to immediate call. These regulations prescribed a further step in the direction of a more definite estimate of the man power of the Nation, so far as this class was concerned, viz, the physical classification of those examined into three groups. The first included men qualified for "general military service"; the second, men qualified for "special or limited military service"; and the third, those "deficient and not qualified for military service." The plan adopted had further advantages, however, for it placed on the registrants a sense of individual responsibility, whether they were called immediately to the colors, held in reserve for a deferred call, or exempted in order to help carry on important industrial procedures or other duties essential for prosecuting the war. The three physical classes of Class I were, to a degree at least, suggested by the experience of some of our Allies who had determined on a similar grouping of men already in the service. It will be shown presently that the purport of this classification was variously understood and was not uniformly interpreted, even in official communications. In Selective Service Regulations of November 8, 1917, which is the first authority for division into "general military service" and "special or limited service" groups, the physical standards (Pt. VIII), though modified in other respects as compared with previous standards, do not refer to the new classification under the subheads treating of various defects and disabilities. Section 188, however, required a special report in each case in which the registrant was found to be physically disqualified for general military service, stating that:

The examining physician will ascertain the nature of the trades, professions, or other civil occupations of registrants and will report to the local board, in the proper place on the form for physical examination, whether in his judgment the registrant is physically capable of rendering special or limited military service in any such trade, profession, or occupation, or in a similar capacity. This information is desired in order that, if the exigencies of the war so require, the War Department may call upon such men for service other than active military service in the field.

SPECIAL BOARD FOR REVISION OF PHYSICAL STANDARDS

In 1917 it was strongly urged by certain leaders of the medical profession who were particularly interested in the organization of medical advisory boards that a board, including specialists in medicine and surgery and officers familiar with medical organization and administration in the Army, should be appointed to revise the standards for physical selection, especially in connection with the new classifications for general and for limited service, and also to define the functions of specialists on the medical advisory boards. On recommendations of the Surgeon General such a board was appointed by paragraph 272, Special Orders, No. 303, War Department, December 29, 1917, and was directed to meet in Washington for the purposes stated. The personnel consisted of 3 officers of the Medical Corps, 10 officers of the Medical Reserve Corps, and 1 contract surgeon. The first results of the labors of this board are shown in Changes to Selective Service Regulations No. 3, January 28, 1918, Part VIII, "Physical examinations," and in Manual of Instructions for Medical Advisory Boards, Form 64, P. M. G. O., February 14, 1918. These must be discussed together.

One far-reaching result of their revision was the establishment of another physical class, the so-called "deferred remediable group," making in all four groups for physical classification of registrants. Form 64, P. M. G. O. (p. 3), provides as follows:

The regulations (Pt. VIII) governing physical examinations by local boards prescribe a standard of unconditional acceptance and a standard of unconditional rejection. All cases found, upon physical examination by a local board, falling between these two standards shall be referred by the local board to the medical advisory board in the same manner as other cases that are required by these regulations so to be referred. Cases so referred as falling between these two standards, and cases referred to medical advisory boards under other provisions of these regulations, shall be examined by the medical advisory boards, who, after examination in accordance with the Manual of Instructions for Medical Advisory Boards (Form 64, P. M. G. O.), shall:

- a. Accept the registrant as physically qualified for general military service; or,
- b. Accept the registrant as physically qualified for general military service when cured of ——— (naming a remediable defect for which acceptance is authorized in the Manual of Instructions for Medical Advisory Boards, Form 64, P. M. G. O.); or,
- c. Accept the registrant as physically qualified for special or limited military service in a named occupation or capacity; or,
- d. Reject the registrant;

and shall record their finding in the proper spaces provided on Form 1010.

* * * * *

Medical advisory boards shall find a registrant physically qualified for general military service when cured of a remediable defect (rule B above) only in those cases when such acceptance is specifically authorized in the Manual of Instructions for Medical Advisory Boards (Form 64, P. M. G. O.), namely, when a registrant is found to fall within the "deferred remediable group."

* * * * *

* * * and such registrant shall be inducted into military service, after his order number is reached, and at such time as may be designated by the Surgeon General of the Army, and shall be sent to cantonment base hospitals, reconstruction camps, or civic general hospitals as may be determined by the Surgeon General.

Registrants shall be found by medical advisory boards as "physically qualified for special or limited military service" (rule C above) only in those cases described in the Manual of Instructions for Medical Advisory Boards (Form 64, P. M. G. O.), and in such cases the medical advisory boards shall designate the occupation or class of service for which such persons are physically qualified in the space provided on page 2, under the general heading "Physically qualified for special or limited military service as" ———. If such finding is confirmed by the local board, the same shall be indicated on the classification list as provided by section 124.

The avowed purpose of the set of standards issued under the title "Selective Service Regulations, Changes, No. 3," of January 28, 1918, was to instruct local board physicians as to what individuals they might unconditionally accept or reject; all other registrants (represented by certain substandard men in Groups B and C, as well as doubtful cases) must be referred to the medical advisory boards for opinion. The minimum requirement (unconditional acceptance) for height was 60 inches; for weight, 114 pounds; for chest measurement, 30 inches. The standards as a whole for unconditional acceptance were lower than the standards of November 8, 1917, depending, however, to some extent on the interpretation made, which was liable to a good deal of variation; for example, under paragraph 184, subparagraph (p):

Lower extremities: Accept all registrants with movable joints and no deformity which interferes with walking and weight-bearing power. Accept all registrants with varicose veins when not associated with edema and leg ulcer. Accept all foot and ankle lesions if they do not interfere with wearing of an ordinary shoe and with walking and weight-bearing power; hammer-toe, hallux valgus, bunion, callosities, the different types of flat, club, and claw foot are to be accepted if they come within the above requirements. Refer all doubtful cases to the medical advisory board. Reject no foot cases.

In the experience of the camp surgeons it would appear that the local board physicians did not discover many doubtful foot cases during this period, judging by the number coming to the camps with orthopedic disabilities of this character. Another bone of contention between the local boards and the camp surgeons had its origin in the provision for unconditional acceptance under subparagraph (k): "Abdomen: Accept all registrants with small or medium reducible inguinal, femoral, umbilical, and postoperative hernias." In the Manual of Instructions for Medical Advisory Boards (Form 64, P. M. G. O., February 14, 1918), under the heading of "Hernia," the wording is as follows:

All other types and degrees of hernia not mentioned in the regulations for local boards shall be carefully studied by the medical advisory board. If after this examination it is the opinion of the medical advisory board the hernia is remediable by operation and the registrant is otherwise physically fit, the registrant shall be accepted for general military service in the deferred remediable group (Group B) and diagnosed hernia.

Very naturally it was thought in some camps that all hernias requiring operation to make the registrant fit for full military service belonged to the deferred remediable group and in consequence should not be sent to camp until directed by the Surgeon General. This being the interpretation in some camps called forth telegraphic instructions from The Adjutant General on February 7, 1918, as follows:³³

You are ordered that no men sent by selective boards shall be rejected by the division surgeon on account of affections of the ear, nose, and throat, of the feet, or operable defects such as small hernias and of all other conditions within the standard for unconditional acceptance. Examination of heart and lungs and provisions of Circulars 20 and 21, Surgeon General's Office, will be carried out as heretofore.

When, on February 14, 1918, Manual of Instructions for Medical Advisory Boards, Form 64, P. M. G. O., was approved and issued, the camp surgeons were furnished copies of C. S. S. R. No. 3 and of Form 64, to serve as a combined guide to their action with regard to registrants received at camp.

GROUP B; DEFERRED REMEDIABLE GROUP OF REGISTRANTS

On account of this group, many new difficulties at once confronted all concerned with the physical examination of drafted men. The question as to when and where the registrants with remediable defects and disabilities should be operated on was apparently the source of much trouble. The wording of the instructions regarding deferred remediable cases in Form 64, P. M. G. O., viz, "Such registrants shall be inducted in military service * * * at such time as may be designated by the Surgeon General of the Army and shall be sent to cantonment base hospitals, reconstruction camps, or civic general hospitals, as may be determined by the Surgeon General," indicates that there was an intent to select a special time and place for calling such persons for operation. On the other hand, while Form 64 specifies definitely that certain types of disabilities and defects shall belong to Group B, it does not state that all cases positively requiring surgical operation in order to become fit for full military service shall be classed in that group. Despite the provision that the Surgeon General was to designate the time for the induction of deferred remediable groups, great numbers of men belonging to such groups were sent to camps without the knowledge or authority of his office.³⁴ It was natural that division and camp surgeons should have felt it was not the spirit of the regulations that hundreds of cases requiring operations should be accepted in camp as fit for full military service when the local boards had determined an operation was necessary to make them capable of rendering service. Furthermore, operations of election during the winter and spring of 1918 were out of the question in the camps or elsewhere on account of the great prevalence of measles, scarlet fever, pneumonia, meningitis, and hemolytic-streptococcus infections, which not only taxed the hospitals to the limit but also rendered elective surgery highly inexpedient. At one time there were about 10,000 hernia cases in military stations awaiting definitive treatment.³⁴

It would appear that War Department General Orders, No. 18, February 14, 1918, Section IV, and General Orders, No. 29, March 26, 1918, Section III, which now for the first time are considered, were prepared in view of setting a time for sending Group B men to camp for operations. These orders required that in the event of a soldier refusing to submit to medical or dental treatment or to surgical or dental operations, a board of three medical officers should be convened to examine the case; if this board determined that such operation or treatment was necessary to enable the soldier to perform properly his military duties, and he persisted in his refusal after being notified of the

findings of the board, he might be tried by court-martial under the ninety-sixth article of war for conduct to the prejudice of good order and military discipline. No record data show that a special call was ever made for the induction of Group B men. Yet they were sent to the camps in large numbers, and the medical authorities in the camps were prevented from having non-essential operations performed, as already shown, by fear of infection and by reason of overcrowded hospitals and limited personnel.³⁵ The great numbers of deferred remediable types in camp occupied tent and barrack space urgently needed for able-bodied men in the spring and summer of 1918. By the time conditions in camp hospitals were more favorable for surgical intervention, a newly adopted set of standards had changed the classification of men with hernias and many other remediable conditions, and so operative treatment was not urged; consequently, most such deferred remediable cases either remained in the service without operation or were finally discharged on certificate of disability.

Correspondence and instructions from the offices of The Adjutant General, the Provost Marshal General, and the Surgeon General during the first half of the calendar year 1918 are replete with references indicating the difficulties which resulted from the Group B cases.³⁶

The division surgeons very generally interpreted The Adjutant General's instructions of February 7, 1918 (see p. 465) as meaning that they must use every care as regards heart and lung conditions, but with reference to the other defects mentioned, they must accept the men sent by the local boards. The following extract from indorsement of April 29, 1918, sent by the Surgeon General to The Adjutant General seems to indicate that the above instructions had proved to be a trouble maker: "It is requested that so much of instructions contained in telegram, A. G. O., dated February 6, 1918, and A. G. O. letter dated February 7, which reads as follows, be revoked."³⁸ Here is embodied the paragraph quoted above from The Adjutant General's communications of February 6 and 7, 1918.

The following telegraphic directions from the Provost Marshal General's Office are further indications of the difficulties that were being experienced:³⁹

Number B-931.

MAY 18, 1918.

To all governors and draft executives:

Anticipating the promulgation of new physical examinations regulations which will clear up many doubts and inconsistencies to existing regulations, The Adjutant General of the Army and the Surgeon General of the Army have issued instructions to examining surgeons at camps by reason of which the latter are rejecting some registrants with slight remediable defects, although properly sent to camp by local boards under existing regulations. In order to avoid expense please instruct all local boards not to induct for general military service registrants having hernias of any kind or degree, or those having foot conditions which interfere with weight bearing or with wearing military shoes, or those having teeth below present dental requirements, whether remediable or not. Please promulgate to local boards as promptly as possible.

CROWDER.

The above quotations emphasize the acuteness of the situation in regard to this matter. The following telegraphic instructions from The Adjutant General gave the camp surgeons a more definite guide as to the disposition of Group B cases, as well as of limited service cases:⁴⁰

Registrants falling into Group B, see page four, Form sixty-four, Manual of Instructions for Medical Advisory Boards. Registrants qualified for general military service "when cured of ——," should not be inducted into camps; no call for such having been made. It is not contemplated that medical examiners in camp shall group inducted registrants as qualified for general military service "when cured of ——," nor group others as qualified for special and limited military service. Medical officers at camp must decide finally whether or not registrant is physically and mentally qualified for general military service. If registrant is found to have defect not curable, he should have been grouped for special and limited military service by his local board, for a named occupation or capacity; he may be retained in camp if necessity exists for his particular qualifications. In other words, registrants sent to camp who can not qualify for general military service because of remediable conditions may be rejected from camp and returned to their local boards for proper classification or grouping as indicated by the defects disqualifying for general military service. Muster-in and service forms should harmonize with the final decision of the medical officers at mobilization point.

McCain.

The vexatious problem of the deferred remediable class (Group B), which in the first half of 1918 was a source of so much trouble and controversy, gradually ceased to be an important factor as the standards and regulations which had evolved this group were replaced by the publication of other rulings on the subject.

On June 5, 1918, a new set of standards went into force for both local boards and camp examiners; for the first time they now had identical instructions. This change was promulgated in Form 75, P. M. G. O., for the local boards and in Special Regulations, No. 65, W. D., for the use of the Army, the two being identical except for the cover. This revision of standards was the direct outcome of the difficulties immediately preceding. The wording of the new instructions was clear and free from equivocal statements which might admit of varied interpretations by different readers.

While the deferred remediable group was retained in essentially the same form, a new clause provided as follows:

11. Local boards may not induct registrants accepted for general military service who are in the deferred remediable group (Group B) or for special or limited military service (Group C), until a special call has been made by the Provost Marshal General's Office for these groups of registrants.

The classification of registrants into Groups A, B, C, and D was placed entirely within the jurisdiction of the local boards, without reference to the advisory boards. This made the function of the medical advisory boards truly advisory and simplified the interpretation of the standards in a marked degree. Clear distinctions were drawn between the duties of medical advisory and of district boards. As regarded the standard for classification of the individual, the alterations from previous requirements were relatively unimportant. The most decided changes were under orthopedic conditions and hernia, as might be expected. On account of the previous misunderstandings which had occurred particularly in these respects, the new orthopedic standards were based entirely upon pathological conditions and symptoms in a scientific manner. The language of the following is plain:

78. Registrants who on examination are found to present the following defects shall be unconditionally rejected for all military service * * *.

(t) Absent longitudinal arch of the foot associated with one or more of the following conditions:

- Limitation of dorsal flexion.
- Rigid metatarsal and subastragaloid joints.
- Rigid toes.
- Marked pronation.
- Prominent scaphoid associated with other disabling foot conditions.

(u) Rigidity of the tarsus and metatarsus due to former infectious processes with or without flat-foot.

(v) Obliteration of the transverse arch associated with permanent flexion of the small toes (claw toes).

(w) Prominence of the plantar surface of the transverse arch especially when associated with large callosities.

(x) Abnormal flaccidity of the foot and toes when associated with rigidity of the tarsal joints and painful symptoms.

(z) Loss of dorsal flexion of the great toe if of a degree to be a disabling factor in walking.

(aa) Hallux valgus if severe and associated with exostoses or a bunion of any considerable size, especially when there are signs of irritation about the joint.

(bb) Loss of great toe.

(cc) Loss of more than two small toes of either foot.

(dd) Clubfoot of even moderate degree, if correction of the condition has not been sufficient to meet the standard requirements. (See par. 23 (n).)

Hernias in any form were no longer to be unconditionally accepted, but might be conditionally accepted for general military service in the deferred remediable group. It will be seen that there had been a decided raising of the standards for acceptance of orthopedic defects; the like was true respecting neuropathic conditions.

The induction of a Group B registrant (deferred remediable class) was authorized only at such time as might be designated by the Surgeon General, on order issued by the Provost Marshal General's Office.³⁶

In the new standards (class A) the minimum for height and weight was raised to 63 inches and 116 pounds, respectively. This was done, as the result of strong recommendations made by commanding generals of divisions, who claimed that shorter men could not carry the packs and could not keep up with the taller men on forced marches. A reconsideration in this respect was soon made, and in July, 1918, instructions were telegraphed to local boards and camp surgeons which restored the minimum height and weight standard of 60 inches and 110 pounds, respectively.⁴¹

Form No. 75, P. M. G. O., was revised on September 27, 1918. The important change consists in the redistribution under Groups B and C. Nearly all of the conditions previously classed as operable conditions in the deferred remediable class (Group B) were classified for limited service (Group C), thus placing such men among those who might be included in special calls for particular occupations without undergoing operation. This change left only a few rather unimportant and rare conditions in the deferred remediable group.

The next revision of standards, under date of September 27, 1918 (Form 75, P. M. G. O., second edition), greatly reduced the number of conditions included in Group B, and the hernia cases, which had caused so much trouble in the spring of 1918, were transferred from Group B to Group C (special and limited military service). The text read as follows:

Group B is restricted to drug addicts, to those having deformities which may interfere with the wearing of a uniform, and to a few special conditions cited in the text.

PHYSICALLY UNFIT MEN SENT TO CAMP

About 324,000 men were found physically unfit at the camps, either early or sometimes only after months had passed. This number was made up as follows: Rejections from the first draft, about 29,000;⁴² rejections from the draft between February 10, 1918, and the date of the signing of the armistice, November 11, 1918, about 172,000;⁴³ discharged from the Army for disability, about 123,000.⁴⁴

GROUPS B AND C OF REGISTRANTS

According to the Provost Marshal General's report, only 108,355 of Group C men (limited service men) were called into service during the draft period, and none of Group B. Yet, as a matter of fact, it is realized that many men who should have been classed in Group B actually reached camps, because of various misapprehensions regarding the instructions. Among the 108,355 Group C registrants called, there were 16,488 rejected at camps before induction. About 20,000 additional limited service men entered the Army through individual induction, making a total of approximately 111,867 Group C soldiers actually accepted for military duty.⁴⁵

The following quotation is pertinent in this connection:⁴⁶

A careful study was made of 10,000 limited service men in the camp for this class of registrants at Syracuse, N. Y., and it is worth while to note what were the prevailing disabilities in the group. Among the 10,000 individuals, a little over 10,600 disabilities and defects were recorded. These were apportioned about as follows: Disabilities referable to orthopedic and bone and joint conditions, 4,989, of which about 2,500 might properly be called orthopedic; to insufficient teeth and allied conditions, 2,695; to deficient height and weight, 1,929; to eye defects, 1,936; to genitourinary conditions, hemorrhoids and hernias, 1,820; to cardiovascular conditions, 1,082; to neuropsychiatric conditions, 259; to ear, nose, and throat defects, 203; to pulmonary conditions, 168; to skin lesions, 51. As a matter of fact, more than 22 per cent of these men were found unfit for any service and were placed in Group D. An investigation of a certain body of these class C men who were afterwards assigned to the coast defenses showed that many were soon found unfit for duty and were ultimately recommended for discharge, the principal defects being referable to weak feet and to heart conditions. Of the defects and disabilities referable to teeth it may be said that all of the 2,695 should have had definitive treatment before being assigned to any branch of the service. Men with teeth so bad as to fall below the existing standards may be considered definitely substandard, and as assignments were made to various small stations, there could not be any guaranty that the necessary work would be completed. A dental problem of this kind could have been properly handled by holding such men at the mobilization camp where they were inducted until essential treatment or operative procedures were completed. Of the orthopedic defects the probability was that very few ever would make good, judging from experience in similar cases at other camps. Of the cases classed as deficient in height and weight, about 1,800 were underweight. Such men put in offices as clerks and messengers undoubtedly would render valuable service, but with most such young men, weighing less than 110 pounds, it is more probable that an outdoor life with systematic physical exercise and training was indicated, and this would not be obtained if they held clerical positions. Of the venereal cases, none would be of any use to the service until cured, and the date of cure was uncertain, and, even in favorable cases, distant. Most of the individuals with hernia should have received operative treatment, but probably few did. Of the severe hemorrhoid cases the same may be said. Among the 259 instances of neuropsychiatric conditions, it is considered that the Government was accepting a liability rather than gaining an asset in the majority of instances. Nearly all of the 1,000 cardiac cases would be poor risks from an insurance standpoint; in many of them the condition was liable to be aggravated as the result of service; therefore, it is believed that it would have

been better for the service if they had never been accepted. This leaves a possible 4,000 individuals—including part of the bone and joint conditions, the visual, aural and nasal defects, and some few of the neuropsychiatric conditions—who, if fitted into suitable positions, might possibly make good to some degree at least.

VENEREAL CASES

As previously noted, venereal cases were deemed acceptable. At the same time men with venereal disease were rigidly excluded, so far as might be, from serving abroad.⁴⁷

After the passage of the selective service act in May, 1917, the first set of physical standards for induction into the service was issued by the War department, on July 2, 1917, under the title "Regulations Governing Physical Examination under the Selective Service Act, Form No. 11, P. M. G. O." While this was followed by five other regulations on this subject, each containing certain modifications, with a gradual lowering in the general standards required, so far as syphilis, chancroids, and gonorrhoea were concerned, the requirements were not altered after the second set of standards (Selective Service Regulations, Part VIII, "Physical examination") was issued November 8, 1917. The regulations published July 2, 1917, were thus worded with reference to venereal diseases:

3. The following defects are causes for rejection:

* * * * * * *

Syphilis when discernible by inspection and physical examination; tight urethral stricture; * * * Gonorrhoea, acute and chronic, is not disqualifying, but individuals so affected should be advised immediately to secure appropriate medical treatment pending receipt of orders to report for duty.

* * * * * * *

Subsequent regulations, those issued November 8, 1917, provided:

Syphilis is a cause for rejection only when permanently incapacitating. Syphilis in the primary and secondary stages—that is, during the infectious period—chaneroid, and gonorrhoea, acute and chronic, are not disqualifying, but individuals so affected should be advised immediately to secure appropriate medical treatment pending receipt of orders to report for duty.

With the exception of a few men rejected for venereal conditions, by reason of camp examining boards not being acquainted with war-time physical standards, no selective service man was rejected by reason of an uncomplicated gonorrhoea, either acute or chronic. Until November 8, 1917, syphilis, when discernible by inspection and physical examination, was a cause for rejection. After this date, however, no syphilitics were rejected unless they had a complication which was permanently incapacitating.

REFERENCES

- (1) Second Report of the Provost Marshal General, December 20, 1918, 369, Appendix J, A summary of the Civil War Draft. (Based on Final Report by the Provost Marshal General of the Operations of the Bureau of the Provost Marshal General of the United States from March 7, 1863, to March 17, 1866.)
- (2) G. O. No. 65, W. D., May 22, 1917.
- (3) Selective Service Regulations. (Form 999, 1917.) On file, Law Library, Office of the Judge Advocate General.
- (4) Registration Regulations (May 18, 1917). Section (b) 5; Section 10, 6. Rules and Regulations prescribed by the President for Local and District Boards (June 30, 1917), section 4, 12. On file, Law Library, Office of the Judge Advocate General.
- (5) Selective Service Regulations of November 8, 1917, section 42, 20. On file, Law Library, Office of the Judge Advocate General.
- (6) Selective Service Regulations of November 8, 1917, sections 32-36, inclusive, 16-18. Also: Edition of September 16, 1918, 20-22. On file, Law Library, Office of the Judge Advocate General.
- (7) Selective Service Regulations, November 8, 1917, Section 29, 14; Section 44, 22; Section 123, 63. On file, Law Library, Office of Judge Advocate General.
- (8) *Ibid.*, section 177.
- (9) *Ibid.*, September 16, 1918, section 177 (a).
- (10) Questionnaire (Form 1001, Provost Marshal General's Office) Contained in Selective Service Regulations, November 8, 1917, section 268. On file, Law Library, Office of the Judge Advocate General.
- (11) Selective Service Regulations, November 8, 1917, section 29. On file, Law Library, Office of Provost Marshal General. Also: Second Report of Provost Marshal General to the Secretary of War, 1918, 150.
- (12) Section II, G. O. No. 72, W. D., August 6, 1918.
- (13) Form 11, P. M. G. O., July 2, 1917.
- (14) Form 11, P. M. G. O., July 2, 1917; G. O. No. 66, W. D., 1910.
- (15) Second Report of Provost Marshal General to the Secretary of War, 336.
- (16) Memorandum No. 3, Surgeon General's Office, August 22, 1917, republished in "Instructions for the Physical Examination of Drafted Men at National Army Cantonments" (War Department, S. G. O., 1917). On file, Record Room, S. G. O., Document File.
- (17) Report of the Provost Marshal General, on the first draft, 1917, 26.
- (18) Telegram from the Surgeon General, September 17, 1917, to Division Surgeons, six National Army Camps; and replies thereto. On file, Record Room, S. G. O., 172229 (Old Files).
- (19) Letter from The Adjutant General to the Surgeon General, April 17, 1918. Subject: Physical examinations. On file, Record Room, S. G. O., Correspondence File, 327.2 (Examinations).
- (20) First indorsement, War Department, A. G. O., to the S. G. O., May 8, 1918, to telegram from Commanding General, Camp Wadsworth, South Carolina, to The Adjutant General, of May 3, 1918. Subject: Drafted men found physically unfit for overseas service. On file, Record Room, S. G. O., Correspondence File, 327.2 (Examinations, Camp Wadsworth) (D).
- (21) Bulletin 32, W. D., seventh section, May 24, 1917.
- (22) Memorandum to division surgeons, camp surgeons, *et al.*, from the Surgeon General, May 1, 1918. Subject: Method of examining drafted men at Camp Lee, Va. Copy on file, Historical Division, S. G. O.
- (23) Office Order No. 97, S. G. O., (November 30, 1918. On file, Record Room, S. G. O., Correspondence File, 024.13 (Sanitation Division).
- (24) Telegram from the Surgeon General, to all camp surgeons and other senior surgeons of commands, April 29, 1918. Subject: Single examination. On file, Record Room, S. G. O., Correspondence File, 327.2 (Examinations).

- (25) Letter from The Adjutant General to all Department Commanders, Commanding Generals, of all Divisions and Ports of Embarkation, and Commanding Officers of all camps, recruit depots, and excepted places, August 22, 1918. On file, Record Room, A. G. O., Correspondence File, 342.15 (Miscellaneous Division).
- (26) Circular Letter, Surgeon General's Office, to all Camp and Division Surgeons and to Surgeons at recruit depots and other independent commands; to all Department Surgeons and to Officer in Charge Air Service Division, September 21, 1918. Subject: Reports regarding examination of drafted men. On file Record Room S. G. O., Correspondence File, 327.2. (Examinations) (Mimeograph No. C-360).
- (27) Monthly Reports of Examinations of Drafted Men. On file, Record Room, S. G. O., Correspondence File, 372.2 (Examinations, Name of Camp) (C).
- (28) Second Indorsement S. G. O., May 10, 1918, To Construction Division, War Department; Also: Methods of examining given in Sanitary Inspection Report, June 5, 1918, by Col. H. P. Chamberlain, M. C. On file, Record Room, S. G. O., Correspondence File, 721.6 (Jefferson Barracks) (N).
- (29) Letter from the Surgeon General to The Adjutant General, July 1, 1918. Subject: Examining Pavilion. On file, Record Room, S. G. O., Correspondence File, 632-1 (General).
- (30) Building plans for physical examination: See Memorandum for Assistant Secretary of War from Assistant Chief of Staff, September 24, 1918, recommending approval for Recruit Examining Building (approved October, 1918). On file, Record Room, A. G. O. 652 (Miscellaneous Division).
- (31) Report from the Committee on Anthropology of the National Research Council: Published in *American Journal of Physical Anthropology*, Washington, 1918, i.
- (32) Second Report of the Provost Marshal General, 1918, 26.
- (33) Telegram from The Adjutant General, to Department Commanders, Commanding Generals of all Regular Army, National Army, and National Guard Divisions, and Commanding Officers of all excepted places, February 7, 1918. On file, Record Room, S. G. O., Correspondence File, 327.01 (General). Also: "Instructions relative to examinations of applicants for enlistment and for registration in the selective service" (February 21, 1918). On file, Record Room, A. G. O., 220.12 (Miscellaneous Division.)
- (34) Data compiled from Forms 52 (Sick and Wounded cards). On file, World War Division, A. G. O.
- (35) Correspondence and reports from various camps. On file, Record Room, S. G. O., Correspondence File, 724.-1 (Overcrowding, under name of hospital. Also: 721. (Medical Inspectors' Reports, under name of hospital.)
- (36) Correspondence on Group B Cases. On file, Record Room, S. G. O., Correspondence File, 327.2 (Examination of Drafted Men) and 327.01 (Regulations National Army) General.
- (37) Letter from The Adjutant General to all National Guard Divisions, February 7, 1918. Subject: Selective Service Regulations. On file, Record Room, S. G. O., Correspondence File, 327.01 (General).
- (38) First indorsement of April 29, 1918, from the Surgeon General to The Adjutant General, on letter from The Adjutant General, to the Surgeon General, April 17, 1918. Subject: Excessive losses of men while in training. On file, Record Room, S. G. O., Correspondence File, 327.2 (Examinations).
- (39) Copy of telegram, with 1st indorsement S. G. O., May 20, 1918, referring same to all department surgeons, division surgeons, surgeons at recruit depots, surgeons, ports of embarkation, chief of Air Service and surgeons of independent posts or camps. On file, Record Room, S. G. O., Correspondence File, 730 (Orthopedics, Camp Wheeler) (D).
- (40) Night letter, from The Adjutant General to Commanding Generals at camps, cantonments, and commanding officers, Recruiting Depots, Depot Posts, and other independent stations, May 11, 1918. On file, Record Room, A. G. O., Correspondence File, 220.81 (Miscellaneous Division).

- (41) Telegram from The Adjutant General to Department Commanders, Commanding Generals of all Regular Army, National Army, and National Guard Divisions, Commanding Officers of all excepted places and Bureau Chiefs, July 18, 1918. Subject: Change of minimum height for selective service registrants. On file, Record Room, S. G. O., Correspondence File, 327.2 (Examinations).
- (42) Report of the Provost Marshal General on the first draft, 1918, 45.
- (43) Report of the Provost Marshal General on the operations of the selective service system to December 20, 1918, 162.
- (44) Data compiled from Form 52 (Sick and Wounded cards). On file, World War Division, A. G. O.
- (45) Second Report of Provost Marshal General on the operations of the selective service system to December 20, 1918, Table 50, 154.
- (46) Based on reports filed in Record Room, S. G. O., Correspondence File, 322.171-1 (Syracuse Recruit Camp) (C) and 702-1 (Syracuse Recruit Camp) (C).
- (47) Letter from The Adjutant General of the Army, to all Department, National Guard, and National Army Division Commanders, November 15, 1917. Subject: Control of venereal diseases. On file, Record Room, S. G. O., Correspondence File, 726.1 (Venereal) General.

CHAPTER XXI

PHYSICAL EXAMINATION ON DISCHARGE FROM SERVICE

PRELIMINARY STEPS TAKEN ON SIGNING OF ARMISTICE

During the war the rights of the individual were largely subordinated to duty toward the state. With the conclusion of active warfare and the consequent demobilization of the military forces, the rights of the soldier came to the fore. Having been exposed to the devices of the enemy, to the numerous accidents due to transportation machinery, to disease, to exposure in extremes of climate, to fatigue, and to overstrain, it was at once apparent that many men who at date of enlistment or induction fell within the class of physically fit (Group A), should at time of discharge be placed either temporarily or permanently in a lower physical classification; in other words, that many men had been more or less harmed as a result of their military service. Following our practice of the past, the Government gladly accepted the responsibility of indemnifying these individuals. On the other hand, in the interest of the taxpayer, the United States must be prepared to protect itself against unjust or fraudulent claims for compensation. This being the case it was necessary to make an accurate record of each soldier's physical condition just prior to the date of his discharge, such a record being fundamental for insuring justice alike to the Government and to the individual. The procedures necessary to carry out the policy in question were familiar, since a similar examination had been required at the close of the Spanish-American war¹ and during the demobilization of the militia on the Mexican border in 1916.² Immediately following the signing of the amistice on November 11, 1918, comprehensive plans were made for universal physical examinations, and for the record thereof, during the contemplated demobilization. On November 18, 1918, Circular No. 73, was issued by the War Department. The following extracts therefrom pertained to the Medical Department:

1. When definite orders are received for the separation of officers and enlisted men from service in the United States Army, either individually or by organization, the following instructions will govern.

2. Every officer and enlisted man will be given a critical physical examination, a record of which will be forwarded for file in The Adjutant General's Office as hereinafter prescribed. A carbon copy will be prepared for transmittal to the Bureau of War Risk Insurance, in case the officer or enlisted man has a wound, injury, or disease that is likely to result in death or disability.

* * * * *

5. The report of physical examination of officer must show the surname, Christian name, rank, and organization; occupation prior to entry in the service; a certificate by the officer showing whether or not at the present time he has a wound, injury, or disease, whether incurred in the military service of the United States or otherwise, and, if so, the nature and location; a certificate by an examining surgeon showing that the officer is physically and mentally sound, or that he is physically and mentally sound except that he has a defect, wound, injury, or disease, the nature and location of which to be described; that it is or is not likely to result in death or disability; that it did or did not originate in the line of duty

in the military service, and that, in view of occupation, the per cent he is disabled. In case the certificate of the officer and the certificate of the examining surgeon do not agree, the case will be submitted to a board of review consisting of not less than two medical officers convened by authority of the camp, post, or other station commander, which will consider the case, examine the officer, and complete the report showing their findings with relation to the matter covered in the certificate of the examining surgeon.

Form No. 395-1, A. G. O., now being distributed, will, when received, be used for the report of physical examination of officers. Until it is available the report will be prepared on 8 by 10½ inches letter paper.

* * * * *

9. The report of physical examination for enlisted men will contain the surname, Christian name, Army serial number; grade, company, and regiment or arm or corps or department; occupation prior to entry in the service; a declaration of the soldier witnessed by an officer relating to his physical condition; a certificate of immediate commanding officer as to the soldier's physical condition; a certificate of the examining surgeon showing data as given in paragraph 5; and if the declaration of the soldier and the certificate of the examining surgeon disagree the same procedure will be followed as prescribed above for an officer. Form No. 135-3, A. G. O., report of physical examination of enlisted man, is being distributed as rapidly as possible.

In the case of men who were accepted for special or limited service the words "Special or limited service" will be written or stamped across the top of the first page of Form 135-3, A. G. O.

* * * * *

22. The following instructions for conducting the physical examination prescribed in paragraph 2 will govern:

a. The physical examination will ordinarily be made in camps or stations in the United States to which troops have been ordered for demobilization, or at which they may already be. Such physical examination will be made and completed under the direction of the camp surgeon or other senior surgeon of the command with the least practicable delay. Except in doubtful or deferred cases, the examination of any individual officer or soldier should be completed on one day by the examining surgeon or a special examining board designated by the camp surgeon or other senior surgeon of the command.

b. Except in case of small commands, the camp surgeon or other senior surgeon of the command will appoint a medical officer experienced in the duties of examining boards and in conducting physical examinations, who shall be the chief medical examiner of that command.

c. The chief medical examiner will coordinate the duties of and have general supervision over the examining board. He will organize the personnel assigned to it into one or more examining teams, assigning the individual members thereof to such duties as the public interest may dictate. He will appoint a principal medical examiner for each examining team.

d. Each principal medical examiner will supervise the operation of his examining team and will be responsible to the chief medical examiner for the conduction of the physical examinations made by the team and the proper preparation of the necessary records. He will sign the certificate of examining surgeon on form for report of examination.

e. The examining board should consist of sufficient medical officers, including all necessary specialists. Experience has demonstrated that a well-balanced team may be composed somewhat as follows:

	Exam- iners
(1) General examination, including skin, general surgery, hernia, hemorrhoids, varicocele, varicose veins, etc.....	3
(2) Dental.....	1
(3) Orthopedic, including bones and joints.....	3
(4) Eyes.....	1
(5) Ears, nose, and throat.....	1
(6) Cardiovascular.....	3
(7) Tuberculosis.....	6
(8) Neuropsychiatric.....	3

f. In the physical examination of special or limited service men, medical examiners will interrogate the soldier as to the disability or defect which he had upon entrance into the service which placed him in the limited-service class. The physical examination of such men will be made with great care, with special reference to the defects which the man states that he had upon entrance into the service.

g. A report of each physical examination will be rendered upon Form No. 395-1, A. G. O., if for an officer, and upon Form No. 135-3, A. G. O., if for an enlisted man (see pars. 5 and 9). Should the certificate of the officer or the declaration of the enlisted man be at variance with the finding of the medical examiner, the officer or enlisted man will be immediately referred to a board of review convened by the camp, post, or regimental commander. A formal order convening the board is not necessary, and in large camps or posts the power to convene the board will usually be delegated to the camp or post surgeon.

h. The board of review will consist of not less than two medical officers, designated by the camp surgeon or other senior surgeon of the command. The board will be under the supervision of the senior medical examiner. After a thorough physical examination of the officer or soldier referred to it, together with a careful investigation of all the circumstances in the case, it will complete Form No. 395-1, A. G. O., or Form No. 135-3, A. G. O., as the case may be.

By order of the Secretary of War:

PEYTON C. MARCH,
General, Chief of Staff.

Official:

P. C. HARRIS, *The Adjutant General.*

Circular No. 73 continued in force throughout the demobilization period, being modified only in minor details by Circulars Nos. 81, 82, 101, 126, 137, 155, 162, 169, 177, and 188, W. D., 1918, Circulars Nos. 22, 114, and 166, W. D., 1919; and by Section II, paragraph 2, Bulletin 36, W. D., July 11, 1918. The last mentioned, which had a decided bearing on discharge from the service of certain classes of men, read as follows:

* * * * *

2. (a) Physical reconstruction is defined as complete medical and surgical treatment, carried to the point where maximum functional restoration, mental and physical, has been secured. In securing this result the use of work, mental and manual, will often be required during the convalescent period.

(b) Hereafter no member of the military service disabled in line of duty, even though not expected to return to duty, will be discharged from service until he has attained complete recovery or as complete recovery as it is to be expected that he will attain when the nature of his disability is considered. When the degree of recovery described in this paragraph has been attained, members of the military service who remain unfit for further duty should be discharged in the manner provided in Army Regulations.

During the earlier part of demobilization it was required that a copy of the physical examination form (135-3 or 395-1, A. G. O.), be transmitted to the Bureau of War Risk in every instance where a disability was claimed by the soldier or found by the examining board.³ At a later date this action was required only in cases where the officer or soldier had executed a claim for compensation.⁴

Many of the questions which had vexed the camp authorities during the examination of selective service men did not arise at the demobilization examination because of the wise provisions of Circular No. 73. The camp or senior surgeon was clearly given supervision of the examination procedures, and the question of control over the specialist groups had already been definitely settled shortly before the armistice (see Chap. XX). The boards of examiners had

been organized and were familiar with the methods necessary for the careful and expeditious handling of large numbers of men. In order that the work might be properly coordinated at the different stations, and with a view to providing for the rendition of a suitable current report of progress, the Surgeon General, on November 21, 1918, issued a memorandum to all camp surgeons and others concerned. This memorandum is given in full below because it well represents the results of experience accumulated during the physical examinations of the draft and the logical application of this knowledge to the reverse process of examination prior to discharge:

File No. S. G. O. 370 (Demobilization).

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, November 21, 1918.

Memorandum for camp surgeons, department surgeons, surgeons of independent posts, commanding officers of all hospitals, surgeons of S. A. T. C. units, surgeons ports of embarkation, chief surgeon, A. E. F., and officer in charge air division:

1. A thorough and complete physical examination will be made, by one or more medical officers of the Army, in the case of each officer and enlisted man, immediately preceding separation from service in the United States Army through muster out, resignation, dismissal, or discharge other than upon surgeon's certificate of disability. Circular 73, already issued by The Adjutant General of the Army, covers the general plan of the examination, but it is considered necessary that certain matters be treated in greater detail than is given in published instructions.

2. The existing machinery (examining boards) for the physical examination of registrants in camps and cantonments will be utilized, where available, in making physical examinations prior to separation from the service by muster out, resignation, or discharge. In the physical examination of registrants preceding their induction, the object of the physical examination has been to determine whether or not the registrant is physically fit for service. In the examination of officers and soldiers preceding their separation from the service, the primary object is to determine whether or not any physical or mental defects or disabilities exist as the result of military service, and in addition to make a judicial estimate, in cases where a defect or disability has been determined by the examining board, as to the degree of disability resulting from such defect or defects, having special reference to the individual's occupation. It will be seen, therefore, that the board for physical examination prior to muster out combines the functions of the examining board for registrants with those of the S. C. D. board.

3. In considering physical examinations before separation from the service, as already indicated, distinction must be made between the objects aimed at in examining registrants about to be inducted into the military service and those desired when soldiers are about to be separated from the United States Army. In the former case the problem is a medico-military one, it being necessary to secure men capable of performing arduous military duties. In the latter instance the problem is a medico-occupational one, the problem being to estimate and seek to form an opinion regarding the ability of the man to resume his former occupation. If occupational ability is found to exist in a lessened degree, and the cause thereof was incurred in line of duty, the United States Government is responsible and must provide compensation commensurate with the decrease in the earning power of the individual.

4. To insure justice to the individual officer or soldier and to protect the interests of the Government, it can not be too strongly emphasized that every effort must be made to secure most thorough and complete physical examinations, together with accurate records thereof. The provisions of the war risk insurance act are far-reaching. That reliable and sufficient data may be available for the proper adjudication of claims, incident to military service, it is essential that the War Risk Bureau be provided an exact statement of the physical or mental deterioration, if any, of each officer and soldier, as found at the date of separation from the service; also the degree of disability based upon earning capacity when the deteriora-

tion is the result of military service. To this end it is of great importance that care be exercised in recording all discoverable defects, whether or not such defects are claimed by the officer or soldier in his signed statement. The "degree of disability" will be recorded on a percentage basis indicating the estimated decrease in earning capacity of the individual examined in view of his occupation as reported on page 1 of Form 395-1 or 135-3, A. G. O.

5. In conducting physical examinations prior to separation from the service, the routine procedure of physical examination will ordinarily be that of examining boards in the examination of registrants. Examining teams will be organized, each with the necessary specialists and operating under the immediate supervision of a principal medical examiner. The principal medical examiner will sign the medical examination certificate covering the results of all examinations made by the other examiners assigned to his particular team. It is suggested that an informal card be adopted upon which will be noted and authenticated the findings of each examiner as the officer or soldier passes from one examiner to another. In addition to this notation, should a disability or defect be discovered in the particular organ or system under examination, the degree, in percentage, of such disability should be noted by the examiner discovering it. The degree of disability indicated will be but an expression of the opinion of the medical officer responsible for it. It will, however, be the result of the physical findings and the estimated decrease in the man's earning capacity, based upon his pre-war occupation. This informal card, with the notations made as described above, should be passed from one examiner to another until, accompanying the officer or soldier, it finally reaches the principal medical examiner. The action of that officer will be determined by the data noted on the card, his own personal examination, and a consideration of the man's decreased ability to earn a livelihood.

6. Estimation of the degree of disability will be made by the principal medical examiner of each examining team, after taking cognizance of the disability ratings furnished by each examiner concerned, together with an actual personal examination of the individual in question. The estimation of the degree of disability represents merely the opinion of the principal medical examiner. This opinion will be based upon the physical examinations and disability ratings made by the different special examiners, together with the findings reached at the general examination of the man concerned. It will therefore be the duty of the principal medical examiner to draw and record a resultant on the several opinions expressed by other medical officers as to the degree of disability, and to sign the required certificate. In reaching this decision due consideration must be given to the occupation of the officer or soldier prior to his entry into the military service.

7. A board of review will be designated by the camp surgeon, or other senior medical officer of the command, to act in cases where an officer or soldier claims a defect, as a result of military service, which can not be discovered or confirmed by the examining board. If the defect claimed by the officer or soldier is of a cardiovascular nature, in designating the composition of the board of review to act on this particular case, a cardiovascular specialist should ordinarily be assigned as a member. Likewise, if the claimed defect is orthopedic, dental, tubercular, or neuropsychiatric, one of the members of the board of review should ordinarily be an orthopedic, dental, tuberculous, or neuropsychiatric specialist other than the one on the original examining team.

8. The board of review should not contain as a member the principal medical examiner who has signed the certificate of the examining surgeon. When practicable the board should consist of officers other than those who conducted the examination which failed to discover or confirm the defect claimed by the officer or soldier.

9. The expression "The wound, injury, or disease $\left. \begin{array}{l} \text{is} \\ \text{is not} \end{array} \right\}$ likely to result in death or disability," found on pages 3 and 4 of Form 395-1 and 135-3, A. G. O., conforms to the wording of the war risk insurance act and should be handled as follows: Either the word "death" or "disability" may be stricken out if the finding warrant, and a clear explanation regarding the condition should be made under "Remarks."

10. If the officer or soldier makes no claim of disability or defect incurred as a result of military service, and if the examining board finds a defect or disability which in its opinion was the result of military service, or which has been aggravated by military service, the certificate of the examining surgeon should clearly set forth such conditions.

11. In the case of soldiers inducted for special and limited military service, the fact of such special and limited military service will be entered at the top of the first page of Form 135-3, A. G. O., before this form reaches the examining board. In such cases special care should be taken in the examination, and under the heading of "Remarks" should be entered a statement of the conditions which the soldier claims existed at date of induction.

12. In the case of a soldier who had a disability or defect prior to induction, and who has incurred an additional disability or defect during military service in line of duty, or who has had an existing defect aggravated by military service, discrimination must be made between the degree of disability actually due to the military service and that due to the defect which existed on induction. Full explanation should be made in such instances under the heading of "Remarks." Similar discrimination will be made and action taken when a soldier's occupational ability is decreased as a result of two disabilities, both incurred during military service but one of which is and the other is not in line of duty.

13. The responsibility for making physical examinations prior to separation from the Army rests with the camp surgeon or other senior surgeon of the command. If medical examiners are not available in sufficient numbers to meet the specific requirements of the station, camp or cantonment, prompt application should be made through military channels for the assignment of the necessary medical personnel. Wherever practicable it is desired that officers and men be examined by a well-balanced examining team of medical officers, and it is believed that in the great majority of cases this can be done. However, there are certain to be many men located at small stations or absent from their respective organizations at the date of muster out, who must be examined and mustered out individually. It is probable that such casualties can not be brought before a complete and well-balanced examining board, but will have to be examined by an individual medical officer. Instructions issued in Circular 73, Adjutant General's Office, provide for this contingency.

14. At the end of each calendar month the Camp Surgeon, or other senior surgeon of the command, will forward direct to the Surgeon General a report in duplicate regarding the work of the examining board. This report should be made out in the form shown in the succeeding pages and should be mailed on or before the 10th of the following month.

By direction of the Surgeon General:

(Signed) C. R. DARNALL,
Colonel, Medical Corps, U. S. A.,
Executive Officer.

Official:

ALBERT E. TRUBY,
Colonel, Medical Corps, U. S. A.

(Place and date)

MONTHLY REPORT OF PHYSICAL EXAMINATION MADE PRIOR TO SEPARATION FROM THE MILITARY SERVICE OTHER THAN BY CERTIFICATE OF DISCHARGE FOR DISABILITY AT-----
----- MONTH ENDING -----, 19--

I

	Number		
	White	Colored	Total
Officers examined.....			
Enlisted men examined.....			
Grand total.....			

II

	Number		
	White	Colored	Total
Found with no disability:			
Officers.....			
Enlisted men.....			
Grand total.....			

III

	Number		
	White	Colored	Total
Found with disability and copy of Form 395-1, A. G. O., or 135-3, A. G. O., provided for B. W. R. I.:			
Officers.....			
Enlisted men.....			
Grand total.....			

IV

	Number		
	White	Colored	Total
Number with acute conditions requiring immediate hospital care or other treatment:			
Active gonorrhoea.....			
Active syphilis.....			
Chancroids.....			
Body vermin.....			
Communicable skin disease.....			
Erythematous.....			
Active tuberculosis.....			
Insanity.....			
Other conditions.....			
Grand total.....			

V

Name of chief examiner.....
 Efficiency.....

VI

Number of examining teams.....

VII

Number of examiners on each team, indicating the number of each class of special examiners.....

VIII

Names of principal medical examiner of each team:

Surname	Christian name	Rank	Efficiency

IX

Nominal list of examiners ("S" to be placed before name if assigned to station or camp as specialist) on duty on the last day of the month:

Surname	Christian name	Rank	Specialty	Date of joining board

Relieved during month:

Surname	Christian name	Rank	Specialty	Date relieved

X

Number of officers and soldiers examined each day:

Day of month	Number examined	Day of month	Number examined
1.....		18.....	
2.....		19.....	
3.....		20.....	
4.....		21.....	
5.....		22.....	
6.....		23.....	
7.....		24.....	
8.....		25.....	
9.....		26.....	
10.....		27.....	
11.....		28.....	
12.....		29.....	
13.....		30.....	
14.....		31.....	
15.....		Total.....	
16.....			
17.....			

General remarks or suggestions for improvement of the service:

Medical Corps,

Camp Surgeon

The memorandum which has just been quoted did not require a classified report of the defects discovered by the camp examiners. It was soon found, however, that such classification would be very useful to the Surgeon General, and consequently a modified and somewhat more complete monthly report was called for by Circular Letter No. 114, S. G. O., March 4, 1919. The rendition of the latter report continued until demobilization was completed.

ARRANGEMENTS FOR DEMOBILIZATION EXAMINATIONS

The task of demobilizing over 4,000,000 men proceeded in practically every military station in the United States and in its insular possessions, but

it was at certain of the larger camps and posts that the major portion of the work was accomplished. In Circular No. 106, issued December 3, 1918, and in Circular No. 122, issued December 7, 1918, the War Department designated the following stations as demobilization centers:

Camp Beauregard, La.; Camp Devens, Mass.; Camp Dodge, Iowa; Camp Grant, Ill.; Camp Gordon, Ga.; Camp Hancock, Ga.; Camp Lee, Va.; Camp Logan, Tex.; Camp Custer, Mich.; Camp Funston, Calif.; Camp Greenleaf, Ga.; Camp Kearny, Calif.; Camp Meade, Md.; Camp Sevier, S. C.; Camp Taylor, Ky.; Presidio of San Francisco, Calif.; Columbus Barracks, Ohio; Camp MacArthur, Tex.; Camp Pike, Ark.; Camp Shelby, Miss.; Camp Sherman, Ohio; Camp Greene, N. C.; Camp Wadsworth, S. C.; Camp Jackson, S. C.; Camp Bowie, Tex.; Camp Dix, N. J.; Camp Travis, Tex.; Camp Humphreys, Va.; Camp Lewis, Wash.; Camp McClellan, Ala.; Camp Sheridan, Ala.; Camp Upton, N. Y.; Fort Logan, Colo.

It was the policy of the War Department to send men for discharge to the stations nearest their places of enlistment or induction, and every effort was made to carry out this policy for divisions,⁵ though this was not entirely feasible in the case of many overseas divisions because their original personnel had been greatly changed by replacements while in France. As a matter of fact, several camps near the Atlantic seaboard received an especially large number of men for demobilization. Then, too, from time to time there were various readjustments in the stations designated as demobilization centers, many being discontinued and a few others established.⁵

In the most important demobilization centers, which corresponded closely to the National Army cantonments, there existed, when the armistice was signed, well-organized medical examining boards, whose personnel was just having a breathing spell after the toil of handling the draft increments which had been crowded into the camps during the summer and early fall of 1918, and after the strain of combating the influenza epidemic, to which duty many members of the boards had been temporarily assigned when the sending of draft increments to camp was suspended because of the influenza. It was determined that the equipment, buildings, and examining personnel as organized for the draft examination, so far as might be, should be held in situ and put into reverse for the purpose of examining, first, the officers and men already in camp, and thereafter the troops brought back from overseas.³ As it proved, during early demobilization there was need for considerable shifting of medical personnel from camp to camp, but then with a fairly good supply of specialists available it was not found difficult to keep at each point as many examiners as were asked for by the camp surgeon. At a later period, when the medical officer personnel in camps and in hospitals was much reduced by War Department orders, and was further depleted by the discharge of medical officers who had put in strong pleas on economic and other personal grounds, the situation was not so easily handled. In a few instances surgeons attached to units returning from overseas were pressed into service to assist in the examining work, but on the whole this procedure was not found at all satisfactory, inasmuch as physical examinations had become well specialized and consequently it could not be expected that officers selected haphazard in this manner and assigned to the examining teams for a few days only could produce results nearly as good as those attained by officers permanently assigned to this duty.

Late in March, 1919, when the War Department issued orders for further reduction of camp personnel, especially in connection with demobilization work, the problem of maintaining adequate medical forces at each center became still more difficult.⁶

An estimate of the average capacity of a well-organized board at that time indicated that a team of 25 examiners could examine properly about 1,000 men daily. It was brought to the attention of the Surgeon General that, if the base hospitals were transformed into camp hospitals and the base hospital specialists thus placed under the control of camp surgeons, adjustments of personnel might be made locally to take care of peak loads when divisions arrived for demobilization, or at such other times as the regular examining boards had more than they could handle. However, as sick and wounded from overseas were still being sent to the base hospitals at the camps, it was not thought best to initiate such a change at this time. The situation was met in another way, viz, by the creation of a temporary general reserve of officers with a view to assignment on short notice at stress points.

Definite allowances in tables of organization for a demobilization group in each center were officially prescribed by War Department instructions of May 28, 1919.⁷ These were on a basis of 25 medical officers for each 1,000 troops to be examined daily, but no provision was made in the tables for additional personnel for the ordinary medical and sanitary services necessary in every camp. Consequently, at some points, particularly in certain debarkation camps, the efficiency of the examining boards was lessened by other details, and complaints were received that the thoroughness of the physical examination was being threatened thereby.⁸ Yet at some stations in which the camp surgeons were able to obtain from the base hospitals suitable temporary assignments for examining boards, this was avoided. However, the personnel difficulty continued to increase, for it became more and more difficult, as the months went by, to refuse approval to the requests for discharge made by the specialists connected with the examining boards, their applications being based on business and other personal reasons. The rank and pay of such officers in most instances were not commensurate with their ability, their needs, or their deserts. It should be noted in this connection that while provision had been made by War Department orders for holding such officers in the service,⁹ no plan had been adopted for their promotion or increase in pay, either on the basis of their economic needs or in recognition of the quality of their work, the importance of the positions then held, and the responsibility imposed thereby.

The examining boards for the most part retained in a general way the organization which had been established during the later period of the draft, though this was modified as was necessary to conform with Circular No. 73. The board of review has been added as a safeguard to satisfy all possible complaints of unfair treatment and to insure thoroughness in the examination. In many of the camps the board of review saw not only the cases which were officially referred to it under the provisions of Circular No. 73, but also all individuals in whom the examining board found evidence of disability. The members of the boards of review, as they were observed in most of the camps visited by sanitary inspectors, seem to have been chosen with due regard to the

importance of their work and of the responsibility devolving upon them.¹⁰ Special examiners in some instances were attached to review boards to act as advisors and to do most of the actual work of physical examination in referred cases, the boards then acting largely in a judiciary capacity for determining the percentage of disability and deciding questionable points.

The daily rate at which the examination could proceed depended very largely upon the tonnage available for bringing the troops from Europe and the railroad transportation for distributing them to the demobilization centers. These factors being uncertain, the result was a very uneven flow of men, and this constituted the greatest difficulty in respect to the examinations that the Medical Department had to meet. Instructions were issued by the War

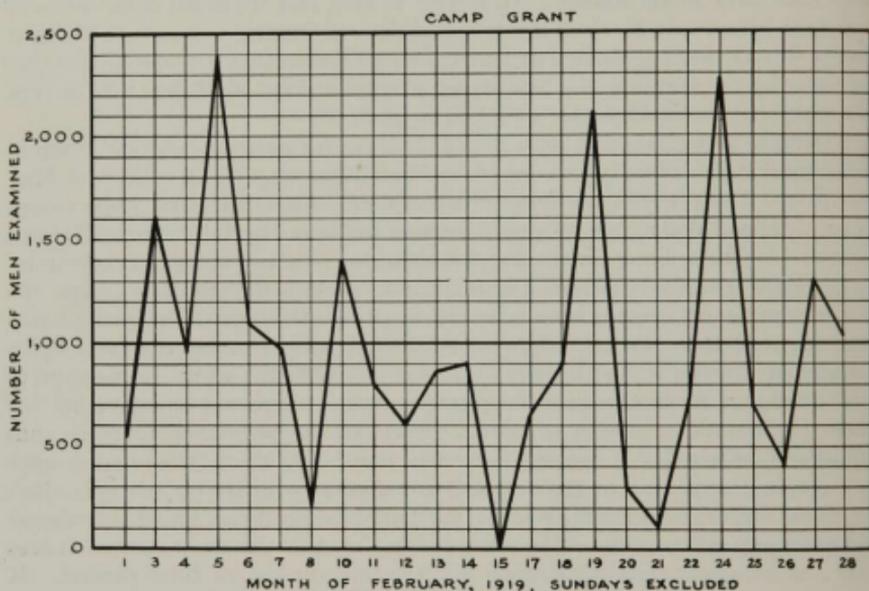


CHART V.—This and the following charts to X show variations of daily rates of physical examinations prior to discharge from service. Heavy horizontal line represents the average daily rate

Department early in 1919 which required that all men be discharged within 48 hours after reaching the demobilization point.¹¹ When large groups of men such as divisions arrived for discharge, the examining boards were overwhelmed with work. Following this no great number might arrive for a week or more, and this resulted in enforced idleness and discontent in the examining personnel. As very little advance notice was received regarding prospective dates for demobilization of divisional troops, it was necessary to keep large examining boards on duty in demobilization centers in order to provide for all contingencies. Had the rate of demobilization been steady and regular, it would have been possible to have dispensed with at least 20 per cent of the examining personnel.

In the monthly reports made to the Surgeon General, as prescribed by the memorandum, November 21, 1918, quoted above, the camp surgeon was

required to tabulate the number of examinations accomplished each day.¹² When the figures taken from these reports are charted, the extreme irregularity in the daily rate of examination at some camps during certain months is strikingly shown (Charts V to X). Charts V and VI show abrupt variations, suggesting a possible lack of care in arranging the daily camp schedule. Chart

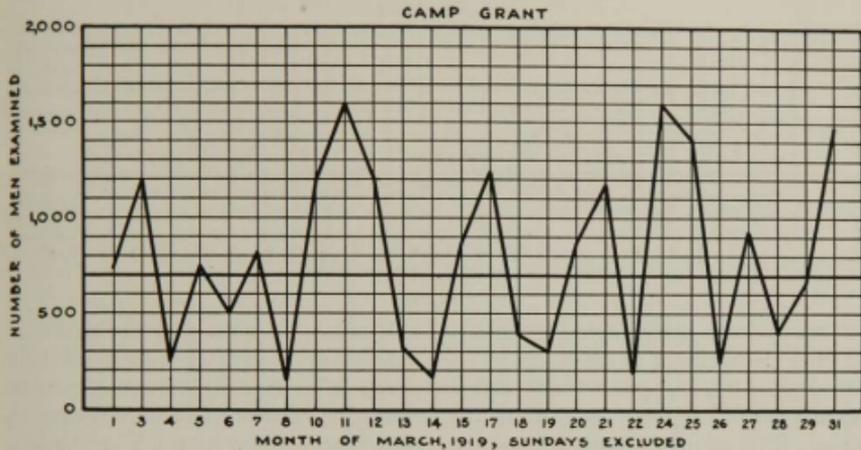


CHART VI

VII shows marked fluctuations, but these are not so abrupt as in Charts V and VI.

Charts V to VII suggest an attempt to maintain a fair average rate in disposing of each group within two or three days. The variation in this case is probably not of local origin. Chart VIII furnishes an example of a satis-

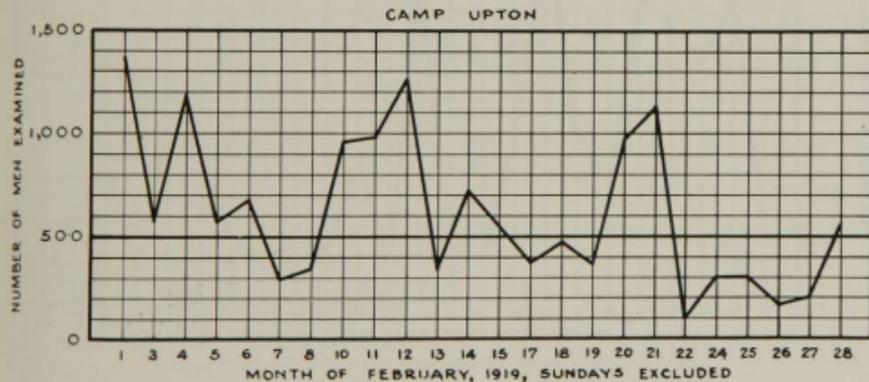
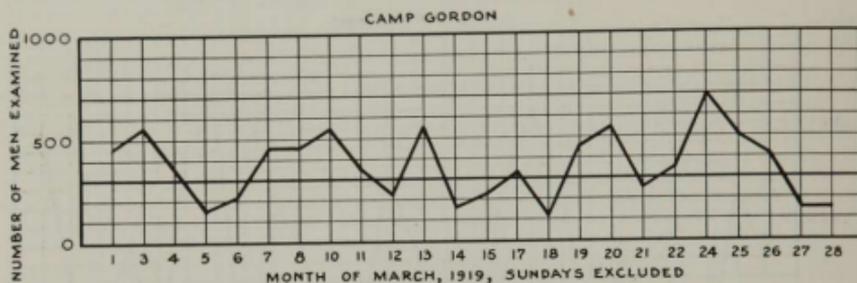


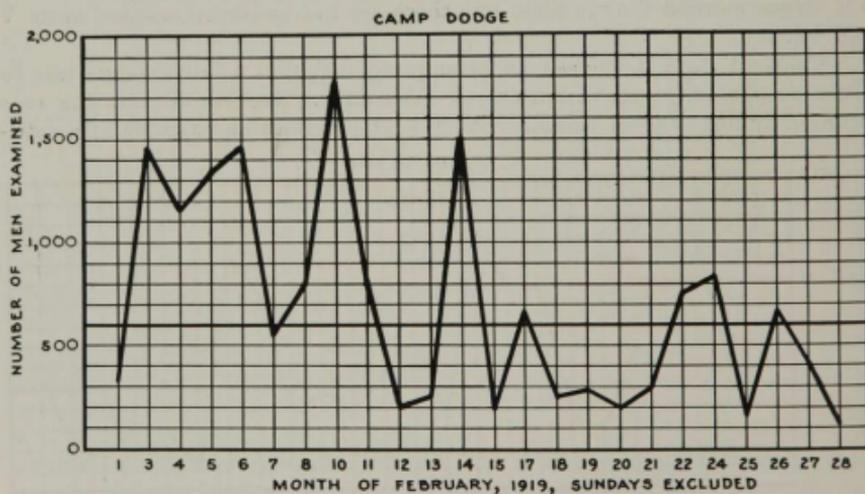
CHART VII

factory examination rate day by day. On only one day during the month was the average daily rate doubled. Chart IX gives a picture of a camp in which there was a great rush for the first two weeks, followed by a lull during the last two weeks of the month. This situation was undoubtedly beyond the control of the camp authorities, but the daily fluctuations during the rush weeks are

so abrupt as to suggest insufficient care in arranging the local schedule. Chart X represents a camp in which on three days during the month the rate jumped to considerably more than double the average daily rate, and on one of these days as many men were examined as on the two preceding and four following days combined. This probably indicates poor local management.



Aside from unavoidable irregularities in transportation and the desire of the War Department to discharge all men within two days after the date of their arrival at camp, it appears that rivalry between different demobilization centers had a decided influence in causing the examining boards to be overworked at times. This spirit of emulation was to some extent fostered by the War Department through the issuance of frequent reports showing the number of men dis-



charged at each station and the cost of the procedure per man.¹³ Failure of the local camp authorities properly to apportion the load was in many instances responsible for irregular daily flow of men through the examining pavilion. Regardless of the cause, it was the view of the Medical Department that such irregularity was highly unsatisfactory from the standpoint of efficiency, since the alertness of the examiner must invariably relax as he becomes overtired,

through having to examine too many men. If 3,000 men were to be examined in three days by a board constituted to examine 1,000 daily, obviously it was not in the best interest of either the men or the Government that 2,000 be examined on the first day and 500 on each of the two following days.

To obviate the tendency toward overhasty and careless examination on the irregular inspections, the sanitary inspectors from the Surgeon General's Office carefully looked into the efficiency of the examination given by the medical boards at the demobilization centers.¹⁴ Furthermore, many special inspections of this particular feature were made by representatives of the Surgeon General.¹⁴ A questionnaire was forwarded to all camp surgeons calling for a detailed report in respect to methods employed in certain specific phases of the examination which, according to frequent reports of inspectors, were being slighted in certain camps.¹⁵ As a result of various communications from the Surgeon General,

CAMP TAYLOR

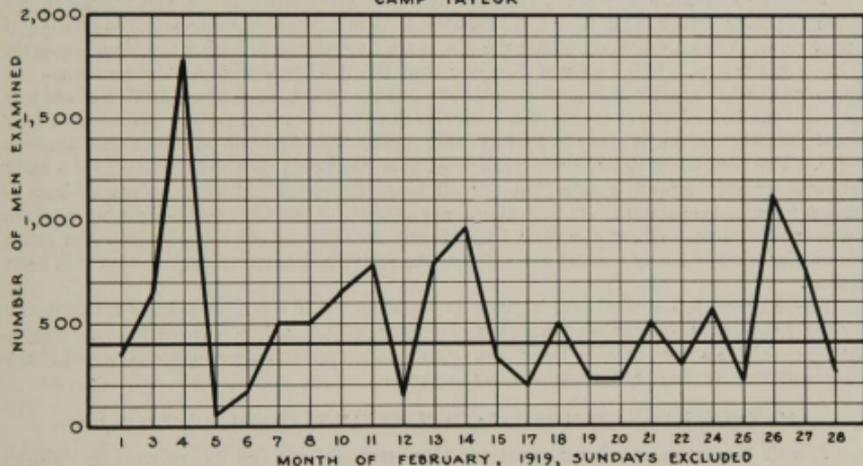


CHART X

setting forth certain defects in the operation of the system of examination, the following telegrams were dispatched by the War Department with a view to bettering conditions:

[Night letter]

APRIL 19, 1919.

220.81 (Misc. Div.).

COMMANDING GENERAL, *Camp Bowie, Tex.*

(And to all demobilization centers.)

Retel April first or March thirty-first A. G. O. first and second paragraphs and later instructions in telegram April seventh relative to discharge within given period and thorough physical examination comma the number to be presented for such physical examination on any one day comma should as nearly as practicable always be kept up to your allotted daily average quota but should never be more than twenty five per cent in excess of that daily quota unless the number of examiners is proportionately increased as per sixth paragraph telegram April seventh and under authority telegram April tenth period This is intended to prevent errors in physical examinations due to too long continued strain on Medical Officers and claims that might otherwise subsequently result from such errors period.

APRIL 25, 1919.

To all demobilization centers:

Your reference to this telegram is quote Dean twelve A unquote period There is reason to believe that telegram AGO April nineteen has been misinterpreted by some period For a camp whose daily discharge output is for example five hundred it is expected that men will be sent to the medical examining board in a steady flow equal as nearly as practicable each day to the daily output above and may on an occasional day be increased twenty five percent to care for a special emergency period It is desired to avoid sending a thousand one day none the next twelve hundred the next none the next and so forth period. Believed careful reading of telegram April nineteenth will show fully intention and reason for its issue.

(To all demobilization centers and to Fort Bliss, Tex.).

[Night letter]

JUNE 3, 1919.

602.1 Gen. Hosp. No. 11 (Misc. Div.).

COMMANDING GENERAL, *Camp Bowie, Tex.*

Your reference to this telegram is Dean twenty.

The War Department is much gratified by the interest, intelligence, and energy shown by commanding officers and their subordinates at demobilization centers in the matter of cutting down personnel, standardizing the discharge process and reducing the time necessary to discharge troops. It is reported however that the discharge period at some camps has been so reduced as to cut the time allowed to the finance officer, medical examining board and especially the United States Employment Service and the recruiting officers to less than they should properly receive in order to perform thoroughly their functions at the demobilization center. The forty-eight hour period prescribed as a maximum in which to handle the daily discharge capacity affords ample time for all these activities. It is therefore desired to impress upon camp commanders that discharges effected in less than forty-eight hours while desirable and sanctioned by the War Department are only so sanctioned when the camp commander has personally assured himself that the activities above referred to have not been slighted.

Where every step of discharge is given ample weight it is not intended nor is this in any way to be construed to lengthen the period of discharge by any time however short. This is sent you solely as a precaution to insure that care is taken not to gain exceptional speed to the possible detriment of both the soldier and the service.

METHODS FOR DEMOBILIZATION EXAMINATIONS OF TROOPS

Blank forms used for recording the demobilization examination (Form No. 135-3, for enlisted men, and Form No. 395-1, for officers) were prepared in The Adjutant General's Office after consultation with the Surgeon General. The data contained thereon were not as complete as were desirable from the standpoint of medical statistics; nevertheless, the forms were satisfactory so far as might be in that when properly prepared they comprehended the essential facts for the protection of both individuals and the Government. Form No. 135-3 is shown below; Form No. 395-1 did not differ from it in any essential respect.

Form No. 135-3, A. G. O.
Nov. 11, 1918

REPORT OF PHYSICAL EXAMINATION OF ENLISTED MAN PRIOR TO SEPARATION FROM SERVICE IN THE UNITED STATES ARMY

(Surname)	(Christian name)	(Army serial number)
(Grade)	(Company and regiment or arm or corps or department)	
(Occupation prior to entry into service)		

DECLARATION OF SOLDIER

Question. Have you any reason to believe that at the present time you are suffering from the effects of any wound, injury, or disease, or that you have any disability or impairment of health, whether or not incurred in the military service?

Answer.....

Q. If so, describe the disability, stating the nature and location of the wound, injury, or disease.

A.

Q. When was the disability incurred?

A.

Q. Where was the disability incurred?

A.

Q. State the circumstances, if known, under which the disability was incurred.

A.

I declare that the foregoing questions and my answers thereto have been read over to me, and that I fully understand the questions, and that my replies to them are true in every respect and are correctly recorded.

.....
(Signature of soldier)

Witness:

.....
(Signature of witnessing officer)

.....
(Rank and organization)

Place.....

Date, 19..

CERTIFICATE OF IMMEDIATE COMMANDING OFFICER

I certify that: *Aside from his own statement I do not know, nor have I any reason to believe, that the soldier who made and signed the foregoing declaration has a wound, injury, or disease at the present time, whether or not incurred in the military service of the United States.

*The soldier who made and signed the foregoing declaration has a †wound, †injury, †or disease, which was incurred about....., 191.., at.....

The nature and location of the †wound, †injury, †or disease, so far as known, are

.....
The circumstances under which incurred were.....

In my opinion the wound, injury, or disease {†did } originate in the line of duty in the military service of the United States.

Remarks.....

.....
Commanding.....

....., 191..

.....
(Place and date)

* Strike out the part of the certificate not applicable to the case.

† Strike out words not applicable.

CERTIFICATE OF EXAMINING SURGEON

I certify that: The soldier named above has this date been given a careful physical examination, and it is found that

*He is physically and mentally sound.

*He is physically and mentally sound with the following exceptions:

(Describe the nature and location of the defect, wound, injury, or disease.)

The wound, injury, or disease $\left\{ \begin{array}{l} \dagger \text{is} \\ \dagger \text{is not} \end{array} \right\}$ likely to result in death or disability.

In my opinion the wound, injury, or disease $\left\{ \begin{array}{l} \dagger \text{did} \\ \dagger \text{did not} \end{array} \right\}$ originate in the line of duty in the military service of the United States.

In view of occupation he is per cent disabled.

Remarks

..... M. C., U. S. Army.

....., 191

(Place and date.)

* Strike out the part of the certificate not applicable to the case.

† Strike out words not applicable.

REPORT OF BOARD OF REVIEW

(See instruction#2)

From a careful consideration of the case and a critical examination of the soldier, we find:

*That he is physically and mentally sound.

*He is physically and mentally sound with the following exceptions:

(Describe the nature and location of the defect, wound, injury, or disease.)

The wound, injury, or disease $\left\{ \begin{array}{l} \dagger \text{is} \\ \dagger \text{is not} \end{array} \right\}$ likely to result in death or disability.

In our opinion the wound, injury, or disease $\left\{ \begin{array}{l} \dagger \text{did} \\ \dagger \text{did not} \end{array} \right\}$ originate in the line of duty in the service of the United States.

In view of occupation, he is per cent disabled.

.....

(Name)

.....

(Rank)

....., M. C., U. S. Army.

.....

(Name)

.....

(Rank)

....., M. C., U. S. Army.

.....

(Name)

.....

(Rank)

....., M. C., U. S. Army.

....., 191

(Place and date.)

* Strike out the part of the certificate not applicable to the case.

† Strike out words not applicable.

INSTRUCTIONS

1. This report will be made out for each soldier, immediately preceding separation from service in the United States Army.

2. If the declaration of the soldier and the certificate of the examining surgeon do not agree, the case will be referred to a board of review, to consist of not less than two medical officers, convened by the camp, post, or regimental commander, which will complete the report on page 4 of this form.

3. When completed the report will be forwarded, with the service record of the soldier, to The Adjutant General of the Army in compliance with instructions prescribed in orders and regulations.

The preliminary statements as to the presence or absence of disability, including all the data on pages 1 and 2 of Form 135-3, usually were prepared in the soldier's organization prior to the time when his group was to be sent in its turn to the examining pavilion. A roster for a group of 25 or 50 men was then made out by the organization, the entries corresponding to the names on the accompanying Form No. 135-3. Generally a copy of the roster and the forms pertaining to it were sent to the chief medical examiner prior to the actual hour set for examination, in order that the name, rank, etc., on Form No. 135-3 might in each case be copied on the local physical examination card (this card was in general but not universal use). This plan effected a saving of time when the men entered the examination building. In a space for the purpose on the bottom of the roster, the chief medical examiner, or his assistant, after specifying the hour when the group concerned should report, signed his name as a safeguard against misunderstandings, the roster being then held by the particular organization. At the hour appointed for examination an officer or noncommissioned officer, as the case might be, appeared with the men and a copy of the roster.¹⁴

An alternative method consisted in passing the men through the personnel department adjoining the examining pavilion and having the data required on pages 1 and 2 of Form 135-3 filled in there immediately preceding the physical examination. These then accompanied the men to the examining room.¹⁴

The men, on entering the examination building, passed directly into the disrobing room, which was usually the mess hall of an unoccupied barrack. This room was provided with benches and clothes racks, the arrangements varying somewhat at different camps. In some of the best arranged buildings the men undressed on one side of the disrobing room and placed their clothing in neat bundles on "through-and-through shelves," which divided the room down the center into two parts. The other side of the room was used for the dressing room, and a man returning from his examination went directly to the dressing room, found his bundle of clothing on the shelf where he had placed it, and thus was able to dress and then to pass from the building without interfering with incoming soldiers.¹⁴

From the disrobing room the soldiers passed in front of a table at the end of which was a wicket through which they filed one by one and were numbered consecutively on the chest with an indelible pencil, the chest number in each case corresponding to that on the local record card, which, with Form No. 135-3, A. G. O., was then given to the man as he passed on for his physical examination. The regular procedure in this examination, beginning with the taking of height, weight, and chest measurement, was carried through in the same manner as in the draft examination. Notation of the findings was made in the appropriate space on the local record card by each group of examiners, and the initials of an examiner were affixed in each case. At the end of the individual examination the chief medical examiner, or a designated assistant, studied the findings of all the examiners, as noted on the local record card, and

entered the result on page 3 of Form No. 135-3, A. G. O. If no disability had been recorded, and no claim of disability had been made, the local record card and Form 135-3 were held at that point for the time being; if the contrary was the case, the man was sent by a designated route to another room where the board of review was in session. The finding of the board of review, whether it confirmed or disagreed with the decision of the previous examiners, was entered in the proper space on page 4 of Form No. 135-3, their decision being final so far as this went. The records were now returned by messenger, or chute, to the same point where the records of the men without disability had been retained.¹⁴

Men to be held in the service temporarily on account of communicable diseases or acute conditions of any kind, which required treatment, were taken out of the line at the point where this was discovered and were then disposed of as was indicated by the particular condition found.¹⁴ Naturally most such cases were sent to the base hospital. Their examination for discharge was finally completed later.

It was customary for a representative of the Bureau of War Risk Insurance and another of the Federal Board for Vocational Education, as well as for officers representing the morale organization, the Red Cross, and other Army and civil agencies concerned, to have rooms or stations in such parts of the examination building, or in an adjoining building, as was most convenient to the board of review.¹⁴ Men in whom disability was found, or claimed, could thus be instructed in the matter of making applications for compensation, the copy of Form No. 135-3 being turned over to the proper authority for this purpose. One copy of Form No. 135-3 for each man, except in those held on account of acute conditions, was returned to his organization, and the results of the physical examination in each case were checked off on the roster, the disposition being noted under a heading corresponding to the physical record; e. g., "discharged with no disability"; "discharged with disability"; "held by reason of ———." ¹⁴

The professional examination given for demobilization was in practically all respects like that given for entrance into the military service. Specialists were employed on the same extensive scale. Every effort was made to maintain the examination at an equally high standard of thoroughness. This was, however, not always an easy matter because of the fluctuations in daily arrivals of examinees and the relaxation in morale and the loss of interest on the part of examiners which followed the cessation of hostilities. Deceit must be guarded against, as was the case in the examination of registrants. Some registrants tried to conceal defects in order to enter the service, and a few feigned disabilities or exaggerated conditions in the hope of exemption. At the time of demobilization a few exaggerated or feigned disabilities in the hope of compensation, while many men were so eager to be discharged and to return to their homes that they strove to conceal conditions which, if detected, they feared might delay their release from the Army. The examiners had to be constantly on the alert to discover men of both these classes and to protect the interests of the Government and of the individuals, even if the latter did not wish to be protected.¹⁴

Limited service men as well were examined by camp boards, but of the 108,355 limited service men inducted¹⁶ undoubtedly many were discharged on certificates of disability. It is not known how many limited service soldiers were examined for discharge on Form No. 135-3, A. G. O., by the camp boards. War Department instructions required that in the case of all limited service men examined the words "special or limited service" be stamped across the front of Form No. 135-3 before the examination took place. This was to be done in order that the examining boards might determine whether or not defects which existed prior to induction had become aggravated, and new defects had been acquired since induction. Unfortunately, owing to absence of service records or other official sources of information, these instructions were not followed out in the majority of cases, and the boards had no means of determining the status of such men except from the statements of the individuals.

SPECIAL FEATURES IN RESPECT TO DEMOBILIZATION IN HOSPITAL

At the time the armistice was signed there were approximately 76,694 patients in the large military hospitals in this country.¹⁷ After that date and until April 30, 1920, 148,488 cases returning from overseas were admitted to these hospitals.¹⁸ In the meantime, moreover, many other patients were received in hospital directly from camps and other stations in this country. While the majority of these patients ultimately were cured and returned to duty, and then were demobilized from the military service in the usual manner (through camp boards), it was also necessary to discharge a considerable number directly from the hospitals on account of their being physically disabled for further service.

It is impossible to state the exact number of men so disposed of, as our records are incomplete, mainly due to the fact that these discharges were not accomplished in a uniform manner at the different camps and hospitals. As will be shown later, it was the desire of the Surgeon General that all permanently disabled enlisted men should be discharged on certificate of disability (Form No. 17, A. G. O.) rather than on Form No. 135-3, A. G. O.¹⁹ But owing to the local interpretations of the orders issued by the War Department with reference to demobilization, this was not done in all places, many soldiers with permanent disabilities actually being discharged in the usual manner for well men, with their disabilities recorded on Form No. 135-3, A. G. O. It should be understood, however, that since a careful record was made on Form 135-3 of any defects noted at the time of separation from the service, no injustice was done to the individual by this procedure. When this method of discharge was adopted, all disabilities which were regarded by the board of review as in excess of 10 per cent (based on the extent to which the soldier was prevented from earning subsistence in view of his occupation) were reported to the Bureau of War Risk Insurance, a copy of the completed Form No. 135-3, A. G. O., being forwarded to that bureau.¹⁹ There was no provision in regulations for the discharge of disabled officers on certificate of disability (Form No. 17, A. G. O.). Consequently all of them were demobilized on Form No. 395-1, A. G. O., and those with defects were reported to the Bureau of War Risk Insurance, as was the case with enlisted men.

DISPOSITION OF PHYSICAL DEFECTIVES PRIOR TO DEMOBILIZATION; METHODS FOR DEMOBILIZATION

The subject of the discharge of those found with physical defects at the examination of troops for demobilization has been discussed. It will be remembered that the plan followed with them generally did not differ from that for their physically fit comrades, except that a disability was shown on their Form No. 135-3, A. G. O. Use of this form for the permanently disabled was acceptable to the Surgeon General (see p. 511) though as stated in his telegraphic instructions on the question, he preferred that Form 17, certificate of disability be used.¹⁹ Besides those men who were able to go to demobilization camps and through the routine demobilization process for troops, there proved to be thousands of other men eligible for discharge whose physical condition demanded quite another program. Some of these could well be taken care of in special camps and others required hospital attention.

In order that the capacity of hospitals might not be overtaxed, and in view of the fact that many disabled soldiers did not require further hospital treatment, even though not yet ready for discharge, the War Department established overseas convalescent detachments in the larger camps, promulgating this policy in Circular No. 90, War Department, November 25, 1918. To these camps were assigned men who had been incapacitated by virtue of having been on duty overseas, but who did not require further treatment in hospitals. Circular No. 90 provided that "Intensive treatment and training of all convalescents assembled in overseas detachments will be immediately undertaken and continued in order that their cure or maximum improvement and subsequent discharge may be accomplished in the shortest possible time." Selected medical officers were assigned to these detachments in order that the treatment received by the convalescents assigned thereto might be complete and thorough. Certain of these soldiers were rendered free from disability before discharge, but a large number still had disabilities in excess of 10 per cent upon their final separation from the service.²⁰ The number of men with disabilities discharged from the overseas convalescent detachments is not available.

"Overseas convalescent detachments" were discontinued under instructions issued in paragraph 4, Circular No. 188, War Department, December 31, 1918, these organizations thereafter being known as "convalescent centers." Paragraph 4 reads as follows:

The designation "overseas convalescent detachments," as provided for in Circular No. 90, War Department, 1918, is hereby changed to "convalescent centers." They will be used as concentration points not only for overseas convalescents but for convalescents from the forces in this country, including the few remaining cases in development battalions whose disabilities are not due to their own misconduct. The quarters selected for convalescent centers should be selected in an attractive part of the camp and, whenever practicable, should be near the various welfare centers conducted by the Y. M. C. A., the American Red Cross, and other civilian organizations.

PRINCIPLES GOVERNING THE DEMOBILIZATION OF PHYSICALLY DISABLED OFFICERS AND MEN

In the earlier part of the World War, disabled soldiers were discharged on certificates of disability, as had been the practice in our Army for many years prior thereto. Such discharges, if for disease or injury incident to the service, constituted a valid claim against the Government. This method of

discharge for disabled soldiers was the only one officially recognized, but actually certain draft men found disqualified on arrival at camps were separated from the service in a more summary manner (see Chap. XX). There was no distinction so far as either this method of discharge or future claim against the Government was concerned. Officers, when of the regular establishment, were retired, and temporary officers were discharged for physical reasons. In consequence the latter had a claim against the Government like that of the men.

The point which it is desired to make here is that the earlier policy in respect to both officers and enlisted men was based on the principle that they should be promptly separated from the Army as soon as it was clearly determined that their physical disabilities were of such a character as to unfit them for further military service. Parenthetically it should be explained here that it is not deemed appropriate to this history to discuss the situation of the disabled after their separation from the military service, as thereafter their care was undertaken by agencies other than the Medical Department of the Army.

A radical change in Army methods with reference to the discharge of the disabled was promulgated in paragraph 2, Bulletin No. 36, War Department, dated July 11, 1918. This bulletin was issued upon the recommendation of the Surgeon General; it provided that:

(a) Physical reconstruction is defined as complete medical and surgical treatment, carried to the point where maximum functional restoration, mental and physical, has been secured. In securing this result the use of work, mental and manual, will often be required during the convalescent period.

(b) Hereafter no member of the military service disabled in line of duty, even though not expected to return to duty, will be discharged from service until he has attained complete recovery or as complete recovery as it is to be expected that he will attain when the nature of his disability is considered. When the degree of recovery described in this paragraph has been attained, members of the military service who remain unfit for further duty should be discharged in the manner provided in Army Regulations.

The policy of the War Department throughout was most liberal with reference to the discharge of disabled patients, and few, if any, were recommended by the commanding officers of the hospitals for separation from the service until the maximum improvement to be expected in the case had been reached and in addition until the Bureau of War Risk Insurance was prepared to continue without delay any further hospital treatment deemed necessary. It is true many officers and men did require further treatment, but as Congress had made ample provisions for this outside the Army, and not in the Army, it was obvious that, when the maximum improvement possible in a military hospital had been attained, discharge was the proper procedure.

As originally passed by Congress, the war risk insurance act provided compensation at a maximum rate of \$30 per month for total disability in the case of a man without dependents.²¹ With the passage of the "Sweet bill" in December, 1919, the original act was so amended as to increase the compensation for total permanent disability to \$100 per month and for total temporary disability to \$80 per month.²² Also provision was made that the compensation allowed for any degree of disability less than total should be made on a sliding pro rata scale, using the amount payable for total disability as the basis.

The Surgeon General had realized at the beginning of the demobilization period that many officers and enlisted men who required further treatment would desire their discharge in order that they might be at their homes during convalescence, or that they might be under the care of a particular doctor who was known to them. No objection could be seen to this procedure provided assurance was furnished that the officer or soldier concerned, or his friends or relatives, were financially able to provide for his proper care by the necessary specialists. Accordingly, recommendation to this effect was made to The Adjutant General, and the policy was promulgated in paragraph 1, Circular 188, War Department, December 31, 1918, as follows:

There will, furthermore, be many cases of disabled men who either possess funds or who have relatives or friends in position to afford them specialized care after discharge. In these cases disabled men may be discharged but not until the responsible commanding officer has fully determined that continued treatment and care is assured. The fact that a man (his continued treatment and care being assured) is being discharged, either at his own request or at the request of the relative or friend, will be noted on the report rendered in connection with the soldier's physical examination prior to discharge. This notation will include the names and addresses of the persons assuming responsibility for such continued treatment and care.

Many officers and enlisted men were discharged as a result of these instructions. The responsibility for determining that suitable future treatment would be assured rested with the commanding officer of the hospital concerned. There was no prescribed method for determining this fact, but most hospitals adopted a form of certificate similar to the following:²³

REQUEST FOR DISCHARGE FROM SERVICE

Of -----
(Name of soldier)

(Place)

(Date)

I, -----, fully realizing that I am in need of further hospital and medical treatment, and that I have not yet attained the maximum improvement possible in my case, hereby request immediate discharge from military service; and in case such discharge is granted I do hereby fully release the War Department from all responsibility for my further care and treatment.

REQUEST AND STATEMENT IN REGARD TO DISCHARGE

Of -----
Name of soldier

(Place)

(Date)

I, ----- to -----
(Name and relationship) (Name of soldier)

(Home address)

Fully realizing that said ----- is in need of continued care and treatment, I hereby request the immediate discharge of said ----- from military service and in case such discharge is granted, I will assume all responsibility for such continued care and treatment until the maximum improvement possible in this case is attained.

I do further certify that I am financially able to provide such care and treatment and in case such discharge is granted, do hereby fully release the War Department from further responsibility for the care and treatment of said.....

NOTE.—A statement from a local banker or business man personally acquainted with the responsible person must accompany this request. This statement must certify as to the financial ability of the responsible person to carry all necessary care and treatment of the discharged soldier.

After the Medical Department became satisfied that the Bureau of War Risk Insurance was able to provide proper hospital care for all disabled soldiers, no reason could be seen for the indefinite retention in the Army of many of the officers and enlisted men then patients in military hospitals. It became increasingly necessary to establish a definite policy regarding the termination of treatment of such patients; therefore, the Surgeon General's views on this subject were transmitted to the Chief of Staff and upon being approved were issued as Circular Letter No. 345, S. G. O., which reads as follows:

Circular Letter No. 345.

NOVEMBER 10, 1919.

Subject: Policy re protracted hospital treatment for military personnel.

1. The following is published for the information and guidance of all concerned:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF STAFF,
Washington, November 7, 1919.

Memorandum for the Surgeon General:

Subject: Policy re protracted hospital treatment for military personnel.

1. Relative to the recommendations made in paragraph 4 of the memorandum for the personnel branch, operations division, from the Office of the Surgeon General, dated October 27, 1919, you are informed that the following policy is announced:

1. That all disabled military personnel, except officers of the permanent Army and special surgical cases shall be granted discharge six months after admission to a hospital in the United States for definitive treatment, if discharge is desired and applied for by the individual in writing.

2. That all disabled military personnel, except officers of the permanent Army and those requiring multiple operations or special surgical treatment, or suffering from mental diseases, shall be discharged one year after admission to a hospital in this country after having been carried on sick report for definitive treatment for the same period: *Provided*, Individuals too sick to be removed from hospital without prejudice to their life or recovery or who, upon the question of discharge being submitted to them in writing, certify that they can not provide for the necessary care and attention for themselves shall be retained until provision for their care and maintenance is made by the War Risk Insurance Bureau, Soldier's Home, or National Home for Disabled Volunteer Soldiers: *Provided, further*, That nothing herein contained shall be deemed to rescind the provisions of Circular No. 188, W. D., 1918, authorizing discharge at any time of the disabled who have been cured or have attained maximum restoration, or those who furnish guarantees that specialized treatment will be continued as long as necessary.

2. As the above policy will not be published as a War Department Circular, you are requested to take steps insuring the proper compliance by all concerned.

E. D. ANDERSON,
Colonel, General Staff,
Acting Director of Operations,

By P. P. BISHOP,
Colonel General Staff,
Chief, Personnel Branch, Operations Division.

By direction of the Surgeon General:

C. R. DARNALL,
Colonel, Medical Corps, U. S. A.,
Executive Officer.

The provisions of this circular letter were further amplified by Circular Letters Nos. 354 and 367, S. G. O., 1919, as follows:

NOVEMBER 21, 1919.

Circular Letter No. 354.

Subject: Discharge of cases under provisions of Circular Letter No. 345, S. G. O., November 10, 1919.

1. When military personnel is to be discharged from the service at the request of the individual after six months' treatment, under the provisions of Circular Letter 345, S. G. O., November 10, 1919, the commanding officers of hospitals will not require from patients, or from their relatives or friends, any letters, certificates, affidavits, or other documents, releasing the War Department from further responsibility for the care of the patient. Neither will they require documents establishing the ability of the patient, or his relatives or friends, to furnish specialized care in civil life. The signed statement of the individual that he desires to be discharged from the military service as provided for in subparagraph (1), paragraph 1, Circular Letter No. 345, is the only paper in this connection that need be filed with the records of the individual who is to be discharged.

2. The above directions do not apply in the case of individuals who desire discharge, under the provisions of paragraph 1, a, Circular No. 188, W. D., 1918, prior to the completion of a period of six months' care in a hospital in the United States which gives definitive treatment.

By direction of the Surgeon General:

C. R. DARNALL,
Colonel, Medical Corps, U. S. Army,
Executive Officer.

DECEMBER 16, 1919.

Circular Letter No. 367.

Subject: Amendment to Circular Letter No. 345.

1. In connection with Circular Letter No. 345, S. G. O., 1919, the following is published for the information of all concerned:

DECEMBER 10, 1919.

From: The Surgeon General of the Army.

To: The Adjutant General of the Army, Washington, D. C.

Subject: Discharge of disabled military personnel.

1. With reference to the discharge of disabled military personnel under the provisions of paragraph 2, Circular Letter No. 345, November 10, 1919, S. G. O., authority is requested to instruct commanding officers of hospitals that individuals, on the completion of twelve months' definitive treatment, who have active lesions, are making satisfactory progress, and who, in the opinion of the commanding officer of the hospital, will fully recover within a reasonable length of time may, if they so desire, be continued under treatment in their present military status.

(Signed) M. W. IRELAND,
Surgeon General, U. S. Army.

WAR DEPARTMENT, A. G. O., December 13, 1919.

To the SURGEON GENERAL.

Approved.

By order of the Secretary of War:

(Signed) F. W. LEWIS, Adjutant General.

By direction of the Surgeon General:

C. R. DARNALL,
Colonel, Medical Corps, U. S. Army,
Executive Officer.

As the Bureau of War Risk Insurance was by December, 1919, prepared to furnish necessary hospitalization for disabled soldiers, it was deemed only just to the individual to permit his discharge on his own request, except in the limited class of special cases referred to in Circular Letter No. 345. Further hospital treatment could be promptly secured if needed and retention

in the military service might be to the financial detriment of the individual, in view of the increased rates of compensation. The provisions of Circular Letter No. 367 were drawn with the desire on the part of the Surgeon General to afford patients every opportunity for making the utmost improvement before their discharge. Many complaints with reference to discharge under the provisions of this circular letter were received by the War Department, mostly from officer patients in the special hospitals for the treatment of tuberculosis.⁸ While it was realized that a monetary loss might accrue to certain officers by reason of discharge from the military service, the fact had been determined that these officers had attained as complete recovery as might be expected, when the nature of the disability was considered, and that any further improvement in their condition was at best problematical. Therefore, the conclusion was reached that such officers should be discharged in order to come under the jurisdiction of the Bureau of War Risk Insurance for any further care considered necessary.

Prior to the World War the disposition of psychiatric patients in military hospitals was largely dependent on whether or not the insanity was incurred in the line of duty; in other words, whether it could be clearly determined that the disease did or did not exist prior to enlistment, or was or was not the result of the soldier's own misconduct (syphilis, drugs, alcohol, etc.).²⁴ When it was determined that the disease was the result of military service the soldier was usually transferred to the Government Hospital for the Insane, St. Elizabeths Hospital, Washington, D. C., for treatment and, if necessary, for discharge from the service at a later date.²⁵ In cases where the medical officer in charge was satisfied that the disability had existed prior to entrance into the military service, or was due to misconduct on the part of the individual concerned, the War Department maintained that the soldier was not a proper charge on the Federal Government, but should be cared for by the State in which he held a legal residence. Accordingly, such patients were returned to the care of relatives or State authorities and then discharged from the service. The war risk insurance act provided that all members of the military service "shall be held and taken to have been in sound condition when examined, accepted, and enrolled for service,"²⁶ thus requiring that, for purposes of compensation and treatment after discharge, all insane cases be regarded as incurred in line of duty unless due to actual misconduct. The accommodations at St. Elizabeths Hospital were manifestly insufficient for the care of the large number of insane who would be found in any army of 4,000,000. Therefore, certain of the Army general hospitals were selected for the treatment of mental cases, and all patients of this character were concentrated in these institutions.²⁷ The rapid decrease in the size of the Army during the demobilization period necessitated the discontinuance of one general hospital after another, with the consequent transfer of the residual patients from place to place. The Surgeon General considered that those unfortunate soldiers who had developed a psychosis while under military control should be placed in a permanent institution near their homes where continuous treatment would be afforded them. Arrangements to this end were made with the Bureau of War Risk Insurance and hospitals were designated to which the soldier could be transferred.²⁸

Upon arrival the soldier was discharged from the Army and his treatment was continued uninterruptedly under the auspices of the bureau. The hospital selected usually was a State institution in the soldier's home State. The method of discharge decided upon was authorized in paragraph 7, General Orders, No. 57, War Department, April 30, 1919, which reads as follows:

1. The Bureau of War Risk Insurance is charged by law with the duty of caring for the compensable insane of the military service after their discharge from the Army and has undertaken to provide institutional treatment after discharge for cases requiring it. Such cases are to be turned over directly to the care and responsibility of the bureau in such a manner that there will be no interval between discharge from the military service and the commencement of the continued care in hospitals near their homes, which is to be provided by the bureau.

2. In order to accomplish this, the following procedure will be observed:

a. Cases which have been under treatment in military hospitals in this country for four months, and which are considered to be incurable or to require a much longer period of hospital treatment to effect a cure, will be reported in writing by the commanding officer of the post, camp, or station directly to the chief medical advisor, Bureau of War Risk Insurance, Washington, D. C. (attention section of nervous and mental diseases), who will give instructions as to the disposition desired by the Bureau of War Risk Insurance. When reporting cases to the Bureau of War Risk Insurance under this paragraph, the following information regarding the soldier will be furnished: (1) Name, rank, organization, Army serial number, and race; (2) length of service; (3) legal residence; (4) name and residence of nearest relative; (5) diagnosis; (6) brief summary of medical history; (7) prognosis.

b. Upon receipt of instructions from the Bureau of War Risk Insurance, the soldier will be ordered discharged on certificate of disability by the authority designated to order discharge in such cases. The same procedure as to preparation and disposition of records will be followed as outlined in Army regulations governing the discharge of insane in the military service and their delivery to institutions. The soldier will be delivered to the designated institution accompanied by necessary attendants and not discharged until his arrival thereat. When the soldier has been delivered to the authorities of the institution designated to receive him, the senior attendant will ordinarily telegraph the commanding officer authorized to discharge the soldier. Upon receipt of this information the soldier will be discharged and discharge papers mailed to the authorities of the institution to which the soldier was transferred for delivery to the soldier. When a patient is delivered to an institution and discharged, the Bureau of War Risk Insurance will be so informed in writing by the commanding officer concerned.

3. The provisions of this order do not in any way amend subparagraph a, Circular No. 188, War Department, 1918, relative to the discharge of a certain class of patients who possess funds or have relatives or friends who can afford them specialized care after discharge.

A subsequent modification of this order was incorporated in paragraph 3, General Orders, No. 96, War Department, July 30, 1919, as follows:

b. At the same time a case is reported to the Bureau of War Risk Insurance a certificate of disability will be forwarded to the authority designated to order discharge in such cases, who will, if he approves the discharge, return the certificate to the patient's commanding officer for appropriate action as hereinafter prescribed. The commanding officer, having been authorized to discharge the patient, will upon receipt of the instructions requested of the Bureau of War Risk Insurance deliver the patient, accompanied by the necessary attendants, to the institution designated. When the patient has been delivered to the institution the senior attendant will telegraph the commanding officer a report of such delivery, who thereupon, and not before, will complete the discharge. The procedure regarding the preparation and disposal of records prescribed in Army regulations for the discharge of insane in the military service, and their delivery to institutions, will be applied also in these cases, except that the medical certificates required by the Department of the Interior, Form 1-107, for patients sent to St. Elizabeths Hospital, need not be filled out. Upon completion of the patient's discharge as above indicated, his commanding officer will send his discharge certificate and

final papers to the institution to which the patient was sent, for delivery to the patient, and will at the same time, in writing, advise the Bureau of War Risk Insurance of the action taken.

The demobilization of patients suffering from psychoses was accomplished most satisfactorily under this plan, and no criticism as to the procedure was heard.

Circular No. 86, War Department, November 25, 1918, provided that "men suffering from venereal disease will not be discharged until cured." The purpose of the Surgeon General in submitting a recommendation to this effect was that such soldiers should not be allowed to return to civil communities where they would be a source of danger to others. The restriction placed on the discharge of this class of soldiers was interpreted to mean that discharge could not be accomplished until the patient had been rendered noninfectious. No effort was made to retain syphilitic soldiers until a complete cure had been attained; they were given, however, at least one thorough course of treatment with salvarsan, or its equivalent, and were discharged when no longer considered as in an infectious stage. Not all soldiers afflicted with venereal disease were admitted to hospitals, many being treated while carried on a duty status in development battalions or convalescent centers, but the same restrictions regarding discharge were applied to all of them.

An important bearing on demobilization was the delay caused in the discharge of officers and soldiers afflicted with venereal disease. At the date of signing the armistice there were 2,839 venereal patients in the hospitals abroad²⁹ and 5,862 in the hospitals at home.³⁰ This total of 8,701, however, represents but a small proportion of the number of men in the Army actually infected with venereal disease on that date, since the great majority of these cases were in development battalions in this country, in ports of embarkation where they had been culled out, or in venereal camps abroad; in these places, though receiving thorough medical attention, they were carried on a duty status. No figures are available as to the actual number of soldiers with venereal disease on or about November 11, 1918, but they certainly numbered many thousands. From the date of organizing development battalions, about June, 1918, up to November 13, 1918, over 77,400 venereal cases had been treated in them.³¹ This number includes only home cases, but it also includes the soldiers infected after entrance into the service, as well as those who were infected before induction. Definite figures as to the number in each class are not available, but it was estimated that of all venereal cases recorded during the years 1917 and 1918 in the entire Army, both at home and abroad, about one-half were contracted after entering the service.³² In addition to those who had already been segregated, some men were found to have one or another of the venereal diseases at the time of physical examination made prior to discharge, and consequently were not considered available for immediate discharge.

The great majority of the soldiers who were retained for further treatment of venereal disease would otherwise have been eligible for discharge when their units were demobilized. Their retention in the service was a great expense to the Army, as many continued to draw pay (not coming under the provisions of General Orders, No. 31, 1912, which provides for forfeiture of pay while absent from duty for disease due to misconduct after entry into service) and

all were clothed, rationed, and given medical treatment during this period. In addition to the expense directly chargeable to the infected men, were the salaries of the officers, both of the line and Medical Department, who were on duty with the organizations to which these men were attached. There was also the cost of hospital upkeep for those who were actually patients in hospitals. The total expense to the Government by reason of the retention of such cases until they were rendered noninfectious and could be discharged with safety to the community amounted to millions. In addition to this, in many instances, there was interference with the return of a soldier to some business connection, with the resulting inconvenience to either the firm, the soldier, or to both.

STATISTICAL RESULTS OF DEMOBILIZATION EXAMINATIONS, BASED ON CURRENT MONTHLY REPORTS

In November, 1918, the Surgeon General ³³ called for a detailed monthly report of the operation of demobilization examining boards. At a somewhat later date a similar report was called for regarding discharges from the service on surgeon's certificate of disability (Form No. 17, A. G. O.).³⁴ Neither report was rendered so carefully as to make it possible to compile complete records, including all stations, but the figures we have are, nevertheless, of much interest and value.

Records are on file of the results of 3,133,921 physical examinations made by demobilization examining boards (for discharge on Forms No. 135-3 and 395-1, A. G. O.) during the period from November 11, 1918, to December 31, 1919, and of 20,755 examinations made by disability boards (for discharge on Form No. 17, A. G. O.) between February 1, 1919, and December 31, 1919.¹² The total of these, 3,154,676, falls short of the entire number examined for discharge during the periods in question, which was approximately 3,350,000, but it is sufficiently large to serve as a good cross section of the physical status of the Army at the time. Of the total number examined by demobilization boards (on Forms No. 135-3 and No. 395-1, A. G. O.), 2,936,780, or 93.7 per cent, of the officers and enlisted men were discharged with either no disability or one of less than 10 per cent; 166,089, or 5.3 per cent, were reported to the Bureau of War Risk Insurance as having a disability of 10 per cent or over; 24,293, or 0.7 per cent, were held in service on account of communicable diseases, mostly venereal; 4,368, or 0.1 per cent, were held until they attained a maximum degree of improvement; and 2,391, or 0.07 per cent, were held for other causes.³⁵

The figures given above include limited service men and the units of the Students' Army Training Corps, since no separate figures are available covering these two classes.

Table No. 41 gives the classification of disabilities, rated as over 10 per cent, which were reported by the camp examining boards to the Bureau of War Risk Insurance from April 1, 1919, to December 31, 1919, the total number of men examined during this period at the camps included in the table being 1,440,859; prior to April no classified report of disabilities was required.¹²

TABLE 41—*Causes of disabilities reported by class of disability in demobilization—April 1 to December 31, 1919*¹²

Conditions	Number of disabilities reported	Percentage of the total number of disabilities
General surgical and skin.....	13,532	24.96
Orthopedic.....	12,711	23.44
Ophthalmological.....	4,639	8.55
Otolaryngological.....	4,444	8.19
Respiratory.....	4,260	7.86
Cardiovascular.....	2,555	4.71
Neuropsychiatric.....	2,489	4.59
Veneral.....	975	1.80
Miscellaneous, including dental.....	8,615	15.88
Total disabilities reported.....	54,220	100.00

Tables 42 and 43 show the comparative results obtained by the medical examining boards at a number of large stations. Table 42 is for the period from November 11, 1918, to April 30, 1919, inclusive. Table 43 is for a smaller number of camps, but covers a longer period—from November 11, 1918, to December 31, 1919. These tables indicate that the percentage of soldiers in whom defects were recorded was higher in the earlier months of demobilization. The situation in this respect is more clearly shown in Table 44, where percentage rates by months are given. It was undoubtedly due to the difference in the class of men discharged in the two periods. During the first three or four months following signing of the armistice the majority of the commands held in camps in this country were demobilized, these including large numbers of limited service men and soldiers undergoing physical reconstruction in development battalions. At a later period most of the units demobilized were combat divisions from overseas, which were made up almost exclusively of men in splendid physical condition.

TABLE 42.—Physical status at demobilization for the period November 11, 1918, to May 1, 1919¹²

	Discharged with no disability					Reported to Bureau of War Risk Insurance with disability					Held on account of communicable disease			Held for maximum degree of improvement			Held for other causes			Total number examined	Per cent reported to Bureau of War Risk Insurance with disability
	White		Colored		Total	White		Colored		Total	White	Colored	Total	White	Colored	Total	White	Colored	Total		
	Officers	Men	Officers	Men		Officers	Men	Officers	Men												
Beauregard.....	605	12,857	0	2,271	15,733	57	1,721	0	126	1,904	126	87	213	0	0	0	0	0	0	17,850	10.67
Bowie.....	432	21,464	20	3,835	25,751	11	433	0	24	471	331	92	423	15	2	17	0	0	0	26,662	1.77
Custer.....	1,696	58,845	4	1,171	59,716	59	1,709	0	10	1,778	551	16	567	42	0	42	57	1	58	62,161	2.86
Devens.....	2,156	61,760	2	1,029	64,947	441	15,560	1	231	16,233	632	7	639	0	0	0	0	0	0	81,819	19.84
Dix.....	4,758	83,583	17	4,877	93,235	263	14,339	13	410	15,025	535	19	554	0	0	0	0	0	0	108,814	14.00
Dodge.....	1,848	88,337	33	2,133	92,351	54	7,898	0	390	8,342	707	18	725	0	0	0	0	0	0	101,418	8.23
Eustis.....	289	6,217	0	38	6,544	4	165	0	0	169	74	0	74	0	0	0	0	0	0	6,787	2.50
Forrest.....	103	1,541	0	1,644	0	9	0	0	0	9	9	0	9	0	0	0	0	0	0	1,662	0.60
Freemont.....	123	2,441	0	3	2,567	63	1,513	0	0	1,576	52	0	52	0	0	0	0	0	0	4,195	37.57
Funston.....	1,039	40,235	60	5,300	46,623	31	1,836	3	243	2,113	328	24	352	31	16	47	27	3	30	49,176	4.40
Gordon.....	1,912	35,383	25	14,878	52,198	31	336	0	43	410	436	737	1,173	0	0	0	0	0	0	53,781	0.80
Grant.....	2,104	108,991	129	13,344	124,568	80	3,983	18	105	4,186	981	308	1,289	63	0	63	162	0	162	130,268	3.21
Greene.....	727	3,426	6	6,736	10,895	24	1,644	0	670	2,338	4	50	54	0	0	0	0	0	0	13,289	17.59
Greenleaf.....	1,967	5,288	0	812	8,067	418	4,453	0	44	915	1	0	1	0	0	0	0	0	0	8,983	10.18
Hancock.....	1,482	8,297	6	2,186	11,971	569	3,613	2	678	4,862	20	21	41	0	0	0	0	0	0	16,874	28.90
Humphreys.....	1,391	17,150	0	2,317	20,858	10	23	0	1	34	130	82	212	2	2	2	0	0	0	21,106	0.16
Jackson.....	2,153	38,755	8	9,622	51,338	72	1,147	1	173	1,393	415	199	614	0	0	0	0	0	0	53,345	2.61
Johnston.....	227	1,818	0	451	2,496	0	43	0	6	49	0	2	2	0	0	0	0	0	0	2,547	2.00
Kearny.....	1,040	15,551	0	42	16,633	14	328	0	1	343	17	0	17	0	0	0	0	0	0	16,993	2.02
Knox.....	286	11,651	0	401	12,338	4	53	0	17	74	3	1	4	0	0	0	0	0	0	12,416	0.60
Lee.....	1,482	30,492	50	8,456	40,480	159	4,776	7	811	5,753	302	115	417	23	5	28	46	8	54	46,732	10.05
Las Casas.....	448	5,744	65	2,559	8,816	4	35	1	6	46	106	30	136	0	0	0	0	0	0	8,998	0.50
Lewis.....	1,605	41,717	0	427	43,749	27	732	0	3	762	100	0	100	0	0	0	0	0	0	44,611	1.71
Logan.....	472	12,384	1	108	12,965	8	59	0	0	67	91	0	91	0	0	0	0	0	0	13,123	0.51
Meade.....	2,135	45,451	138	12,312	60,036	50	1,328	7	96	1,481	510	120	630	8	0	8	18	4	22	62,177	2.38
Mills.....	74	483	0	56	613	1	0	0	0	1	0	0	0	0	0	0	0	0	0	614	0.15
Merritt.....	52	525	0	6	593	0	1	0	0	1	1	0	1	0	0	0	0	0	0	595	0.17
MacArthur.....	939	13,564	0	1,360	15,863	13	270	0	43	326	85	25	110	0	0	0	0	0	0	16,299	2.00
McClellan.....	170	3,896	0	3,155	7,221	1	466	0	157	564	65	65	130	0	0	0	0	0	0	7,915	7.13
Meigs.....	102	7,887	0	200	8,189	0	4	0	0	0	0	1	10	3	0	3	0	0	0	8,206	0.05
Pike.....	1,460	41,877	17	9,812	53,166	62	1,181	8	168	1,419	298	204	502	8	2	10	1	0	1	55,098	2.58
Polk.....	56	151	0	170	377	1	19	0	107	127	0	0	0	0	0	0	0	0	0	504	25.09
D. A. Russell.....	111	11,075	0	81	11,257	0	156	0	0	156	109	0	109	6	0	6	1	0	1	11,539	1.35
Sevier.....	790	7,157	0	4,408	12,355	4	281	0	192	477	15	24	39	0	0	0	0	0	0	12,871	3.70
Sherman.....	2,322	67,005	32	7,800	77,159	236	12,185	1	535	12,957	9	7	16	401	12	413	216	0	216	90,761	14.45
Shelby.....	615	11,049	8	6,338	18,010	14	60	0	111	185	71	64	135	1	0	1	3	0	3	18,334	1.01
Sheridan.....	138	2,840	0	252	3,230	2	20	0	5	27	22	5	27	0	0	0	0	0	0	3,284	0.82
Taylor.....	2,975	59,017	25	8,512	70,529	333	11,847	7	1,167	13,354	377	132	509	0	0	0	27	6	33	84,425	15.80
Travis.....	686	20,971	1	6,615	28,273	92	261	8	96	457	310	221	33	0	0	0	0	0	0	29,261	1.30
Wheeler.....	333	9,532	0	2,544	12,409	12	1,197	0	327	1,536	13	15	28	0	0	0	0	0	0	13,973	10.99

TABLE 43.—Physical status at demobilization, by camps, November 11, 1918, to December 31, 1919¹²

Camp	Number examined	Number disabilities reported *	Percentage reported with disabilities	Camp	Number examined	Number disabilities reported *	Percentage reported with disabilities
Dodge.....	210,455	14,782	7.02	Custer.....	86,432	2,106	2.44
Dix.....	316,336	23,105	7.30	Funston.....	92,032	3,336	3.62
Devens.....	141,001	22,767	16.14	Upton.....	202,675	6,351	3.13
Grant.....	236,877	5,998	2.53	Meade.....	95,018	2,243	2.36
Sherman.....	188,829	14,815	7.85	Jackson.....	68,243	1,954	2.86
Taylor.....	153,518	17,811	11.60	Shelby.....	42,390	492	1.16
Lee.....	138,271	7,167	5.18	Presidio of San Francisco.....	32,839	2,174	4.11
Gordon.....	121,291	981	.81				
Pike.....	111,112	2,812	2.53	Total.....	2,323,852	130,060	4.84
Lewis.....	66,535	1,167	1.75				

* Only disabilities over 10 per cent were reported.

It is not possible to explain fully the causes for the variations in the percentage of disabilities reported by the different camp boards. The following reasons are advanced, however, in partial explanation:

CHARACTER OF TROOPS EXAMINED

There were approximately 108,355 limited service men inducted into the Army, nearly all of whom were on duty in camps in this country.¹⁶ No figures are available showing how many were stationed in each camp, but it is probable that some camps contained a larger quota than others. This class of men, all of whom had physical defects, if present would of course increase the percentage of disabilities found upon demobilization at any particular camp. There were also many men, classified upon enlistment or induction as fit for general military service, who as a matter of fact never went overseas because of defects discovered after induction which caused their removal from class A. Men of this class were usually assigned to development battalions and in the majority of cases remained in such organizations until demobilization. It is a known fact that some camps contained many more men of this type than others, and this circumstance tended to increase the disability rate in the former. In addition, there was undoubtedly some difference in the physical make-up of the overseas divisions demobilized at the various camps, though no data are available from which to make deductions. On the other hand, any differences in the physical characteristics of these divisions as they were originally composed had but slight, if any, influence on the number of disabilities found upon demobilization, because replacements made during their tour of duty in Europe had largely changed their original personnel.

THE MEDICAL EXAMINING BOARDS

Several factors enter into this phase of the question: (a) There is no doubt that the personal equation of the examining boards exercised a marked effect upon the results of the examination. Some examiners were undoubtedly better qualified than others; some interpreted the instructions regarding demobilization very strictly, others less so. This is realized to have been the case though every effort was made to furnish each camp a well-balanced and

experienced board. Yet constant shifting of personnel as a result of transfers and discharges rendered this impracticable in some instances and during some periods. (b) Whether or not the different climatic conditions at the different stations had any effect upon the efficiency of the examination is problematical. As bearing on this point the following facts are given: Fifty-two per cent of demobilization examinations were made during the summer months;¹² the work of examining hundreds of men each day is an arduous, monotonous task under the best conditions; it is much more so during hot weather. The heat was presumably greater in the southern camps. In the northern camps the percentage of disabilities found was 5.04, while in the southern tier it was 4.02; if we exclude Camp Taylor from the latter group, the rate for the South was still lower, being but 2.51 per cent. (c) The chief examiner of the board exerted a marked influence upon the results obtained. This duty required administrative ability and judgment of the highest order, qualifications which were obviously not possessed in the same degree by all the individuals concerned. (d) Facilities varied widely in the examination centers. By this is meant the local character and arrangement of the buildings used for the examination. In some camps the rooms used by the cardiovascular and lung examiners were not partitioned off at all, or else not in such a manner as to secure the degree of quiet which is so essential for examinations of this character; in other stations the "dark-room" facilities for eye, ear, nose, and throat examinations were below standard; in some camps the space available was too small and the overcrowding and confusion exercised an unfavorable influence on the work. These factors and others may have affected the final results. (e) The difference of opinion among the various boards as to what constituted a disability of 10 per cent undoubtedly exerted a marked influence. The degree of disability was adjudged in view of the defect, taken in conjunction with the man's occupation; there was no schedule extant giving the rate of reduction in earning capacity resulting from specific injuries or diseases; hence the percentage of disability rating accorded to each soldier depended absolutely upon the judgment of the individual examiners, a fact which alone might be expected to produce varying results.

TABLE 44.—Physical status at demobilization for the period November 11, 1918, to December 31, 1919, by months¹²

Camps, posts, and forts	Discharged with no disability				Reported to Bureau of War Risk Insurance with disability					Held on account of communicable disease			Held for maximum degree of improvement			Held for other causes			Total number examined	Per cent reported to Bureau of War Risk Insurance with disability		
	White		Colored		Total	White		Colored		Total	White	Colored	Total	White	Colored	Total	White	Colored			Total	
	Officers	Men	Officers	Men		Officers	Men	Officers	Men													Officers
<i>November, 1918</i>																						
All camps, posts and forts.....	3,210	66,969	12	7,304	77,495	52	2,933	0	480	3,465	439	193	632	0	0	0	0	0	0	0	81,502	4.25
<i>December, 1918</i>																						
Camps.....	17,390	273,039	158	60,130	350,717	1,157	15,282	6	1,985	18,430	1,726	996	2,722	0	0	0	0	0	0	0	371,869	4.90
Posts and forts.....	4,841	65,194	4	159	70,198	119	5,003	0	21	5,143	474	0	474	0	0	0	0	0	0	0	75,815	6.92
Total for month.....	22,231	338,233	162	60,289	420,915	1,276	20,285	6	2,006	23,573	2,200	996	3,196	0	0	0	0	0	0	0	447,684	5.27
<i>January, 1919</i>																						
Camps.....	9,507	263,113	45	21,178	293,843	648	25,055	5	1,399	27,107	1,836	464	2,300	0	0	0	0	0	0	0	323,250	8.38
Posts and forts.....	6,107	30,138	3	290	36,508	356	3,111	0	3	3,470	226	5	231	0	0	0	0	0	0	0	40,209	8.64
Students' Army Training Corps units	1,421	72,772	12	2,720	76,925	22	1,912	0	26	1,960	353	21	374	0	0	0	0	0	0	0	79,259	2.48
Total for month.....	17,035	366,023	60	24,158	407,276	1,026	30,078	5	1,428	32,537	2,415	490	2,905	0	0	0	0	0	0	0	442,718	7.35
<i>February, 1919</i>																						
Camps.....	6,527	153,224	89	23,954	181,794	481	18,686	3	1,470	20,640	1,551	433	1,984	0	0	0	0	0	0	0	206,418	9.99
Posts and forts.....	3,497	11,971	3	298	15,769	211	856	0	3	1,070	120	9	129	0	0	0	0	0	0	0	16,968	6.31
Total for month.....	10,024	165,195	92	24,252	199,563	692	19,542	3	1,473	21,710	1,671	442	2,113	0	0	0	0	0	0	0	223,386	8.75
<i>March, 1919</i>																						
Camps.....	4,917	168,127	198	34,810	208,052	301	12,391	21	1,285	13,998	2,274	563	2,837	236	39	275	217	11	228	225,390	6.88	
Posts and forts.....	1,771	12,548	1	278	14,598	143	307	1	15	466	48	0	48	23	0	23	3	0	3	15,138	3.08	
Total for month.....	6,688	180,675	199	35,088	222,650	444	12,698	22	1,300	14,464	2,322	563	2,885	259	39	298	220	11	231	240,528	6.01	
<i>April, 1919</i>																						
Camps.....	7,288	214,251	230	11,043	232,812	666	22,171	43	814	23,634	2,018	174	2,192	688	17	705	574	18	592	259,935	9.09	
Posts and forts.....	1,924	17,062	3	427	19,416	365	758	2	14	1,139	89	0	89	50	0	50	3	0	3	20,697	5.48	
Total for month.....	9,212	231,313	233	11,470	252,228	1,031	22,869	45	828	24,773	2,107	174	2,281	738	17	755	577	18	595	280,632	8.83	

IN THE UNITED STATES

<i>May, 1919</i>	9,880	307,680	44	10,563	328,176	563	14,330	11	498	15,362	2,217	211	2,428	918	9	927	375	10	385	347,278	4.42
Posts and forts.....	2,363	23,017	2	349	26,531	416	688	1	5	1,110	153	1	154	81	0	81	6	0	6	27,882	3.96
Total for month.....	12,452	331,297	46	10,912	354,707	979	15,018	12	463	16,472	2,370	212	2,582	999	9	1,008	381	10	391	375,160	4.39
<i>June, 1919</i>																					
All camps, posts, and forts.....	12,214	356,506	23	23,917	362,660	818	11,146	5	470	12,439	2,484	261	2,745	709	7	716	308	4	402	408,962	3.04
<i>July, 1919</i>																					
All camps, posts, and forts.....	15,996	251,910	41	73,059	340,976	961	6,321	4	767	8,083	1,849	430	2,299	847	10	857	315	36	351	352,536	2.28
<i>August, 1919</i>																					
All camps, posts, and forts.....	11,872	113,729	37	17,863	143,531	726	3,325	2	247	4,300	982	260	1,242	560	25	525	285	16	301	149,859	2.87
<i>September, 1919</i>																					
All camps, posts, and forts.....	7,344	62,235	18	3,816	73,413	478	1,948	6	83	2,515	729	64	793	172	5	177	93	1	94	76,962	3.26
<i>October, 1919</i>																					
All camps, posts, and forts.....	7,911	24,972	6	1,703	34,592	488	827	1	31	1,347	355	13	368	12	0	12	8	0	8	36,327	3.71
<i>November, 1919</i>																					
All camps, posts, and forts.....	492	11,076	2	259	11,829	64	182	0	3	249	150	1	151	15	0	15	10	0	10	12,254	2.03
<i>December, 1919</i>																					
All camps, posts, and forts.....	280	4,025	1	39	4,945	86	103	0	3	192	100	1	101	5	0	5	8	0	8	5,251	3.66
Grand total, all camps, posts, and forts.....	136,931	2,504,758	932	294,159	2,936,780	9,121	147,275	111	9,582	106,089	20,173	4,120	24,296	4,256	112	4,638	2,265	96	2,301	3,133,921	5.30

VARIATIONS IN THE METHOD OF DISCHARGE

This refers to discharge of men permanently unfitted for further military service, upon Form No. 135-3, A. G. O., at some of the camps, while in other stations such men were examined by disability boards and discharged on Form No. 17, A. G. O. Paragraph 159, Army Regulations, 1916, states:

When an enlisted man is permanently unfitted for military service because of wounds or disease, he should, if practicable, be discharged on certificate of disability before the expiration of the term of service in which the disability was incurred.

The "certificate of disability" referred to is Form No. 17, A. G. O. To be discharged in this manner the man must be examined by a regularly appointed disability board consisting of two or more medical officers. Hence, a narrow construction of A. R. 159, would exclude any man who was permanently unfit for military service from examination by a camp examining board with a view to discharge on Form 135-3, A. G. O. Furthermore, paragraph 1-b, Circular No. 86, War Department, November 25, 1918, provided that "no man will be discharged who at the time of physical examination prior to discharge is unfit for duty in the class in which he was rated at the time of entrance into the service (namely class A, class C-1, or class C-2), or in a higher class, in case he has been subsequently so rated," and paragraph 1, Circular No. 93, War Department, November 27, 1918, directed that "No class C-1 and C-2 men, nor men under treatment or physical training, will be discharged until the board of review certifies that the maximum degree of improvement has been obtained or that physical disabilities have not been exaggerated or accentuated, etc." Paragraph 4 of the same circular announced that "present regulations concerning discharge on certificate of disability are not changed by aforesaid instructions." Paragraph 2-d, Circular No. 188, War Department, December 31, 1918, contains the following statement:

The cases that can not be benefited by further treatment in hospitals or by transfer to convalescent centres or development battalions will be discharged on Form 17, A. G. O. (certificate of disability) in accordance with existing instructions.

These somewhat obscure instructions upon this subject were variously interpreted at the different camps. For example in some, such as Camps Pike and Devens, practically every enlisted man who was physically able to appear before the camp examining boards was examined and discharged on Form No. 135-3, A. G. O., regardless of whether or not he was permanently incapacitated for further military service, while in others, as, for instance, Camps Gordon and Taylor, War Department instructions were correctly interpreted and no enlisted men who were permanently incapacitated were examined by the camp examining board for discharge on Form No. 135-3. It is obvious that in those camps in which practically all men were examined by the camp examining board, regardless of the character of disability, the percentage of disabilities so reported by the board would be greater than in others where the camp board examined only men who were not permanently incapacitated. So far as the records are concerned, this would have been susceptible of correction if we knew the number of men discharged on certificate of disability, but, unfortunately, there are no accurate data regarding the number actually

discharged on S. C. D. (Form No. 17, A. G. O.) at the individual camps prior to February 1, 1919, and it can not be stated to what extent the percentage of disabilities found by demobilization boards was affected thereby.

Aside from the records, in reality it mattered little either to the Government or the soldier which method was used in discharge, provided a copy of the completed form (Form No. 135-3, A. G. O., or Form No. 17, A. G. O.) was sent to the Bureau of War Risk Insurance, as required by existing instructions. The opinion of the Surgeon General as to the preferable method is best expressed by the following telegram:¹⁹

MAY 6, 1919.

CAMP SURGEON, *Camp Grant, Ill.*

Soldiers permanently incapacitated for military service should be discharged on Form seventeen period. It has been the practice in some camps to discharge on Form one thirty-five dash three and there has been no objection thereto provided copy of Form one thirty-five dash three is furnished War Risk Bureau and register card Form fifty-two Medical Department is made in the case and forwarded to Surgeon General (see circular letter December sixth, nineteen eighteen) period. Present orders may be interpreted to authorize discharge on either Form one thirty-five dash three or Form seventeen period. This office considers it preferable that permanently disabled be discharged on Form seventeen.

IRELAND.

As previously stated, the Surgeon General received no current reports of the number of men discharged on surgeon's certificate of disability (Form No. 17, A. G. O.) during the first part of the demobilization period, reports thereof not having been called for until the issue of Circular Letter No. 115, S. G. O., March 4, 1919. Then after that date some camps and hospitals did not render these reports monthly according to instructions. However, current records are on file regarding the discharge of 20,755 men by disability boards for the period from February 1, 1919, to January 31, 1920; it is estimated that the total number discharged in this manner after the beginning of the armistice was approximately 35,000. Table 45 gives the classification found in men discharged on certificate of disability from February 1, 1919, to January 31, 1920:

TABLE 45.—*Classification of causes for discharge in 20,755 soldiers discharged for disability (Form No. 17, A. G. O.) between February 1, 1919, and January 31, 1920*¹²

Conditions causing discharge	Number of disabilities	Percentage of total so discharged
Orthopedic.....	4,864	23.4
Neuropsychiatric.....	3,343	16.2
Respiratory.....	3,047	14.6
General surgery and skin.....	2,761	13.3
Cardiovascular.....	1,431	6.9
Ophthalmological.....	627	3.0
Otolaryngological.....	612	2.9
Veneral.....	265	1.3
Miscellaneous, including dental.....	3,805	18.4
Grand total.....	20,755	100.0

REFERENCES

- (1) G. O. No. 124, W. D., August 20, 1898.
- (2) Section 115, Act of Congress approved June 3, 1916, published in Bulletin No. 16, W. D., June 22, 1916, 77.
- (3) Circular No. 82, W. D., November 23, 1918.
- (4) Circular No. 114, W. D., 1919.
- (5) Compilation of Circulars Containing Information and Instructions Relating to Demobilization of the Army, War Department, 1918.
- (6) Circular No. 152, W. D., March 28, 1919.
- (7) Letter from The Adjutant General to Commanding Generals of all Demobilization Centers, May 28, 1919. Subject: Instruction creating at each Demobilization Center a Demobilization Group and directing demobilization at each such center as soon as practicable of Depot Brigade, Convalescent Center, and Development Battalion. Table of organization incorporated in letter. On file, Record Room, A. G. O., 324.122 (Miscellaneous Division).
- (8) Criticisms and complaints. On file, Record Room, S. G. O., 321.6 (Complaints name of Camp. (E). Also: 370.01-2 (Demobilization) General.
- (9) Circular No. 79, W. D., February 14, 1919. Subject: Temporary Promotions. On file, Record Room, S. G. O., Document File.
- (10) Reports of general sanitary inspectors made during the World War. On file, Record Room, S. G. O., Correspondence File, 721.-1 (General).
- (11) Memorandum from Secretary of War to The Adjutant General, April 5, 1919, paragraph 4. Also: Memorandum from the Chief of Staff to The Adjutant General, June 2, 1919. Both on file, Record Room, S. G. O., Correspondence File, 370.01-2 (Demobilization). Also: Telegram from The Adjutant General to Demobilization Centers and Fort Bliss, June 3, 1919. On file, Record Room, A. G. O., 602.1 General Hospital No. 11 (Miscellaneous Division).
- (12) Consolidated Monthly Tabulations. On file, Record Room, S. G. O., Correspondence File, 370.01-2 (Demobilization).
- (13) Weekly Statistical Reports. On file, Statistical Branch, General Staff.
- (14) Sanitary Inspectors' Reports. On file, Sanitary Division, S. G. O.; also, Record Room, S. G. O., Correspondence File, 721.6 (under name station).
- (15) Questionnaire. On file, Record Room, S. G. O., Correspondence File, 370.01-2 (Demobilization).
- (16) Report of the Provost Marshal General on the operations of the selective service system to December 20, 1918, 154.
- (17) Annual Report of the Surgeon General, U. S. Army, 1919, Vol. II, 1163.
- (18) Annual Report of the Surgeon General, U. S. Army, 1919, Vol. II, 1162; 1920, 266.
- (19) Night letter from the Surgeon General to the Camp Surgeon, Camp Grant, Ill., May 6, 1919. On file, Record Room, S. G. O., Correspondence File, 220.8 (Camp Grant) (D).
- (20) Annual Report of the Surgeon General of the U. S. Army, 1920, 203.
- (21) Act of Congress approved October 6, 1917, published in Bulletin No. 57, W. D., October 12, 1917.
- (22) Bulletin No. 1, W. D., January 9, 1920.
- (23) Copies of Request for Discharge from Service. On file, with the Retained Records of Hospital, Medical Record Division, A. G. O.
- (24) Manual for the Medical Department, U. S. Army, 1916, paragraph 448 A.
- (25) Army Regulations, 1916, Article XLV.
- (26) Section 300, War Risk Insurance Act, October 6, 1917, published in Bulletin No. 41, W. D., July 19, 1918.
- (27) See Special Regulations re Treatment and distribution of patients arriving at Atlantic Ports from Overseas. On file, Record Room, S. G. O., Correspondence File, 701 (General). Also: Annual Report of the Surgeon General of the U. S. Army, 1919, Vol. II, 1164.

- (28) Correspondence between the Surgeon General of the Army and Bureau War Risk Insurance. Subject: Care of Insane. On file, Record Room, S. G. O., Correspondence File, 701 (General). Also: Hospitals for mental and nervous diseases. See report of the Surgeon General of the U. S. Army, 1919, Vol. II, 1164.
- (29) Cablegram, sick and wounded report, from chief surgeon, A. E. F., November 14, 1918, to the Surgeon General. Copy on file, Cablegram File, Historical Division, S. G. O.
- (30) Weekly Health Report of Division of Sanitation, S. G. O., November 15, 1918. On file, Record Room, S. G. O., 721.6 (Sick and Wounded Reports).
- (31) Annual Report of the Surgeon General, U. S. Army, 1919, Vol. II, 1031.
- (32) Annual Report of the Surgeon General, U. S. Army, 1919, Vol. I, 954.
- (33) Memorandum, W. D., S. G. O., for Camp Surgeons, Department Surgeons, Surgeons of Independent Posts, Commanding Officers of all Hospitals, Surgeons of S. A. T. C. Units, Surgeons Ports of Embarkation, Chief Surgeon, A. E. F., and Officer in Charge Air Division, November 21, 1918. On file, Record Room, S. G. O., Correspondence File, 370. (Demobilization.)
- (34) Circular Letter No. 115, Surgeon General's Office, March 4, 1919.
- (35) Report of the Surgeon General of the U. S. Army, 1920, 202.

CHAPTER XXII

PREVENTION OF DISSEMINATION OF DISEASE BY DISCHARGED SOLDIERS

The demobilization of the military forces after former wars led frequently to introduction into the civil populations of the countries concerned of diseases which were then prevailing among the troops. During and at the close of the Spanish-American War typhoid fever was spread broadcast by the practice which prevailed of moving the sick, furloughing early convalescents, and practically releasing whole organizations from military control for some months prior to their muster out.¹

During the World War the importance of preventing dissemination of infectious diseases by the Army at any stage was recognized from the outset and vigorous efforts were taken to guard against it. These efforts were directed toward notification of local health authorities on rejection at camp of selective service men with infectious conditions;² similar notification in the case of discharge from the service of soldiers who were carriers or who were suffering from chronic communicable diseases;² compulsory retention in the service during the demobilization period of all soldiers with acute diseases,³ particularly venereal diseases, until they had passed the infectious stage;³ and careful deverminizing of troops returning from Europe.⁴

The officials of the National Association for the Study and Prevention of Tuberculosis, with whom the tuberculosis section of the Surgeon General's Office was in close liaison, desired to be informed as to the names and addresses of soldiers discharged with tuberculosis, and of registrants rejected for this disease, with a view to putting the local representative of the association in touch with each such tuberculous individual.⁵ As shown in Chapter II of this volume, all members of the Regular Army and of the National Guard, and subsequently all draft registrants arriving at camps, were examined by boards of tuberculosis experts, infected individuals being eliminated by discharge, at first; later, sick were retained until maximum cure had been effected.⁶ In 1917 these boards were directed to report to the Surgeon General the names and home addresses of tuberculous soldiers and registrants, and this information was transmitted by him to the National Tuberculosis Association. At a later date, in order to obtain more complete reports, a letter identical with the following was sent to the surgeon of each large camp:⁷

SGO 220.8 (Camp Pike) D.

JANUARY 24, 1918.

From: The Surgeon General, United States Army.

To: The division surgeon, Camp Pike, Little Rock, Ark.

Subject: Names and home addresses of soldiers discharged on account of pulmonary tuberculosis.

1. It is requested that you furnish this office, attention of the tuberculosis section, division of internal medicine, a list of the names and home addresses of soldiers who have been discharged or rejected at your camp on account of pulmonary tuberculosis.

2. This list should be made as complete as practicable up to the present date, and in future similar lists should be furnished at least once each week.

By direction of the Surgeon General.

¹ Never since the Spanish-American War have Army patients with acute communicable disease been discharged and so allowed to infect civilians, but this was not previously universally the case so far as tuberculosis and venereal diseases were concerned.

With a view to having the names of tuberculous soldiers who were discharged from general hospitals reported direct to the National Association for the Study and Prevention of Tuberculosis, letters were sent to commanding officers of general hospitals requesting that the names and home addresses of soldiers discharged from the hospital on account of tuberculosis be furnished to the National Association for the Study and Prevention of Tuberculosis, with headquarters in New York City.⁸ It was further directed that, in the cases of men discharged upon the request of relatives or friends who have guaranteed continued treatment subsequent to discharge, the following information be sent to the American Tuberculosis Association, New York City:⁹

(a) Statement as to physical condition at date of discharge.

(b) Name and address of party assuming responsibility for such continued treatment and care.

Many conditions other than tuberculosis demanded equal care, this being particularly true for chronic carriers of the *Bacillus typhosus* and the *meningococcus*, when prolonged treatment had failed to effect a cure. Such cases were provided for as follows:

SGO 220.8-1 (Discharge).

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, April 16, 1918.

Memorandum to all division surgeons, to surgeons of special camps and recruit depots, to department surgeons, to chief surgeon, aviation section, and to commanding officers of hospitals:

1. It is the present intention of the Medical Department to take care of all chronic meningitis carriers that are found in the military personnel, until it is determined that they may be discharged without menace to the civil communities. No such individuals should be recommended for discharge from the service without authority from this office.

2. If any meningitis carriers have been discharged from your cantonment in the past, notification of the names and addresses of the persons so discharged should be forwarded by you to the proper State health authorities, with statement that persons so named are meningococcus carriers. Similar information should be furnished to the Surgeon General, United States Public Health Service, Washington, D. C.

3. In the event of discharge from the service by reason of tuberculosis, trachoma, leprosy, malta fever, yaws, mycoses, or other chronic infectious diseases, notification of name, address, and cause of discharge should be furnished as provided in paragraph 2. Similar action will be taken in case of discharge of a soldier by reason of being a carrier of typhoid or paratyphoid bacilli, diphtheria bacilli, or amoebae.

By direction of the Surgeon General.

With the beginning of demobilization following the signing of the armistice, increasing care had to be exercised to prevent the discharge of men in the incipient stage of infectious disease. The extremely careful physical examination required prior to demobilization, which was usually held on the day before discharge, was sufficient to sift out practically all cases of chronic and most cases of acute infectious disease. Suspicious cases were sent to hospital and held for further observation.

At the date of the signing of the armistice there were thousands of venereal cases undergoing treatment in hospitals and in development battalions, and the policy was adopted, as previously explained, of holding in service and under treatment all men with venereal disease until they ceased to be a danger to the community. The circulars following and circular letters indicate the practice of the War Department in these respects.

Circular No. 86.

WAR DEPARTMENT,
Washington, November 25, 1918.

DISCHARGE OF ENLISTED MEN

Under orders issued or that hereafter may be issued for the discharge of enlisted men the following will be strictly observed:

* * * * *

c. Men suffering from venereal diseases will not be discharged until cured. Intensive treatment of all venereals will be undertaken at once with a view to their cure and discharge at the earliest possible date.

* * * * *

By order of the Secretary of War:

Official:

P. C. HARRIS,
The Adjutant General.

PEYTON C. MARCH,
General, Chief of Staff.

Circular No. 188.

WAR DEPARTMENT,
Washington, December 31, 1918.

INTERPRETATION OF INSTRUCTIONS RELATIVE TO THE DISCHARGE OF DISABLED SOLDIERS

* * * * *

2. During the demobilization of the present Army, commanding officers of general hospitals will dispose of patients in such hospitals who are enlisted or drafted men, as follows:

* * * * *

c. Men, without regard to date of entry into the service, who have become disabled, either prior to or since entry into the service, due to venereal disease and who need further treatment but do not necessarily require hospital care, will be transferred to the development battalion nearest their place of entrance into service.

* * * * *

By order of the Secretary of War:

Official:

P. C. HARRIS,
The Adjutant General.

PEYTON C. MARCH,
General, Chief of Staff.

In reply refer to S. G. O. 704.1.

Circular letter No. 41.

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, January 21, 1919.

Subject: Treatment and discharge of sick and wounded.

1. The attention of medical officers is called to the provisions of Circular 188, War Department, December 31, 1918, respecting the discharge of disabled soldiers.

2. It is the policy of the War Department thereunder, subject to the provisions of section 4, act June 15, 1917, governing the termination of the service of men, drafted or enlisted, under the act May 18, 1917, to retain, so far as practicable, under military control, for the purpose of active medical and surgical treatment—

(a) Officers and soldiers suffering from acute diseases, or acute exacerbations of chronic diseases, or unhealed lesions.

(b) Officers and soldiers suffering from communicable diseases, or who are "carriers," whose discharge would be a danger to the civil community.

* * * * *

4. In applying the foregoing principles, the following special rules will ordinarily be observed:

(a) Cases of tuberculosis should be kept under treatment in military hospitals until the disease is arrested, or until it is ascertained that they are progressive in type or incurable.

* * * * *

By direction of the Surgeon General:

(Signed) C. R. DARNALL,
Colonel, Medical Corps, U. S. A.,
Executive Officer.

In reply refer to S. G. O. 710.

Circular letter No. 107.

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, February 26, 1919.

Subject: Reporting of communicable diseases of discharged soldiers.

1. The attention of medical officers is called to the enclosed reprint from Public Health Reports of February 7, 1919, United States Public Health Service, which lists those diseases required by law to be reported to the health authorities in each of the States, and also to the enclosed list of the addresses of the State boards of health.

2. On the discharge of a soldier having any diseases required to be reported to the health authorities in the State to which he is going, a sealed report will be sent to the board of health of that State. This report will give the soldier's name, his full address at the point of destination, and the name of the disease.

3. Special care should be given to the reporting of venereal diseases, as cases discharged in a noninfectious state may need further treatment and supervision. The method of reporting venereal diseases varies in the different States, but in reports of cases of men who are discharged with venereal disease the name and address will be given in all instances. The medical officer may, in his discretion, add information regarding past treatment and supply other data of use to the health authorities in determining what further treatment and observation will be needed. Such additional data will be the most valuable in cases of latent syphilis and will, in many instances, give the patient further benefit from the information contained in his syphilitic register.

4. The reporting of venereal cases to State health officials has been requested by the United States Public Health Service. The Surgeon General of that service states that such information will remain confidential, and will be used only by accredited representatives of the Public Health Service, or persons selected by them to work in connection with venereal disease control as representatives of the State boards of health.

By direction of the Surgeon General:

C. R. DARNALL,
Colonel, Medical Corps, U. S. A.,
Executive Officer.

In reply refer to S. G. O. 726.3.

Circular Letter No. 141.

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, March 18, 1919.

Subject: Discharge of patients capable of transmitting infection.

1. Reports indicate that a considerable number of carriers of intestinal parasites and carriers of typhoid and paratyphoid bacilli are arriving from France.

2. All oversea patients whose history indicates possible previous infection with intestinal group of organisms (typhoid, paratyphoid, dysentery, cholera) will be examined to determine whether or not they are carriers, and those found to be carriers will be treated by appropriate medical and surgical measures to free them from this condition. Attention is invited to Circular Letter No. 41, paragraph 2-b, S. G. O. If any carriers have been discharged or may in the future be discharged, they should be reported as required by Circular Letter No. 107, S. G. O.

3. The retention of soldiers having venereal diseases in the Army and their intensive treatment until they have been rendered clearly noninfectious, as required by Circular No. 41, paragraph 2-b, S. G. O.; Circular Letter No. 86, paragraph 1-c, War Department, November 25, 1918; Circular Letter No. 93, paragraph 3, War Department, November 27, 1918; and also the reporting of cases of venereal disease in discharged soldiers in accordance with Circular Letter No. 107, S. G. O., are measures essential to the welfare of the soldier and necessary for the protection of the civil population.

* * * * *

By direction of the Surgeon General:

C. R. DARNALL,
Colonel, Medical Corps, U. S. A.,
Executive Officer.

In reply refer to S. G. O. 710.

Circular Letter No. 220.

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, May 23, 1919.

Subject: Reporting of communicable diseases of rejected applicants for enlistment.

1. The provisions of Circular Letter No. 107, Office of the Surgeon General, February 26, 1919, concerning the reporting of communicable diseases of discharged soldiers will apply also to the reporting of communicable diseases of rejected applicants for enlistment.

2. Reports of cases of venereal disease are required to be sent to the boards of health of all States requiring the reporting of these diseases. The following are the only States without such requirement: Missouri, Tennessee, Pennsylvania, and Nevada.

3. Reports under this letter and Circular Letter No. 107 should give the age and race in addition to the name and address.

By direction of the Surgeon General:

C. R. DARNALL,
Colonel, Medical Corps, U. S. A.,
Executive Officer.

REFERENCES

- (1) Report on the Origin and Spread of Typhoid Fever in U. S. Military Camps During the Spanish War of 1898, by Walter Reed, Major and Surgeon U. S. Army, Vol. I, 18 (Government Printing Office, 1904).
- (2) Memorandum from the Surgeon General, to all division surgeons, to surgeons of special camps, etc., April 16, 1918. On file, Record Room, S. G. O., Correspondence File, 220.8-1 (Discharge). Letter from the Surgeon General, to the commanding officer, U. S. Army General Hospital, Fort Bayard, New Mexico, June 5, 1918. Subject: Notification of discharge of patients. On file, Record Room, S. G. O., Correspondence File, 705. (General Hospital, Fort Bayard) K. Circular Letter No. 107, S. G. O., February 26, 1919. Subject: Reporting of communicable diseases of discharged soldiers.
- (3) Bulletin No. 36, War Department, July 11, 1918. Also: Circular No. 86, War Department, November 25, 1918.
- (4) Letter from Surgeon General to Chief of Staff, November 20, 1918. Subject: Delousing troops returning from Europe, with 1st Indorsement A. G. O., November 26, 1918. On file, Record Room, S. G. O., Correspondence File, 729.61 Vermin. Also: Letter from the Surgeon General to the Chief of Construction Division, November 29, 1918. Subject: Delousing Plants. On file, Record Room, S. G. O., Correspondence File, 679 (Delousing Plants).
- (5) Verbal request of representative of National Association for the Prevention and Study of Tuberculosis.
- (6) Memorandum No. 3, S. G. O., August 22, 1917, and Circular No. 20, S. G. O., June 13, 1917, republished in Instructions for the Physical Examination of Drafted Men at National Army Cantonments (War Department, S. G. O., 1917).
- (7) Letter from the Surgeon General, to the Division Surgeon, Camp Pike, Little Rock, Arkansas January 24, 1918. Subject: Names and home addresses of soldiers discharged on account of pulmonary tuberculosis. On file, Record Room, S. G. O., Correspondence File, 220.8 (Camp Pike) D.
- (8) Letter from the Surgeon General to the Commanding Officer, U. S. Army General Hospital, Fort Bayard, New Mexico, June 5, 1918. Subject: Notification of discharge of patients. On file, Record Room, S. G. O., Correspondence File, 705 (General Hospital, Fort Bayard) (K).
- (9) Letter from the Surgeon General, U. S. Army, to the commanding officer, General Hospital No. 21, January 24, 1919. Subject: Notification of discharge of patients. On file, Record Room, S. G. O., 705 (G. H. No. 21) K.

SECTION II

IN THE AMERICAN EXPEDITIONARY FORCES

CHAPTER I

SANITARY ORGANIZATION

The organization of the Medical Department in the theater of operations is given in detail in Volume VIII of this history, which concerns the operations of this department in the American Expeditionary Forces. For this reason no attempt is made here to deal with the question of Medical Department organization except in so far as it is related to the primary or essential duty of the members of the department; that is, the prevention of disease in the Army.

Primarily, it must be understood that the commanding officer of each organization is directly responsible to his next higher commander for the sanitary condition of the immediate place in which his troops are located, and for taking all requisite measures for preserving the health of those troops.¹ Thus the ultimate responsibility inevitably reaches the commander in chief of our field forces. However, our general scheme provides for each commander of troops, with certain exceptions which will be explained later, having a medical adviser who is responsible to him for all matters which are directly concerned with the health of the command. An examination of Chart I clarifies the above statements. In this chart, which has been prepared with the thought of showing the responsibility of the Medical Department only, it must be understood that where the position of a surgeon, from the chief surgeon down, has been given, both in the overseas territorial areas and in the combatant organizations, the organization commander is taken for granted. Also, it is apparent that groups of organizations, especially in the areas, and more particularly small organizations, shared in common the services of a medical officer. Where medical officers commanded Medical Department units, they were responsible, of course, for the sanitation of their respective units. Also, when commanders of organizations delegated a certain authority to their medical officers (sanitary inspectors) to give, in their names, orders for the immediate correction of sanitary defects, the responsibility of the medical officers concerned was markedly increased.

At the first, the chief surgeon, A. E. F., planned for a centralized control of sanitation in the American Expeditionary Forces, and on July 28, 1917, he organized as one of the divisions of his office the division of sanitation.² At this time the number of our troops in France was relatively small; there were no territorial subdivisions of the forces, and there were no greater tactical units than the division. Central control of sanitation was relatively easy of accomplishment, especially in view of the fact that our troops then in France were, for the most part, seasoned, and their sanitary organization was highly efficient, because they, especially the combatant organizations, had come to France almost directly from service on the Mexican border,³ where both officers and men had acquired knowledge of the fundamental principles of the care of the soldier's person and of his surroundings.

Even though the division of sanitation had been provided for in the chief surgeon's office, A. E. F., in the summer of 1917, it was not until the early spring of 1918, as will be told later, that much was done in the way of the perfection of its organization. With the organization of the Line of Communications, A. E. F. (afterwards the Services of Supply), and its subdivisions into territorial sections, in August, 1917,⁴ the decentralization of the supervision of sanitation was begun. In these territorial sections the chief surgeon, A. E. F., was immediately concerned with the sanitation of troops not actually under the command of the commanding general, Line of Communications; that is to say, there was now a chief surgeon, Line of Communications, with a sanitary inspector as assistant who was charged with all matters relating to the sanitary care of the troops forming a part of the Line of Communications.⁵ In turn, each of the territorial sections comprising the Line of Communications had its surgeon with his sanitary inspector; and within the sections there were camps, the larger of them having local sanitary inspectors. To the Line of Communications the sanitary squads belonged; however, these organizations will be considered separately later.

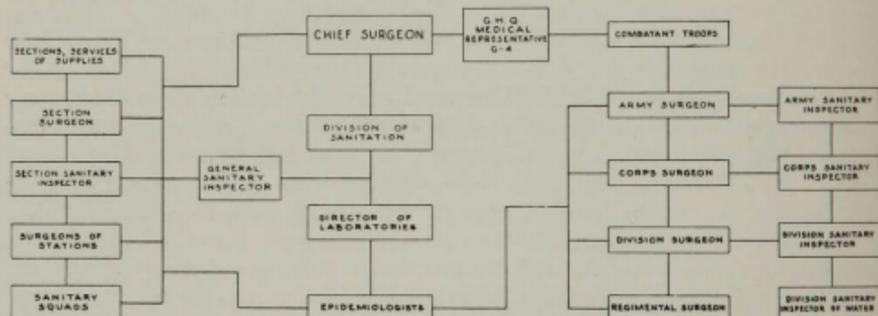


CHART I.—Organizations for sanitation, American Expeditionary Forces

In so far as the combatant organizations, and the organizations attached to them, are concerned, it is stated above that at first there was no greater tactical organization than the division. Each division had its sanitary inspector, charged, analogously to section sanitary inspectors, with all matters relating to the sanitary care of troops of the division. Such organizations, being directly controlled by General Headquarters, A. E. F., were centrally supervised in their sanitation by the chief surgeon, A. E. F., until the early months of 1918. At this time several events occurred which made a considerable change in this control. These were the separation of the chief surgeon, A. E. F., from General Headquarters, A. E. F., the organization of the division of sanitation in the chief surgeon's office, and the appointment of general medical inspectors.

DIVISION OF SANITATION AND INSPECTION, CHIEF SURGEON'S OFFICE

The division of sanitation and inspection of the chief surgeon's office, A. E. F., although theoretically in existence from August, 1917, as has been mentioned above, did not properly begin to function until March 12, 1918, when a chief of the division was appointed by the chief surgeon.⁶

The administrative details which were included within the jurisdiction of the division of sanitation and inspection now were:⁶ (a) The receipt, record, and analysis of reports of disease and injury; (b) the receipt and review of monthly and special sanitary reports; (c) the selection, supply, and direction of laboratory services for the prevention, diagnosis, and treatment of disease, for the protection of water and food supplies, and for research by experimental laboratory methods in all matters pertaining to personal hygiene, physiology,

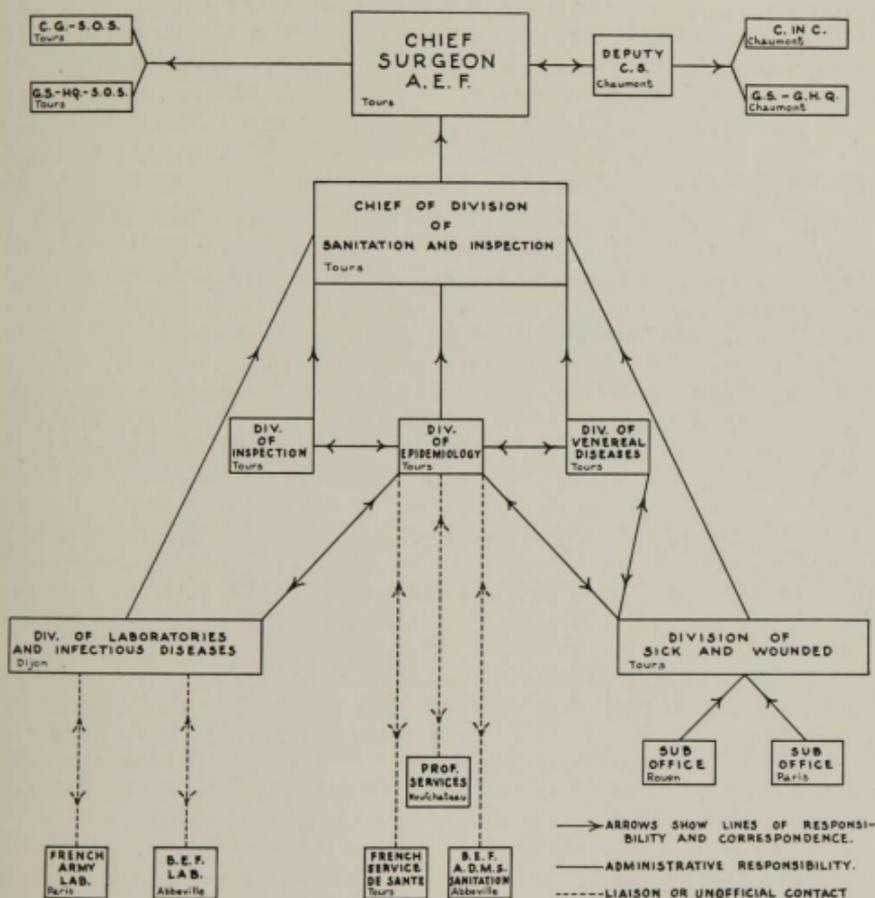


CHART II.—Organization of Division of Sanitation and Inspection, Office of Chief Surgeon, A. E. F., March, 1918, to June, 1919

the science of nutrition, pathology, and bacteriology, as they bore upon the problems of the armies; (d) the inspection of areas and premises occupied by our troops, together with such examination of men, singly or in groups, as was required in tracing the origin, distribution, and spread of causes of non-effectiveness, whether due to communicable disease or to other cause; (e) the correlation of the reports of disease with the reports of sanitary conditions, troop movements, weather conditions, military operations, or other essential factors,

to the end that epidemics might be brought to an end promptly, and their recurrence prevented; (f) the collection of data for statistical purposes to serve as a basis for the direction of sanitary policies of the American Expeditionary Forces; (g) the selection, training, and appointment of qualified officers and enlisted men to serve the functions above described; (h) the collection and publication of information dealing with preventive medicine; (i) the maintenance of liaison with other divisions of the Medical Department, A. E. F., and with divisions of sanitation in the medical services of our Allies.

For efficiency of operation the division of sanitation was divided into four sections, as follows:⁶ (1) Sick and wounded reports; (2) epidemiology; (3) laboratories; (4) sanitary inspections.

SICK AND WOUNDED REPORTS

REPORTS AND STATISTICS

The sick and wounded section of the chief surgeon's office was organized on August 22, 1917, with a personnel of one officer and two enlisted men. The early work consisted of auditing and tabulating the few reports then received from the scattered units in France and sending them to the Surgeon General of the Army. With the growth of the American Expeditionary Forces, the duties of this section, while of the same general character, increased so greatly in volume that when the war came to an end the office occupied a large three-story building in Tours and had a personnel of 1 officer of the Medical Corps, 5 officers of the Sanitary Corps, 86 enlisted men, and 80 French women.⁶

As early as September, 1917, when changes in organization were being made, it was seen that the period of reporting sick and wounded, as directed in the Manual for the Medical Department, was inadequate and unsatisfactory under conditions which obtained in the American Expeditionary Forces.⁶ Orders were being received from the commander in chief, A. E. F., from the general staff at General Headquarters, and from other agencies, calling for reports which could not be made. Being convinced of the impossibility of furnishing the desired information under the then existing system and of its impracticability in time of active operations, the chief surgeon appointed a board of medical officers to revise the methods and make the system meet the needs of the American Expeditionary Forces.⁶ This board consisted of three medical officers, each of whom had had experience with large British hospitals and was familiar with the statistical methods employed in them.

At about this time the adjutant general's department, A. E. F., was undertaking the organization of the statistical section (later, the central records office) and inaugurating a program which called for numerous and elaborate reports from hospitals.⁶ The necessity for coordination and holding in check the amount of clerical work required made it more than ever necessary to reorganize the statistical part of the chief surgeon's office.

SYSTEM OF REPORTS

After careful study and consultation with officers of the adjutant general's department, the following system was recommended by the board:⁶

(a) *Field medical card and envelope*, to be attached to the patient at the first clearing station to which admitted, and to accompany him until his case should be disposed of; the use of the diagnosis tag to cease.

(b) *A daily report of casualties and changes*, for patients in hospitals and infirmaries functioning as hospitals.

(c) *A telegraphic report of communicable diseases*.

(d) *A special venereal disease report*.

(e) *A monthly report*, consisting of a complete sick and wounded card, no register number, for every "completed" case and for every patient evacuated to the United States. This latter report was to constitute the soldier's permanent record in the War Department.

It should be noted that the change here was that no sick and wounded card was to be sent in until the case was completed; nor was it necessary that it be made except by the completing hospital, though as a matter of fact hospitals generally made and retained these cards for their own information. It will be seen that the principal addition to the old record system was the field card, attached to the soldier's clothing and remaining with him; a device derived from the British.⁶ The other new reports called for were temporary, and were planned to give information from day to day.

The above plan recommended by the board was approved by the chief surgeon, A. E. F., and after some delay was put into effect.⁶ The details and directions were published in a pamphlet of instructions, which was ordered to be made effective on May 1, 1918. On account of delay in securing medical card envelopes and blank forms, the system was not actually inaugurated until June 15, 1918.⁶

In order to obtain records of the American troops serving with the Allies, arrangements had to be made for reporting American patients in the allied hospitals in France and England. This was accomplished, and for the purpose suboffices were established in Paris and London. Each suboffice was in charge of an experienced registrar, who had authority to employ clerical help. Women only were used as clerks. All reports of patients in allied hospitals were sent to these offices, where they were transcribed on American Expeditionary Forces forms and forwarded to the chief surgeon, A. E. F.⁶

The daily report of casualties and changes from hundreds of hospitals, showing the change of status of every one of these patients for the hundred or two hundred thousand, had to be made available for statistics, and for answering thousands of individual inquiries concerning the whereabouts and conditions of soldiers. The central records office, A. E. F., had been made responsible for these records by general orders.⁷ However, it was thought that the chief surgeon's office, A. E. F., should have all available information concerning patients in hospitals, and should be able to furnish it promptly when properly called for.⁶ Therefore the essential records were kept there. Experience proved the wisdom of such action, and this office was able to answer hundreds of inquiries daily from the central records office and other official and civilian agencies. In addition to the work outlined above, the monthly sick and wounded reports from all units had to be checked and corrected in detail in the chief surgeon's office before they could be forwarded to the War Department for permanent record.

TABULATING MACHINES

To handle this tremendous volume of business, tabulating machines were installed.⁶ Then daily reports were transferred by numerical codes to cards for either disease or injury as the case might be. The cards gave such data as name, rank, number, organization, diagnosis, disposition, date, and hospital transfers. The cards for injury cases gave, in addition, the cause of injury, its location, and nature. When cards had been coded, clerks perforated them on machines. After being perforated and verified, the cards were passed through sorting machines where they were sorted for required data. Cards were run through the machines for one kind of data, then for another, and so on. Not the least of the advantages of the system is that this enumeration is not susceptible of error. After all tabulations were made, cards were finally sorted by name, so that each man's card was filed in its proper alphabetical order. This file constituted the master file for all cases reported in all hospitals in Europe, and at the last it contained 4,000,000 cards and was a complete directory and news agency for all sick and wounded.

A set of books was kept in the sick and wounded section, corresponding to a ledger, in which daily entries were made of the number of admissions and the disposition of each disease and injury.⁶ This ledger constituted a ready reference record for special reports called for. The balance showed the hospital status from day to day.

Great difficulty was experienced from the first in obtaining complete and accurate reports.⁶ The greatest difficulty came from the constant and rapid shifting of troops, the filling of units with replacements, the change of status of hospitals, splitting up of units, consolidation of others, and continual changes of various kinds. All these, vitally affecting the keeping of records, took place with such rapidity (and often without notice or report) that it was impossible to keep track of them in this section. Many reports were lost in transit and had to be duplicated. Often when duplicates were called for the reply was that the originals had been lost. Then, too, the majority of the medical officers were inexperienced in keeping records, and some did not see the necessity for them.

REGISTRARS

To meet these conditions, a field force of trained medical officers and experienced registrars was organized.⁶ Their function was to inspect hospital records, give instructions in the preparation of them, and keep the chief surgeon, A. E. F., advised in all matters affecting reports of the sick and wounded. To avoid loss, hospitals were required to send their reports by a special messenger, if such reports were too bulky to be sent by registered mail. A sub-office was established at Joue-les-Tours, where the retained records of closed hospitals were sent and made available for use when called for. Many reports lost in transit to the United States were duplicated from this source. In order that no organization should leave France before rendering the required reports, registrars of outgoing units were required to bring to the chief surgeon's office the final reports of sick and wounded, with certain other records, where they were checked. If found correct and complete, a clearance was given.

EPIDEMIOLOGY

SCOPE

Epidemiology may be described as the science or study of the incidence, cause of origin, and spread of such diseases as occur chiefly or generally in groups of cases and which come within the commonly accepted definition of communicable and preventable. Therefore the section of epidemiology, office of the chief surgeon, A. E. F., was primarily concerned with obtaining and collecting for study data as to (a) the population under consideration; (b) environment—i. e., the conditions of sanitation in the broadest sense; the physical surroundings, to include food, water, air, climate, housing, etc.—the psychical, to include occupation, recreation, education, and discipline; and (c) the incidence of the diseases as they occurred.

SOURCES OF INFORMATION

Population—i. e., numerical strength—was obtained weekly from the adjutant general's office, A. E. F., and from the general staff (personnel division), General Headquarters, A. E. F. Such information included troops in Russia and Italy, and only after troops had landed in Europe.⁶

The monthly sanitary reports (Form 50, M. D.) from all commands, special sanitary reports upon sanitary conditions existing during particular emergencies, regardless of the presence of diseases, and reports of special inspectors and investigators, assigned usually from the central or base laboratories, to make field study of conditions with the object of giving expert technical advice and service to medical officers of commands where disease was epidemic or threatened to be so, were the three sources of information which reached the section of epidemiology, chief surgeon's office, A. E. F.

As regards the monthly sanitary report (Form 50, M. M. D.) as a source of information for epidemiological purposes in the chief surgeon's office, it proved necessary in the spring of 1918 to require greater detail when this report was rendered, as is shown in the following letter:

AMERICAN EXPEDITIONARY FORCES,
France, 8th May, 1918.

Circular Letter No. A-3.

From: The chief surgeon.

To: Division surgeon, — Division.

Subject: Sanitary reports.

1. Owing to the unusual conditions of service with the American Expeditionary Forces, the following additions should be included in the sanitary reports of this expedition.

(a) Under paragraph 1, "Public buildings, etc.," mention should be made of the degree of crowding, and an estimate of the floor space per capita should be given as nearly as practicable, where there is any question of adequate space for sleeping purposes.

(b) Under paragraph 3, "Sanitary appliances, etc.," there should be included a statement of the facilities for bathing and for laundering clothes, and of their adequacy to meet the needs of the command.

(c) Under paragraph 6, "Clothing of the men," mention should be made of the facilities for drying clothes and the provision of clean clothing.

(d) Under paragraph 7, "Character and causes of prevailing diseases, etc.," the prevalence of itch, body lice, and other infestations with body vermin should be indicated, as well as a statement of the method used and the equipment available for their prevention and treatment.

(e) Under paragraph 8, "Dates of semimonthly physical inspections, etc.," add the mean strength of the command for the month, which figure can be obtained from the adjutant.

2. Attention is invited to par. 1367, A. R., to paragraphs 182, 414, 415, 416, 417, M. M. D., 1917, and to Circular No. 27, C. S. O., S. O. S., 17 April, 1918.

WALTER D. McCaw,

Colonel, Medical Corps,

For and in the absence of the Chief Surgeon.

Again, in September, 1918, the persistent disregard of many medical officers to furnish adequate and accurate details on the monthly sanitary report prompted the chief surgeon to promulgate the following circular letter to all supervising surgeons in the American Expeditionary Forces:

AMERICAN EXPEDITIONARY FORCES,
OFFICE OF THE CHIEF SURGEON, SERVICES OF SUPPLY,
France, September 17th, 1918.

From: The chief surgeon, S. O. S., A. E. F.

To: Section, corps, and Army surgeons.

Subject: Sanitary reports.

1. Attention is invited to the importance of inclusion in the sanitary reports which pass through your hands for review, of accurate details concerning the data called for in Circular Letter No. A-3, of May 8th, from O. C. S.

2. Slipshod methods of inspection and loose expressions in description are only too commonly revealed in sanitary reports.

3. Owing to the threatening danger of a return of the high incidence of respiratory infections from which the A. E. F. suffered last winter, every effort should be made, by the use of tentage, if necessary, to obtain not less than 40 square feet of floor space per capita in sleeping quarters, for every man under your jurisdiction. It is important that the information called for in par. 1 (a) of the circular be answered categorically and not by a general phrase "space adequate" or "good."

4. The importance of immediate provision of adequate bathing and delousing facilities, and place for drying outer clothing and shoes available day and night, demands a careful description of the facilities now on hand or planned for. "Out-doors drying" and "river bathing" are not acceptable as adequate.

5. The errors of calculation as to rate of venereal disease per 1,000 of mean strength for the month of report continue to be so common that the necessity of supplying the mean strength of commands as well as the number of new cases, as called for in par. 1 (e) of the circular, must be obvious, yet this item is lacking in about 50 per cent of the reports received.

6. An administrative measure put into effect in Base Section 3 at the request of the surgeon, which would seem, from the results obtained, to merit initiation in other sections of the A. E. F. is the withdrawal of all passes for a month from any organization or command which has a venereal disease rate over 4.17 per 1,000 strength until such time as the venereal disease rate has been lowered, for the period of one month at least, to that of the average rate for the section.

7. It is expected that supervising surgeons will take proper steps to correct the defects complained of in the sanitary reports. Action should be indicated in forwarding reports to high authority. Forwarding sanitary reports with the indorsement "Contents noted" is insufficient when grave sanitary defects which demand action are complained of.

Col. W. D. McCaw,

For and in the absence of the Chief Surgeon.

Of the preventable causes of hospitalization or noneffectiveness, injuries and accidents occurring otherwise than in action supplied a considerable proportion of wastage of life and loss of time in the American Expeditionary Forces, but this large group was not, until the winter and spring of 1919, subjected to special study and analysis, and then only in the office of the surgeon, Third

Army.⁶ Of the preventable communicable diseases, tuberculosis, venereal disease, and the influenza and pneumonia groups will be dealt with in subsequent chapters. The following communicable diseases which occurred in the American Expeditionary Forces were reported to the section of epidemiology: Anthrax, chicken-pox, diphtheria, dysentery, German measles, infectious jaundice (spirochetal), influenza, leprosy, measles, meningitis (meningococcus), mumps, paratyphoid fever, pneumonia, poliomyelitis, scarlet fever, smallpox, trench fever, tuberculosis, typhoid fever, typhus fever, venereal diseases.

REPORTS OF DISEASE

Reports of the diseases named in the preceding paragraph, as of all other causes of sickness, were received, prior to March 11, 1918, only by mail communications, in compliance with paragraphs 201, 202, and 203, Manual for the Medical Department, 1916, and instructions on Forms 22 and 52 (M. D.). These reports commonly were incomplete as to numbers of cases, identity of patients, place of origin, and organizations exposed, while the delay in transmission usually was such that further action by the office of the chief surgeon, A. E. F., was unprofitable, and further report, as called for by the French, was futile except as a matter of formal record.⁶

On March 11, 1918, Circular 13, C. S. O., A. E. F., was issued, and, with the slight additions incorporated in Section XII, Manual of Sick and Wounded Reports, A. E. F., which went into effect June 15, 1918, the reports of the specified communicable diseases, upon which all subsequent studies were made, were in compliance with the circular and section mentioned. Two sections of the latter read as follows:

XII. REPORT OF EPIDEMIC DISEASES

1. Special telegraphic or telephonic reports will be required once each twenty-four hours (ending midnight) of commanding officers of field hospitals, evacuation hospitals, camp hospitals, and base hospitals, of all cases or suspected cases of the following diseases occurring in their command or admitted to, or occurring in, their hospitals, that have not been previously diagnosed in full and reported. At the time the case of any of these diseases is diagnosed and reported, this fact will be stated by entering on field medical card or diagnosis tag, in space for diagnosis, "Notifiable disease reported," or abbreviated "N. D. R.," for the information of the commanding officer of each hospital to which the patient may be admitted and to prevent duplication of record: Chicken-pox, cholera (Asiatic), diphtheria, dysentery, German measles, measles, meningitis (meningococcus), paratyphoid fever, plague, scarlet fever, smallpox, typhoid fever, typhus fever.

2. This report will include name, rank, organization (including company), and place of origin of infection (town or village).

XIII. WEEKLY VENEREAL DISEASE REPORT

1. All surgeons of organizations and all surgeons of detachments operating independently of their main command will submit a weekly report of venereal disease by courier where possible, or by mail. No cases of venereal disease detected before debarkation of troops will be included in this report. Commanding officers of all hospitals and hospital trains will make separate reports for the personnel of the command and for new cases developing among patients.

Attending surgeons and senior medical officers of camps which serve as concentration centers for smaller units will make this report for each component organization within the jurisdiction of the reporting officer during the week.

2. This report will include the following data presented in the following form:

Name of organization.....
 Strength of organization on day of report.....
 S. O. S. section or special area within which located.....
 Week ending.....
 Number of cases of:

Chancroid	Gonorrhoea	Syphilis	Total number of venereal disease cases occurring after failure to take prophylaxis

3. The original report will be forwarded direct to the chief surgeon, A. E. F., S. O. S., and shall not be sent through channels. Army, corps, division, or section surgeons may require duplicate copies. These duplicates will not be forwarded to the chief surgeon, A. E. F., S. O. S.

4. The period of the report will be construed to mean seven (7) days ending at midnight on Wednesday. It will be forwarded by the responsible medical officer as early as possible the following day.

5. Report of the strength of the command will be submitted even though no new cases have developed. This report applies to all A. E. F. troops regardless of whether they are serving with the Allies or not.

6. This report and the reports called for by G. O. No. 77, G. H. Q., A. E. F., and by MEMORANDUM FOR COMMANDING OFFICERS OF TROOPS ARRIVING ON TRANSPORTS, dated November 15, 1917, G. H. Q., A. E. F., are the only reports of venereal disease now required by the chief surgeon, A. E. F. No others will be submitted.

Telegraphic report of mumps was not called for, because of the impracticability of obtaining telegraph service of the extent necessary for this, and of the relative uselessness of centrally reporting a disease against which no measures of emergency prevention had hitherto proved effective.⁶ For similar reasons, telegraphic reports of pneumonia and influenza were not called for. It was expected that the occurrence of anthrax, infectious jaundice, leprosy, and poliomyelitis would be so rare as to play no important rôle in France or England, and that, if such diseases did occur, they would be considered of enough importance to elicit telegraphic report regardless of circulars or other orders. Trench fever and whooping cough had not occurred, or at least the former had not been recognized, in enough instances in the American Expeditionary Forces to warrant the requirement of reporting them by telegraph. Confirmation, often with correction of data, of the telegrams by mail, was required. A subsequent check upon these reports was available by comparison with daily nominal roll of hospital admissions, transfers, changes of diagnosis, and deaths, at the office of the chief surgeon, A. E. F. From the surgeons of the base sections, telegraphic reports were received on the arrival of transports whenever cases of the specified communicable diseases had occurred during passage from the United States, such reports giving information as to name, rank, organization, etc., of the patients and the identity of organizations exposed.⁶

From the French reports were received of the communicable diseases among our patients in their hospitals, and every 10 days a report of these diseases among French troops in different regions in France. Each month, there was also received from the laboratory officer (*V'adjoint technique*) of each region a summary of the communicable-disease situation among the civil as

well as the military population. A report of the total incidence of the communicable diseases in the French armies at the front, together with the strength of these armies, was received each 10 days.⁶

From the British a weekly report of communicable diseases was received dealing with our sick in their hospitals and with the total incidence of the same diseases in the entire British Expeditionary Forces, together with the strength of the forces at the time of the report.⁶

FILING

On the receipt in the chief surgeon's office of the report of a case, either definitely diagnosed, or suspected, of one of the diseases specified, an entry was made in a daily blotter giving the administrative area from which the report came, the designation of the hospital and the commanding officer reporting the disease, the name, rank, and organization of the patient, the place of origin of infection, if known, or as suspected in the case of typhoid and paratyphoid fever, the date of the onset of the case, and the date of transmission of the report.⁶

A card file was maintained, recording disease and dates of report by organization; i. e., by companies or equivalent subdivisions, of large units. Another card file was used to record cases by disease and date alphabetically, according to the name of town, village, or other place given as place of origin of infection. In order to permit of the rapid assembly of data for each disease according to area or administrative section, by days, weeks, or months, a third card file was kept which showed the daily admissions by diseases, days, and hospitals reporting, assembled on a card for each of the main 10 administrative areas (Base Sections Nos. 1, 2, 3, 4, 5, 6, 7, Advance and Intermediate Sections, and District of Paris). The cases as received were indicated by pins, with differently colored heads, on a map of France and England, according to the place of origin of infection, four such maps being used in rotation for four successive weeks to give a graphic picture of local distribution and changes in incidence for a period of one month.⁶

The method of filing the reports received as above outlined made it possible to analyze disease incidence by organizations, by areas, and by individual towns or departments, to calculate rates by any desired unit of time, and to compare these rates with the incidence of the same diseases among our Allies for comparable periods of time. These were the objects sought.

VENEREAL DISEASE REPORTS

Until August, 1918, the weekly reports of venereal disease incidence by commands gave such incomplete records that no reliance could be placed upon the rate calculated, and the information contained was insufficient to permit of analysis of distribution of cases by organizations and location of source of infection, facts essential for any intelligent supervision and control of these diseases.⁶ After August 21, 1918, reports of venereal diseases were received in compliance with Section XIII, Manual of Sick and Wounded Reports, A. E. F. The analysis of the reports subsequent to this date was made by organizations and administrative areas, at first in the section of epidemiology, chief surgeon's office, A. E. F., and later in the division of venereal diseases, which was established at Tours in December, 1918.⁶

ROUTINE REPORTS ISSUED

Each week a report of all the communicable diseases listed in Sections XII and XIII, Manual of Sick and Wounded Reports, A. E. F. was issued by disease and by administrative area, and this report was published on Monday morning for all diseases except the venereal diseases for the week ending Sunday, the day previous, and for the venereal diseases (reported by mail) for the week ending Wednesday, 11 days previous.⁶ A list of organizations, arriving at base ports within the week, which had been exposed to infection during transportation from the United States was published in the weekly bulletin of disease. A report of the communicable diseases (Section XII, Manual of Sick and Wounded Reports) occurring in the American Expeditionary Forces was made each week to the French Medical Department, giving each place of origin of infection, together with the total number of cases charged against each place since the beginning of an epidemic. A separate report to the commanding general of the allied armies was made weekly, giving the total for each disease included under Sections XII and XIII, Manual of Sick and Wounded Reports, and for pneumonia and influenza. Monthly summaries of disease were published in the weekly bulletin. Charts of rates per 100,000 strength by weeks and months were kept, and, in periods of epidemic prevalence of certain diseases, daily graphs were prepared.⁶

SPECIAL REPORTS

The chief of the division of sanitation of the chief surgeon's office made special reports by wire and mail to the director of laboratories and to the surgeons of armies, divisions, sections and other administrative areas, to commanding officers of hospital centers and hospitals whenever it was thought that warning of cases or information concerning their distribution, which might not have reached them so promptly through other channels, would be helpful in detecting, preventing, or controlling communicable diseases in areas or among groups for which the respective officers were responsible.⁶

SOURCES OF STATISTICAL ERROR

The main sources of statistical error were similar to those affecting civilian health statistics, and they fell naturally under the following headings:⁶ (1) Error in diagnosis; (2) failure to report, duplicate reports, changes of diagnosis after reporting, failure of arrival of telegram or confirmation, error in computing strength returns. The requirement to report suspicious cases, as such, doubtless prevented all but a slight error under the first heading. Checking of primary telegraph reports against daily mail confirmation copies, constant follow-up of delinquents, and checking every name reported against the daily office blotter record of name and disease, resulted in small error under the second heading. Estimates of rates while troop arrivals were causing large weekly increments of strength always led to rates of incidence less than the true rates, these being based on the strength for the week of report, while the origin of the cases according to incubation periods of the different diseases was at a time one or two weeks earlier, when the strength may have been 10 per

cent less. Similarly, while troops were embarking in large numbers from France and England, January to July, 1919, the weekly rates were fictitiously high. The monthly rates were considered more reliable than the weekly rates.⁶

APPLICATION OF INFORMATION

The measure of the value of any such system of disease records, the justification for all the work imposed upon reporting officers in the hospitals, must be sought in the results of the practical application of all the sorted facts of incidence and distribution of disease to its control. No decisive answer can be given to such a question, for the true reason of increase and decrease of many of the communicable diseases which usually show epidemic distribution, is still unknown in the majority of cases, but examples are abundant to show that, while troop movements were rapid and extensive throughout the American Expeditionary Forces, the information sent out from the chief surgeon's office, A. E. F., to widely separated units, to surgeons of armies and sections, put many a medical officer on his guard and permitted early and adequate segregation of exposed or already infected men from contact with units known to be free from disease.⁶

When, during violent and sustained battle activity, cases of typhoid fever, not yet diagnosed, were evacuated in the course of 10 days through as many hospitals and were detected in the acute stage of the disease and so reported from Savenay, Vichy, Perigueux, or Brest, the information sent back to the surgeon of the division or army from which the patient came, was not infrequently the first information he had had that enteric disease was prevalent or had appeared at all among his own troops.⁶

The smaller the area of observation the more intensive could be the profitable study of distribution of disease. The more rapidly moving the troops, the wider the area covered and the more communities they came in contact with, the more essential it was to have an immediate central report of all cases of communicable diseases, at least daily (in the British Expeditionary Forces the reports were made to their central office twice each 24 hours), and at the central office provision made for analysis of reports and prompt action upon them.⁶

The information received by the section of epidemiology, chief surgeon's office, A. E. F., from the epidemiologists of the central and base laboratories, from the sanitary inspectors of sections and armies, and from the results of autopsies reviewed and reported from the central Medical Department laboratory at Dijon, were of the greatest importance in detecting errors in reporting and in obtaining early warning of mistakes in diagnosis. Also, through the director of laboratories at Dijon, the commanding officers of base laboratories, and the surgeons of geographical sections and armies, the most effective and appropriate action always was obtained when warning or request for special report or precautions was sent from the section of epidemiology of the chief surgeon's office, A. E. F., either in individual communications or through the medium of the *Weekly Bulletin* or official circulars of the chief surgeon's office.⁶

WEEKLY BULLETIN

The "*Weekly Bulletin*" deserves more than passing notice. The publication was on a 5 by 8 inch sheet, running from 6 to 12 pages. It included not only data on epidemics in the American Expeditionary Forces, but also on the causes and treatment of wounds; notes on health conditions in the United States; references and extracts from medical literature, and charts and drawings. The matter was written up in clear and concise form and in a manner interesting even to the laity. The following extracts will serve to illustrate. Discussing the importance of proper food, the *Bulletin* says:

In spite of the ubiquitous motor truck and the occasional passenger car, the army still walks on its belly. Improve the walking and quicken the pace.

The following paragraph summarizes a suggested talk for line officers to their men, in which disease is very logically likened to an enemy:

View health preservation as a tactical situation, a problem to be solved. Avoid invasion; subdue the invader when possible. Keep up the front line of defense, or sanitation, and the second line, which is body resistance. Above all, avoid situations where both of the above factors are present; that is, invasion with defenses down. The same qualities that beat the Hun will beat disease—energy, initiative, teamwork, alertness, resourcefulness, and, above all else, discipline.

Immediately after the signing of the armistice the *Bulletin* began as follows:

No emissaries received from the enemy. The Medical Department is still actively engaged with a foe from which no quarter is to be expected. Unconditional surrender will be demanded. We face a life and death struggle, made more serious by the removal of the barrier of the trenches. Victories over disease are the only ones which give instead of take life.

Even the following jingle, directed against careless sneezing, appears in one issue:

Against a whole bunch of diseases
That knock a good Yank all to pieces
The best prophylaxis is the personal practice
Of dodging the spray of all sneezes.

It is evident that some of the methods of modern publicity agents were used in this publication.

GENERAL CONDITIONS INFLUENCING THE SICK RATE

It is reported that wherever, owing to fortunate local conditions, adequate floor space per capita was available, or where the ingenuity, resourcefulness and determination of the medical and commanding officers were brought into play to obtain adequate space and facilities, the sick rate always was low. Here, as elsewhere, attention to the comfort, cleanliness, food, sleep, exercise, and rest of the troops was always accompanied by a low sick rate.

Lack of adjustment to environment by green troops under young and inexperienced officers, advised by medical officers wholly unfamiliar with any aspect of medicine save that of hospital or private practice, was accompanied by many of the losses from sickness which more experienced troops escaped when line officers were capable and willing to take infinite pains to guard the health of their men, when medical officers understood the preventive side of medicine, and when the men themselves were trained in practical hygiene and

sanitation. From month to month the improvement in sanitary discipline and the results thereof became more marked, and at the date of the signing of the armistice some organizations and areas in the armies and in the Services of Supply had reached a good standard of field sanitation. During the armistice the standard was steadily improved, and the attention given to sanitation and hygiene was sufficient to accomplish a progressive lowering of the noneffective rate. During the period of active operations equal success was not possible. The total noneffective rate from disease and injury in April, 1919, was a fraction over 4 per cent—a very satisfactory figure for troops in the field in such an environment.

PROBLEMS

One of the war's greatest sanitary difficulties resulted from the necessity of bringing troops to the seat of war by a long overseas journey on transports which had to be filled to utmost capacity in order to place a maximum force in the field at the earliest possible moment.

Debarking troops constantly were reintroducing epidemic diseases into the American Expeditionary Forces.⁶ Much of the scarlet fever, diphtheria, and measles originated on shipboard and was spread among organizations exposed in crowded quarters, the troops not being held long enough at the base ports to eliminate infected men. This danger was lessened somewhat by increasing camp space near the points of debarkation, so that troops could be held for a sufficient time, and also by the very hearty cooperation of Navy medical officers in their efforts to reduce the danger to a minimum.⁶

Though the following statistical data are exceptional, they indicate the serious menace presented by transport conditions in the presence of epidemic influenza:⁶ In one convoy of 24,488 men there were 4,147 sick during this epidemic on the voyage, 1,127 sick on arrival, and 230 deaths (about 1 per cent on the way).

Only two diseases developed in the American Expeditionary Forces in a sufficiently generalized way to affect our entire forces, cause temporary excessive sick rates and, to some slight extent, affect military operations: Epidemic diarrhea and epidemic influenza, and only the latter disease, through its accompanying pneumonia, caused a serious rise in the death rate.⁶ Both diseases were prevalent in the allied armies at the same time as with us, as well as in the civilian population of France. And we have the statement of Von Ludendorff that influenza materially weakened the German Army in the autumn of 1918 and contributed to its defeat.⁶ It is doubtful if any sanitary measures which could have been taken under the then existing conditions would have prevented either of these two epidemics among our troops. The coincident crisis in the military situation throughout the period of July 1 to November 15, 1918, demanded such priority in service, transportation, and material that many precautions, practicable under ordinary field conditions, often were not practicable so far as influenza is concerned; the shipments of troops had to go on during the epidemic. Allied success, apparently in sight, warranted the turning of every man and every possible effort to the advance, regardless of ordinary sanitary measures, and the results achieved fully justified the course pursued.

DIARRHEA

Epidemic diarrhea, with a considerable amount of dysentery and probably some unrecognized typhoid and paratyphoid, developed in various parts of France late in June, 1918, appearing first in the more southern areas and wherever insanitary disposal of waste, fly breeding, and inadequate precautions in food handling prevailed.⁶ Immediately after the Chateau-Thierry operation (July, 1918), our troops in that region suffered quite generally from diarrheal diseases, probably as many as 70 per cent of the men being affected. This was inevitable under the conditions of a hard fought and prolonged battle which made even elementary sanitation impossible. Insufficient and ill-prepared food, chilling at night, polluted water, a plague of flies which fed and bred on human excreta everywhere exposed, and on the dead bodies of men and animals—all these combined to produce a widespread epidemic of diarrhea with a certain proportion of true dysentery and typhoid-paratyphoid infections. The majority of the men affected never reached a hospital or received any medical treatment; spontaneous recovery in a few days was the rule. The enthusiasm of the forward drive carried many men out of reach of hospitals, so the true extent of this epidemic can only be guessed. A small number of cases of serious and persistent infections found their way to the base hospitals, and of these the majority were found to be suffering from true dysentery, caused by well-recognized strains of bacteria. Fortunately the type of infection was mild and very few deaths resulted; in a few favored places where exposure was less, where alert medical supervision and adequate safeguarding of food and water could be carried out, only an occasional case developed and entire organizations escaped infection; but in the main the disease prevailed throughout the American Expeditionary Forces from July 1 to the end of the fly-breeding season, about September 15, 1918.⁶

TYPHOID AND PARATYPHOID

Following the period of diarrheal diseases a few cases of typhoid and paratyphoid developed each week.⁶ In December, 1918, and January, 1919, the greatest number of these diseases occurred, the incidence declining sharply in February, to rise again in March with an outbreak of 70 cases at Marseille, due to infection in a large mess kitchen by an unrecognized acute typhoid case among the kitchen help. The cases fell off to an inconsiderable number in April. The total number of cases of typhoid up to the end of February, 1919, was about 1,000; sufficient to call attention to a considerable prevalence of undetected carriers and loose water and food discipline. During the entire period after November 11, 1918, the infection, in a great majority of the cases reported, was found on careful study to be due to the use of polluted and unauthorized water supply, or to carriers. In many instances the carriers were found among the cooks and kitchen police. There is good reason to believe that the carriers and undetected early cases had acquired their infections during the period of excessive incidence of intestinal disease in the summer months. This should not be held to cast discredit on typhoid vaccination. As a matter of fact the value of this was never so conclusively demonstrated; unquestionably without it there would have been not only a thousand but tens of thousands of cases. Everything made for widespread typhoid infection, and the only thing which prevented it was the vaccination.⁶

INFLUENZA-PNEUMONIA

The other epidemic, much more serious in character than that of diarrhea, and the greatest cause (from sickness) of noneffectiveness and deaths in the American Expeditionary Forces, was influenza. This disease prevailed in a mild form from the middle of April, 1918 (when there was a general epidemic in the camps in America), until the middle of July, but without interfering materially with military activities. At this time there was a marked increase in the sick rate from this cause for a week or two while the disease swept through a command, but recoveries were prompt, complications rare, and deaths very few.⁶

In September the disease returned (as it did in the United States), when large shipments of troops were arriving from home and when every resource of men and material was being strained to prepare for or to take part in the Meuse-Argonne operation. The weather was unfavorable, ordinary precautions impossible in the life and death urge of the front, the means of evacuation and the hospitals were strained to their capacity by battle casualties, and the disease, or rather the accompanying pneumonia, was of a most severe, often malignant type. Troop movements were extensive and urgent; military necessity demanded every sacrifice for the benefit of the offensive operations. The conditions combined to make adequate preventive measures and early and sufficient hospital care nearly impossible.⁶

It was not only in the advance zone that the disease prevailed; it was very severe in the rear and base areas. Heavily infected during the voyage, troops had a loss as high as 10 per cent within the three weeks after embarking. Ideal opportunities of spread from man to man, long delays and insufficient provision for rest, food, and medical supervision during train transport to training areas or replacement divisions, added to the number of cases of the disease. Crowding in billets and barracks, beyond the limits of safety, was common. Delay in diagnosis and in removal to hospital added to the danger from pneumonia. In the hospitals insufficient precautions for preventing communication of the infection in the wards probably contributed to a heavy incidence of pneumonia and consequently to a high death rate.⁶

By the second or third week in October, 1918, the epidemic began to decline and by December following, it was at an end. In the latter part of January, 1919, there was a third, mild wave; but this time there was no considerable loss of life. By the middle of March this third wave had subsided, and in April, as is usually the case at this season, the incidence of all the respiratory diseases reached very low figures.⁶

The incidence and death rates of influenza in the American Expeditionary Forces were much lower than in the United States. There were more seasoned troops in France than at home, where there were hundreds of thousands of new men, and many passed through the infection in the United States before going to France.

MUMPS AND MEASLES

Of the less important communicable diseases which required the attention of the division of sanitation, mumps held first place in the number of cases and, indeed, led all causes of noneffectiveness in the first year of the American

Expeditionary Forces. No preventive measures applicable under existing conditions appeared to have any definite effect in controlling the disease. It is presumed that exposure to infection was almost universal and that all men not immune because of having already had the disease developed mumps.⁶

Measles similarly prevailed, always at base ports, among recently arrived troops, appearing to a less and less degree as troops were passed through replacement depots and training camps, on their way to the front. It should be remembered that in all the earlier divisions going overseas measles had practically exhausted itself. Only in the few late divisions, containing newly drafted men, was there any considerable amount of disease.⁶

DIPHThERIA AND SCARLET FEVER

Diphtheria, while occurring to a degree not previously experienced in the United States Army, was seen in epidemic form in only a few divisions and hospital units, and then only for brief periods, or until well-known methods of control could be made effective. The successful treatment of diphtheria epidemics demands laboratory facilities of a very efficient kind, for the diagnosis of mild cases and the detection of carriers. In this war, for the first time, these technical facilities were furnished to troops in the field. This was effected by means of mobile laboratories, sent out instantly on call, from the central laboratory at Dijon.⁶

Scarlet fever, except on one occasion, in a regiment delayed in its passage across France, in December, 1917, never developed into an epidemic of any proportions. There was always some mild scarlet fever present in the Army.

The incidence of other communicable diseases was not sufficient to merit mention in a brief summary such as this.

DISEASES AVOIDED

Of the diseases which caused serious loss of man power in the armies of the Allies, more particularly before American participation in active operations, several deserve mention if for no other reason than that they played an inconspicuous rôle as causes of sickness among our troops. Because of the nature of the military operations in which our troops took part (open warfare) and the season of the year during which most of our front-line activities were carried on (autumn) our troops almost entirely escaped "trench nephritis" and "trench foot"; affections due in a large measure to exposure to wet or cold for long periods under trench conditions such as prevailed in the flat, swampy terrain of Flanders. The conditions under which "trench fever" became prevalent in the British Expeditionary Forces never developed among our troops; chiefly because of military conditions and not on account of any more favorable state of cleanliness or sanitation among them. The trench fever committee of the American Red Cross, acting under the authority of the commander in chief (December 22, 1917), carried out early in 1918, accurately controlled experiments upon the means of transmission and the period of infectivity of the diseases, which determined beyond question that the body louse was the intermediate host and the means of transmission of the diseases from sick to well. This piece of scientific research added materially to the security of the troops by its contribution to the knowledge of preventive medicine.⁶

The so-called "trench mouth" or Vincent's angina was a condition of sluggish infection and ulceration of the gums and mucous membrane of the mouth, developed in numbers of our men in whom neglect of oral hygiene was coupled with poor conditions of general health. Relatively simple local and general measures were sufficient to prevent this annoying condition from becoming a noticeable source of noneffectiveness.⁶

From tetanus the American Expeditionary Forces were almost entirely spared, partly because of the cleaner character of the terrain over which our men fought and partly because of the universal and prompt use of prophylactic doses of tetanus antitoxin.⁶

Gas gangrene, as a complication of battle wounds, always threatened much loss of life, but in point of fact this infection developed in but a small fraction of the wounded men of the American Expeditionary Forces. A month before the signing of the armistice, preventive inoculations were undertaken which promised to give still further protection against this feared complication of surgical cases.⁶

MENTAL DISEASES

While not communicable, mental diseases were within the scope of operations of the sanitary division, office of the chief surgeon, A. E. F. Modern, firm, humane methods applied to the prevention and treatment of mental diseases saved many men for service or from a life of invalidism.⁶

FRANCO-AMERICAN LIAISON IN SANITATION

The liaison between the French and American Medical Departments was established in the Services of Supply through the intermediary of missions and through the local and regional Franco-American sections.⁸

The French mission at headquarters, Services of Supply, included a medical officer in liaison with the office of the chief surgeon, A. E. F. The surgeons of sections and of bases, and the commanding officers of a few of the larger hospital centers, also had a liaison officer assigned to them.⁶

The Franco-American sections at the large French services were instituted by a circular letter from the Prime Minister, Minister of War, dated December 30, 1917.⁶

The Undersecretary of State for the French Medical Department and each regional director of the French Medical Department thus had at their disposition a Franco-American section composed of a French medical officer able to speak English and of an American medical officer.⁶

The duties of these sections were fixed as follows: Their exclusive mission was to study, on behalf of the authorities whom they served, all Franco-American affairs transmitted to them and to follow their solution to completion.

Ministerial circular letter, February 12, 1918, prescribed that the local representatives of the American Medical Department be put in touch with the technical head of the regional headquarters, who would bring to bear his experience in the solution of all questions of hygiene, epidemiology, and prophylaxis concerning American contingents.⁶

Ministerial Circular No. 2902-3/7, February 20, 1918, prescribed that the head of each regional headquarters offer his collaboration to the American Medical Department, and that the liaison should especially be carried out on the following points:⁶ (a) Study and survey of water supplies. (b) Putting all bacteriological laboratories at the disposal of American medical officers (establishment and confirmation of diagnosis in cases of communicable diseases, search for germ carriers, water analysis, etc.) (c) Regular and constant receipt of all communications concerning the cases of contagious diseases observed among American troops, and concerning prophylactic measures taken to check their spread. Reciprocally, notification to the American authorities of all epidemics among French population, civil or otherwise, of any importance, with description of preventive measures taken. (d) Notification to the American Medical Department of localities quarantined and released from quarantine. (e) Study, in collaboration with the chief medical officers of centers, as well as with the chief medical officers of dermatovenereal subcenters, of all questions concerning the American Medical Department, and bearing on the treatment and prevention of venereal disease. Putting at the disposal of the American Medical Department, as a matter of information, translations of all regulations, circular letters, and notices concerning sanitation, epidemiology, and preventive measures.

In order to comply with the general instructions above, the following reports were made by the regional Franco-American "sections":⁶ (a) Report every 10 days of all contagious diseases among American troops stationed in the region, including all necessary precautions. Eventually these reports were sent to the Undersecretary of State for the French Medical Department (First Technical Division). (b) Notice to civil authorities of contagious diseases occurring among American troops, promptly made, in compliance with Notice 36 of the regulations of the French Medical Department (act of February 15, 1902). (c) Monthly report by chiefs of dermatovenereological centers and subcenters, including in a special chapter all questions concerning venereal diseases occurring among American troops. (d) Monthly report by the assistant chief medical officer of the region or the technical adviser was addressed to the medical officer of the French military mission at headquarters, Services of Supply, to be transmitted to the office of the chief surgeon.

In compliance with request from the chief surgeon, A. E. F., the Undersecretary of State for the French Medical Department, on April 15, called the attention of the regional directors of the French Medical Department to the necessity of notification of all new cases of the following diseases, occurring among American troops and hospitalized in French formations of each region; this declaration to be sent by mail by the regional Franco-American "sections":⁶ Chicken-pox, cholera (Asiatic), diphtheria, dysentery, meningitis (meningococcus), paratyphoid fever, plague, scarlet fever, smallpox, typhoid fever, typhus fever. This declaration was to include the name and organization of patient, the nature of the disease, date of admission, designation of French hospital where admitted, and place of origin of the infection. This information was to be delivered to the American medical officer of the Franco-American sections, whose duty it was to forward it to the chief surgeon, A. E. F. (division of sanitation).

NOTIFICATION OF CONTAGIOUS DISEASES TO THE FRENCH AUTHORITIES

By order of the chief surgeon, A. E. F., under date of February 29, 1918, all surgeons of organizations or units were required to make declaration to the local civil and military authorities, immediately upon diagnosis, of all cases of contagious disease occurring in their organizations.⁶

Besides the aforementioned, the Franco-American liaison was of great benefit and importance on certain points:⁶ (a) Delivery of sera to American medical officers by French laboratories; (b) sterilization and analysis of drinking water in railroad stations.

Consequent to ministerial circular letter of October 18, 1918, the principle of collaboration of the American and French medical authorities concerning reports relative to bacteriological, chemical, and sanitary tests of water supplies along railroad lines traveled over by troop convoys was recognized, and the necessary steps were taken to advise laboratory officers in charge of water analysis of it.⁶

An agreement was reached between the high commissioner for Franco-American affairs and the Minister of Public works consequent to a request by the American Water Supply Service, Director General of Transportation, and Medical Department, and it was decided that control and analysis of water supplies in railroad stations and along railroad lines would be exercised jointly by the American and French medical officers. Likewise, "drinking water" posters in both French and English were to be placed, at the discretion of the American and French medical officers, wherever justified, in stations.⁶

INFLUENZA EPIDEMIC—RECIPROCAL REPORTS

By ministerial telegram, October 29, 1918, the Undersecretary of State for the French Medical Department informed the regional chief medical officers that all information at their disposal concerning influenza, its spread, evolution, etc., should be communicated daily to the American Medical Department through the regional liaison officers.⁶ Vice versa, a letter from the chief surgeon dated October 24, 1918, bearing on the influenza epidemic, called the attention of all members of the Medical Department to the urgent necessity of maintaining liaison and daily interchanges of information with the French medical officers, with a view to detecting the appearance of cases of influenza and of studying the preventive measures necessary to check its spread. It was recommended that all medical officers, as far as possible, should obtain from the French Medical Department all available information which might prove of value to the Medical Department, and should likewise communicate their views and findings in the same manner to the French Medical Department.

The liaison between the Medical Department and the French medical officers proved to be most valuable in that which concerned local questions of a sanitary character relative to American troops (camp sites, dangerous territory, etc.).

GENERAL MEDICAL INSPECTORS

On January 31, 1918, the chief surgeon, A. E. F., in a letter to the commander in chief, A. E. F., made the following statement:⁹

The question of general medical inspectors has never yet been presented for consideration because the proper officers were not available for this duty. It, however, must be brought to the commander in chief's attention in a few days, as suitable officers are now on their way to France to perform this most important duty. These officers should be general inspectors and should occupy the same status that the general medical inspectors occupied during the mobilization on the border (Mexican) in 1916. The same inspectors are functioning under orders from the War Department in different divisions of the United States at the present time. These officers I consider most important to the successful meeting of the demands of the American Expeditionary Forces or the chief surgeon. While the administration of all sanitary units, except those attached to combatant troops, rests with the commander in chief, Lines of Communication, the chief surgeon of the A. E. F. must have, to carry out his obligations, general inspectors clothed with proper authority and under the control of these headquarters, who will investigate sanitary conditions, epidemics, the care of property, hospital administration, conservation of food and property, and many other important subjects of similar nature.

It is equally necessary that experienced sanitary officers from this office shall be authorized to inspect in the zone of the division occupying a sector of the front. In no other way can the chief surgeon know that proper disposition of sanitary personnel and sanitary units has been made and the required medical material provided. It may be considered that this duty should devolve upon the chief surgeon, but recent information indicates that the corps surgeon's sphere of activity does not comprise supervision of the work of the sanitary personnel of the division. If, however, the chief surgeon, American Expeditionary Forces, is to be held responsible for the proper care of sick and wounded in the zone of the advance, then it would seem that he should have the necessary authority to either visit in person or send his representative to ascertain whether or not proper provision has been made for the care of wounded in advance sanitary formations and evacuations to Lines of Communication Units.

* * * * *

It is recommended that general medical inspectors whose sphere shall cover the entire field of Medical Department activities in France be authorized. The officers should be attached to this office, and their duties should not only include those commonly assigned to medical inspectors, but in addition they should be authorized to advise and cooperate with the division and corps surgeons in the organization of the means for the care and evacuation of battle casualties. Therefore, they should be experienced and capable officers familiar with the latest developments in the highly complex problem of so organizing a sector that the high standard set by our Allies in the care and evacuation of wounded may be realized.

Based on this recommendation, two medical officers were appointed general medical inspectors February 14, 1918.¹⁰ Such was the demand, however, for medical officers that one of these officers was ordered to duty as surgeon of one of the base sections before he could assume his duties as a general medical inspector.⁹ This left but one officer to carry on the work of general medical inspections.

The effectiveness of this inspectorial work for purposes of raising the standard of sanitation in the American Expeditionary Forces was seriously hampered by the fact that much of the time and energy of the one general medical inspector were taken up with the study of and reporting upon purely administrative and disciplinary problems of the Medical Department in its hospitals, only a small portion of his services being available or applied to surveying and reporting upon personal hygiene, the sanitation of environment, and the practice of preventive medicine in the field.⁶

SANITARY SQUADS

The first instructions promulgated by the War Department concerning sanitary squads appeared in the Manual for the Medical Department, 1911. These instructions, quite general in character, contemplated that the personnel of these organizations would be line of communications units, and would be charged with the supervision of sanitation, the operation of sanitary apparatus, selection of water supplies, disposal of wastes, and under certain circumstances the performance of duties of sanitary detachments. The edition of the Manual for the Medical Department published in 1916 prescribed that, in the line of communications, sanitary squads would be organized for the purpose of giving attention to sanitary matters not within the control of regimental or other military organizations. The squads so organized were to consist, under the immediate command of a medical officer, of enlisted men of the Medical Department augmented by such number of other enlisted men and civilian laborers as the amount and character of the work to be done might justify. The functions outlined for these squads were to supervise or execute, as the case might be, the necessary measures for the sanitation of camp sites, towns, or village—not occupied or garrisoned; sanitary work necessary for general welfare, but which conveniently or profitably could not be performed by organizations, and the operation of sanitary apparatus used by troops in common but not under the control of any one organization. It was specifically provided that the squads would not be employed to relieve regimental and other similar organizations of the duty of providing for the sanitation of their own camps.

To carry out the above outlined functions in the American Expeditionary Forces, General Pershing, in his organization project of September 18, 1917, asked for two sanitary squads, each to consist of 1 medical officer, 4 noncommissioned officers, and 22 privates, Medical Department, for each division training area, and 12 squads for the Line of Communications. In December, 1917, the Surgeon General instituted measures looking to the organization of two sanitary squads, in the camp of each division then in training in the United States.¹¹ Since these squads were organized by the divisions, the impression became prevalent among division surgeons that they were permanent parts thereof and that they would remain constantly with the divisions after arrival overseas. Because of this misconception and the confusion resulting therefrom, instructions were issued from General Headquarters, A. E. F., designating sanitary squads as Service of Supply organizations.¹²

The general outline of the work of sanitary squads in the American Expeditionary Forces was planned after the British system of area sanitation, but adapted to combat units.¹³ For a long time the exact status of sanitary squads in the American Expeditionary Forces was not clearly defined, and the selection and training of the personnel for the squads was left to the discretion of the division surgeons. For the most part, the enlisted personnel was selected from men trained in engineering, plumbing, carpentering, and similar trades, but a careful study of the positions held prior to the World War showed that nearly every branch of trade and profession was represented.

From the separate histories of the various sanitary squads in the American Expeditionary Forces it is seen that in most instances, particularly soon after

the arrival of the squads in France, they were used as general fatigue and police details in whatever town they happened to be located.¹³ This was, of course, the inevitable result of a lack of understanding, not only by line officers, but also by division medical officers, of the exact status of the squads.

Within a few weeks after their arrival in France the status of the sanitary squads became more definitely fixed. When the divisions to which they were attached became located in the training areas, it proved highly advantageous to select groups of trained men to install practical sanitary contrivances where they were most needed.¹³

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- (3) Brief Histories of Divisions, U. S. Army, 1917-18. Prepared in the Historical Branch, War Plans Division, General Staff, June, 1921.
- (4) G. O. No. 20, Hdqrs., A. E. F., August 13, 1917.
- (5) Manual for the Medical Department, 1916, par. 827.
- (6) Report of the division of sanitation and inspection, chief surgeon's office, A. E. F., from Col. Haven Emerson, M. C., May 31, 1919, to the Surgeon General, U. S. Army. On file, Historical Division, S. G. O.
- (7) G. O. No. 89, G. H. Q., A. E. F., June 8, 1918.
- (8) G. O. No. 40, H. A. E. F., September 20, 1917.
- (9) Report on general medical inspections, from Col. H. C. Fisher, M. C., general medical inspector, A. E. F., to the Surgeon General, U. S. Army, February 3, 1919. On file, Historical Division, S. G. O.
- (10) G. O. No. 29, H. A. E. F., February 14, 1918.
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- (12) G. O. No. 85, G. H. Q., A. E. F., June 3, 1918.
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CHAPTER II

GENERAL PLAN, ORGANIZATION, AND DEVELOPMENT, SUBDIVISION OF INFECTIOUS DISEASES, DIVISION OF LABORATORIES AND INFECTIOUS DISEASES

One of the most important lessons in sanitary administration which the World War taught is the necessity for close coordination between sanitary supervision and laboratory service. Between these two services there stands, as a link, the work generally spoken of as epidemiology, but which, since it consists in the tracing of communicable diseases to their sources, the scrutiny and classification of reports, and the investigation of the relationship between cases, is, after all, merely a definite part of intelligent sanitation. The sanitary inspector who does not institute and supervise epidemiological and laboratory studies is not completely fulfilling his functions. As will be seen below, the World War indicated the necessity of so training sanitary inspectors that they can organize, under their own supervision, these various important and integral branches of a complete sanitary organization.

From the beginning of the World War it was recognized by sanitary authorities in Washington, and later in the American Expeditionary Forces, that the closest possible cooperation between sanitary and laboratory organizations must be developed.¹ It was found in the United States, for instance, that in order to obtain a complete survey of the conditions underlying any outbreak of infectious disease and to formulate intelligently the particular measures which must be instituted to arrest an epidemic, it was desirable to send men who not only had a basic comprehension of sanitation, but who also could wield the methods of epidemiology and of the laboratory.¹

It was this conception which led, in the American Expeditionary Forces, to the establishment of a subdivision of infectious diseases, a branch of the division of laboratories and infectious diseases, in order that there might be a definite administrative link between sanitary field work and the laboratory service.¹

Shortly after the appointment of a director of the division of laboratories, A. E. F., in November, 1917, the name of this division was changed to "the division of laboratories and infectious diseases," and its director planned the organization of a subdivision to be called "the subdivision of infectious diseases."² It was planned to place this work under the direction of an assistant director of laboratories, who should act as general advisor in all matters pertaining to communicable disease.

The duties and activities of this subdivision as conceived at this time are outlined in the following memorandum:²

DIVISION OF LABORATORIES AND INFECTIOUS DISEASES, SUBDIVISION OF INFECTIOUS DISEASES

The function of the subdivision of infectious diseases is to provide an instrument for the prompt epidemiological and bacteriological investigation of transmissible diseases among troops of the American Expeditionary Forces. It constitutes, therefore, a direct liaison between the division of sanitation and inspection and the laboratories, and is grouped with

the latter only because its activities require the occasional mobilization of laboratory facilities, and because its personnel should be capable of directing on the spot any laboratory work which the thorough study of any given situation may require. While operating from the laboratories as bases, therefore, this subdivision constitutes actually a part of the machinery of sanitation.

The duties of the subdivision of infectious diseases consist of:

1. Epidemiological and laboratory studies of outbreaks of transmissible diseases in the American Expeditionary Forces having as primary purposes the discovery of source of outbreak, its mode of dissemination, and its control.

2. The study and organization of new prophylactic measures.

3. The investigation of special problems which may arise in connection with the control of epidemics.

4. The instruction of laboratory personnel in so far as their diagnostic work, carrier examinations, and epidemiological work are concerned.

5. The preparation of circulars and literature concerning infectious disease for submission to the chief of the division of sanitation and inspection.

6. Advisory cooperation with the various sanitary medical authorities in the hospitalization and isolation of infectious diseases.

Organization.—There will be a central office of this subdivision in the office of the director of laboratories, A. P. O. No. 721, American Expeditionary Forces, which will be in charge of officers delegated to this work by the director of laboratories.

The activities of this office will include:

- (a) The selection and instruction of personnel to carry on the work of the subdivision.

- (b) The supervision of the work of this personnel whenever necessary in a given outbreak.

- (c) The maintenance at the office of the director of laboratories of records of the activities of this subdivision.

- (d) The study of special problems that may arise in connection with transmissible disease.

An officer selected and trained for epidemiological and bacteriological studies of outbreaks of infectious disease will be stationed at the base laboratory of every base section and of the intermediate section. It is the intention that this officer shall represent the agency supplied to the chief surgeon of the respective section, for the intensive study of any outbreak that may seem to require such study in the opinion of the surgeon of the section. When so ordered, he will proceed to any point in the section, taking with him a mobile laboratory or any materials and personnel needed for the performance of the work to be done. The officers assigned to the subdivision of infectious disease at the office of the director of laboratories will be ready to reenforce the work in such sections by personal visit, additional personnel and materials if so requested by the chief surgeon of the section in cases of unusual extension of the outbreak or for any other reasons that make this desirable in the opinion of the chief surgeon.

In the advance section and the zone of advance the epidemiological work will be centralized at the office of the director of laboratories and infectious diseases.

At this place the officers in charge of the subdivision of infectious diseases will be stationed. It will be their duty to keep in constant touch with the incidence of such diseases in these areas. In addition to this a system of direct communication will be maintained whereby the chief surgeons of divisions in the advance section and in the line will be enabled to communicate with the office of the subdivision of infectious diseases whenever they believe that the occurrence of cases of a communicable disease in their respective units indicates the possibility of an incipient epidemic, or whenever for any other reason they believe that the facilities for the control of such diseases in their unit needs reenforcement.

Whenever such requests are made by any of the chief surgeons concerned, the officers in charge of this work will personally visit the division, study the situation in consultation with the local medical authorities, and if necessary institute epidemiological and laboratory studies indicated by and necessary for the control of the situation. Laboratory units, for such purposes, will be sent either directly from the central Medical Department laboratory or from one of the more advanced army laboratories, according to the judgment of the

director of laboratories and infectious diseases or his representatives. The work done in these areas will be under the general technical supervision of the officers assigned to the subdivision of infectious diseases by the director of laboratories, and these officers will be responsible for its proper performance.

Whether or not it will be desirable to recommend at a later date that an adviser for infectious diseases be attached to the staff of the chief surgeon of each field army is a matter the discussion of which it is deemed best to postpone. The accessibility of the central Medical Department laboratory and the office of the director of laboratories to the army zones render this unnecessary and undesirable at the present time.

Suggested mode of procedure.—When the occurrence of cases seems to call for the detailed study of local conditions, orders will be issued to the officer stationed at the respective base laboratory, who will proceed to the station indicated. On arrival, he will report to the local surgeon and will familiarize himself with local laboratory facilities and arrange cooperation with the officer in charge of local laboratory personnel. He will consult local sanitary officers and obtain a careful history of the outbreak from its beginning, will visit commands and quarters from which cases have been taken, make spot maps of the occurrence, trace contacts, and investigate relations of case to case. He will study relations of outbreak to water and food supply and will proceed to organize and carry out any laboratory work or serum tests necessary to elucidate the situation and control the disease.

In consultation with local medical authorities he will inaugurate sanitary measures aimed at control of the disease, and on completion of the work will write a report, incorporating specific recommendations. One copy of this will be sent to the surgeon of the respective section, Services of Supply, in which the work was carried out, another copy will be left with the local surgeon, and one will be forwarded to the director of laboratories as a record of the subdivision of infectious diseases.

In the advance section and zone of the advance, the officers in charge of the subdivision of infectious diseases will supplement this system by visiting as promptly as possible all locations where infectious disease is occurring and determine by personal investigation whether the situation requires special study.

It was very definitely the intention of those in charge of the work at this time that the subdivision of infectious diseases should not become in any sense a research organization except in so far as the careful study of outbreaks of communicable disease and the conscientious attempts to suppress such outbreaks might yield valuable information.¹ The primary purpose of this organization was to be the early discovery of foci of infection, the prompt tracing of these to their sources, and the suppression of spread before the disease could reach epidemic proportions. It was believed that epidemics, unless well started, could probably be arrested before irreparable damage had been done, but that it was prompt attention to the few early cases which should become the principle of action of the subdivision. It was conceived that its duty in addition to this was chiefly that of furnishing trained personnel, circularizing information, and, if necessary, establishing courses of instruction.¹

At the time when the organization had reached this stage of early development, the American Expeditionary Forces were in a state of active growth. Troops were coming to France in increasing numbers, and it became necessary promptly to formulate a system of decentralization. In consequence, the establishment of similar divisions for laboratory and epidemiological study in the various base sections was begun along the lines indicated in the following memorandum:¹

In response to a circular letter, sent to chief surgeons of base sections, on the organization of epidemiological work and the control of infectious diseases, a number of replies have been

received in which chief surgeons have outlined the organizations they have initiated. The base sections are the first filters through which troops pass on their way to the fighting line, and since sea transportation unavoidably exposes men to indiscriminate contact with others, who may be carriers of disease or may be actually suffering from infectious disease in the early stages, troops arrive in the base sections under conditions which necessitate the most painstaking supervision. It is of the utmost importance, therefore, that the arrangements made at base sections for the prompt discovery and segregation of infectious disease and for the tracing of sources of infection be as perfect as possible. For this reason it is desirable to formulate a standard organization for sanitary and epidemiological work in these sections which can be submitted to chief surgeons for their consideration and as a basis for uniformity, which, of course, can be altered according to the varying needs required by local conditions.

It should be added that the plan submitted has been formulated after consultation with chief surgeons of base sections, some of the features of the plan being directly taken from the outlines furnished by them.

1. *Personnel.*—The chief surgeon should have on his staff an officer who is trained in public health work and has had a sufficiently thorough training in laboratory methods to be capable of supervising public health laboratory work, know the scope and limitations of the laboratory, and therefore be capable of intelligently applying the laboratory to the problem of limiting epidemic disease. It would be best to appoint a man so qualified as sanitary inspector to the section. If, however, this seems impossible or undesirable, such an officer can be appointed with the designation of "epidemiologist." It will be the duty of this officer to act as the representative of the chief surgeon in all matters concerned with the control of infectious disease. He will keep in touch with all incidence of infectious disease in the area and will visit personally all places where cases have occurred and where epidemiological or laboratory investigation seems indicated for the suppression of the disease. His instruments of action will be described below.

In addition to this there should be in the office of the chief surgeon an officer or intelligent noncommissioned officer in charge of records and reports of infectious diseases whose duty it shall be to tabulate, keep spot maps, and promptly furnish information to the sanitary officer.

As instruments to be used by the above personnel in the prevention and control of epidemic diseases, and in preventing men with infectious disease or those who are carriers or contacts, from penetrating farther into the American Expeditionary Forces, there should be two agencies: (a) A system of laboratories; (b) a system of local sanitary supervision.

(a) *Laboratories.*—There will be established in every base section a main base section laboratory. This will be equipped for any kind of diagnostic or other necessary laboratory work and will have personnel sufficient not only to carry out the work directly referred to it, but also to be in a position to send out mobile laboratory groups to places where the sanitary inspector or epidemiologist may find that laboratory work is necessary for the suppression of an epidemic. The commanding officer of the base section laboratory can, if desired, be utilized also as general laboratory supervisor for all the laboratories in the section. The base laboratory should functionate also as a central supply station for other laboratories in the section. Attached to this central laboratory there will be either a motor-car laboratory or laboratory units in chests, which can be sent out as desired when special work in other parts of the section becomes necessary. When the sanitary inspector or epidemiologist needs a laboratory in the course of his work in other parts of the section he will requisition men and materials from the central laboratory. These will be forwarded, will report to the epidemiologist, and will be returned to their station on completion of the work.

Other laboratories situated permanently in the base section, such as those attached to base hospitals and camp hospitals will be utilized for the same purposes when problems arise in the localities where such laboratories are situated.

(b) *Local sanitary supervision.*—There may possibly be some difficulty at the present time to carry out any elaborate scheme of permanent local supervision of subdivisions of base areas. However, as personnel increases and the number of troops in France accumulates, the control of areas by permanent personnel should be held in mind for ultimate attainment. It is a system which has been found of the utmost value by the British. Wherever possible, therefore, an attempt should be made to organize along these lines.

In every base section there are rest camps and other areas into which American troops are sent for a short time before they are forwarded to divisional training areas. It should be attempted to attach to every such camp, as a permanent staff, one or more medical or sanitary corps officers who can supervise the sanitary arrangements made for the reception of troops. Their duties will consist in the general sanitary policing of the billets in their areas, feces disposal, manure disposal, suppression of flies, construction and repair of latrines and incinerators, investigation of infectious disease reported among civilian population, and, in connection with the proper authorities, supervision of water supplies. Such officers can give immediate and accurate information to the medical officers in charge of incoming troops, and in the intervals between the occupation of the area by troops can work toward the installation of permanent sanitary improvements.

These men will be the direct working agents of the epidemiologist or sanitary inspector of the base section.

When this whole plan is considered it becomes obvious that the ideal sanitary inspector is one who is capable of acting as epidemiologist—in other words, a man combining the experience of bacteriologist and field sanitarian with some clinical knowledge of infectious disease.

We feel that one of the assistants of the army surgeon, corps surgeon, and division surgeon should be a man of this type. The medical officers now being sent out with the divisional laboratory are being chosen on the basis described in the preceding paragraph. Similarly trained but more experienced men can be suggested as assistants to corps and army surgeons.

The above memorandum, however, indicates merely the general conception for infectious services in base sections, but does not represent the final form in which the various chief surgeons of base sections organized the work. In each case the chief surgeon adapted the above plan to the particular local problems confronting him.¹ There was rapidly established, in all base sections, a similar service which was in a general way, independent of the central administration under the director of laboratories, but continued to call upon him for advice, personnel, and supplies, and was thereafter in uninterrupted communication with the central office in the course of its activities. This was true of all the sections except the advance section which, together with the troops in the zone of advance—that is, in the line—remained under the direct supervision of the central office of the director of laboratories, A. E. F., and his assistants, until the late summer, 1918.¹

In order that a clear conception may be had of how the work was carried on in the forward areas, at this time it will be necessary to outline briefly the system of sanitary control prevailing in divisional units of the American Expeditionary Forces. The officer responsible for sanitation in a division was, as hitherto, the sanitary inspector, who functioned as an assistant of the division surgeon.¹ All ordinary matters of general sanitation were attended to by him with the assistance of two officers¹—one, the divisional laboratory officer who had charge of a simple laboratory, equipped for clinical pathology but insufficiently supplied for extensive cultural work; the other assistant was the divisional water officer, generally a lieutenant of the Sanitary Corps, whose training had been largely in water examination but who had had some training in general bacteriology as well. Some of the divisions came to France without these laboratory officers; however, for these divisions, laboratory equipment and personnel were organized at the office of the director of laboratories by the subdivision of infectious diseases.¹ Later in the work much of this personnel received a short course of instruction before being assigned to a division. It was intended that the divisional laboratory officer not only should act as a

technical laboratory worker for the division, but should assist the sanitary inspector in making epidemiological surveys and sanitary inspections. It may be said, in passing, that in many cases this hope was not realized because of the lack of transportation.¹ It seemed impossible in many divisions to supply even a horse or motor cycle for this officer, who consequently became immobilized and very often quite useless.

The duties of the divisional water officer were reduced to their simplest form. It was this officer's duty to supervise the chlorination of drinking water in the division; to instruct noncommissioned officers, cooks, and others in the proper method of performing this task; to keep in touch with water problems which might arise, and to keep informed concerning the supply of water sterilizing bags and tubes of calcium hypochlorite.¹ Laboratory examinations upon divisional water supplies could not be made since it was not feasible to furnish a laboratory sufficiently equipped for this purpose. This, however, was not a serious detriment inasmuch as the almost universal contamination of water supplies in the occupied areas of France rendered quite justifiable the assumption that all supplies available for troops should be considered as contaminated, and sterilized before use.¹ The duties of this water officer, therefore, became very simple, but nevertheless of considerable importance. Incidentally, one of the difficult things to impress on the young chemists and bacteriologists who occupied these positions was the fact that their apparently uninteresting routine was one of the very important factors in keeping the troops healthy and, at that time, of immeasurably greater importance than any chemical studies they might have made upon the waters of France. It should be added, however, that the duties of these officers did not by any means exhaust the work done upon water supplies, since an elaborate organization under the engineering department, A. E. F., was occupied in the delivery of water from large sources, in the general survey of available waters, and in the construction of pipe lines and purification plants. In this the Medical Department took part by a special organization which is described in Chapter VII.

The divisional organization described above was quite adequate under ordinary circumstances to deal with conditions that threatened the health of the troops, but because of insufficient laboratory equipment and shortage of personnel it was obvious that any considerable outbreak of communicable disease in a division would necessitate reinforcement. It was felt that it was the duty of the subdivision of infectious diseases, as organized above, to furnish this reinforcement. In order that such service might be rendered promptly and efficiently to troops both in the training areas and in the front line, the following bulletin was issued by General Headquarters on May 27, 1918, in order to avoid delays which occasionally had occurred before its issue, owing to the necessity of requesting orders through indirect channels.

Bulletin No. 32.

G. H. Q., AMERICAN EXPEDITIONARY FORCES,
France, May 27, 1918.

Whenever the appearance of contagious diseases among the troops in a division or army leads the chief surgeon thereof to believe that an epidemic is apt to ensue, he is authorized to communicate directly, by telephone or telegraph if necessary, with the director of laboratories, A. E. F., A. P. O. No. 721, and request him to furnish specialist professional assistance and material to temporarily reinforce his local facilities and arrest the epidemic in its incipi-

ency. The director of laboratories will promptly dispatch, from the laboratories under his control, to the points indicated, such personnel and material as he may deem necessary, and cooperate with the chief surgeon to the fullest extent of his resources toward accomplishing the end sought.

By command of General Pershing.

JAMES W. McANDREW,
Chief of Staff.

Official:

ROBERT C. DAVIS,
Adjutant General.

Under the authority conveyed by the above bulletin, the subdivision of infectious diseases was active throughout the Advance Section and zone of advance, studying and assisting in the arrest of small outbreaks of diphtheria, scarlet fever, measles, meningitis, influenza, and diarrhea.¹ More extensive studies were made on the first outbreak of influenza at Chaumont and the rather more important epidemic which occurred, very shortly after this, in the 42d Division, then in the line.¹ Reports of all these investigations were rendered to the chief surgeon, A. E. F., through the director of laboratories, and a copy of each report sent to the division surgeon and local chief surgeon in each case.¹ Moreover, all this work was done in divisions or in local areas presided over by a responsible medical officer, and was invariably carried out in cooperation with the local authorities, in daily consultations, so that division surgeons felt that there was no infringement upon their prerogatives, but rather that they had been furnished with specialized personnel and additional laboratory service.

In many cases it became necessary for the subdivision of infectious diseases to avail itself of additional laboratory personnel and equipment. This was obtained in various ways.¹ According to location, mobile laboratory cars, equipped and constructed (with some modifications) according to the English plan, manned usually by one commissioned officer, a driver, and a technician, were sent upon telegraphic request, either from the central Medical Department laboratory in Dijon or from Army Laboratory No. 1 at Neufchateau, Vosges.¹ Army Laboratory No. 1 gradually assumed a more and more important function in aiding in the laboratory service for communicable diseases in the areas easily accessible to Neufchateau; that is, in the Toul-Baccarat section and in the regions of Chaumont and Langres. In other cases local laboratories were utilized, such as the laboratories of accessible base and evacuation hospitals in which supplies and cooperation were always readily obtained. Additional supplies and personnel were secured by telegraphic request to the director of laboratories whenever needed.¹

In the meantime, at the central office of the director of laboratories, the subdivision of infectious diseases also was occupied with the preparation and issuing of information and circulars upon communicable diseases, a function which it assumed in its advisory capacity to the chief surgeon, A. E. F., in matters concerning this branch of sanitation.¹

Instructional work also was begun at this time.¹ This consisted at first only in consultations with laboratory officers intended for divisional work. The knowledge of these officers in the work for which they were intended was scrutinized and they were given a few simple directions for the epidemiological tracing of disease sources. Later this instructional plan was much elaborated,

and there was organized at the central Medical Department laboratory a course in the bacteriology of carrier work and other technique needed in field work upon communicable diseases.¹ Similar courses in the supervision of drinking water were organized by the chemical division of the central Medical Department laboratory.¹

Meanwhile, the work of decentralization had continued. The base sections were organized to a degree of completeness which rendered them relatively independent of central supervision, and special base laboratories had been established for the use of these sections.¹ A further decentralization, however, seemed indicated, inasmuch as American troops were now concentrating in the Advance Section and in the front line, and more and more divisions were beginning actively to participate in the combatant armies. It seemed necessary now to begin to consider whether or not a further system of daughter organizations should not be split off from the central office of the subdivision of infectious diseases, based upon army corps or field army units. It was difficult to decide without experiment whether the corps or the field army should become the administrative unit upon which such decentralization must be based, for it was quite uncertain at this time whether the coming months would lead to a relatively stationary form of warfare which had prevailed along the British and French fronts for several years, or whether this would give way to conditions of rapid movement and shifting troops.¹ There resulted a period of transition in which there was some groping concerning the proper form of organization, a groping which was rendered particularly difficult because of the fact that although a definite field army had been organized, these troops were distributed in groups which operated along a line extending from Belfort in the south to above Chateau-Thierry in the north. It was decided by the director of laboratories and his advisers to make a rapid experiment in utilizing the army corps as the basis of organization.¹

The purely tactical nature of the army corps as used in operations in July, August, September, and October of 1918, rendered this unit entirely unsuitable as the foundation of a sanitary organization.¹ The eventual solution was the organization of a complete sanitary department in the field army which, in its relationship to the office of the chief surgeon, A. E. F., and the subdivision of infectious diseases, was analogous to that of the base sections but which required adjustments to its individual problems owing to the necessity for combat and the mobility of troops.

When the armies had become organized with sanitary and administrative provisions, all large units of the American Expeditionary Forces could be considered as successfully decentralized. The office of the director of laboratories, in its subdivision of infectious diseases, thereupon assumed functions more of an advisory and supervisory nature than, as previously, actively taking part in the solution of the smaller individual problems.¹

REFERENCES

- (1) Report on General Plan, Organization and Development of the Section of Communicable Diseases, from Lieut. Col. Hans Zinsser, M. C. (undated), to the Surgeon General, U. S. Army. On file, Historical Division, S. G. O.
- (2) Report from the chief surgeon, A. E. F., May 1, 1919, to the Surgeon General, U. S. Army. Subject: Activities of the Chief Surgeon's Office, A. E. F., to May 1, 1919. On file, Historical Division, S. G. O.

CHAPTER III

FIELD ARMY SANITARY ORGANIZATION FOR THE CONTROL OF COMMUNICABLE DISEASES^a

A body of troops is a community for which, in addition to organization for combat, provision must be made for all the needs of a civilian community, for supply of food and water, for shelter and warmth, for refuse disposal, for personal cleanliness and laundry, for care of the sick, and for all other innumerable details that arise where human beings live in crowded places. The military sanitarian has some advantages over his civilian colleague: he has his community under more rigid control than the latter, and the individuals comprising it are young and hearty. These, however, are his only advantages. To offset this he is confronted with the difficulties that arise from the housing of many men in barracks, from the exposure and hard work that form the daily routine of their lives and, most important of all, from the fact that all his arrangements must be made with the clear recognition that there will be times when all considerations of health must become subordinate to the purposes for which his community has been formed, namely, the training for combat.

In the training areas and in base sections in the American Expeditionary Forces, the problems of military sanitation were very similar to those of municipal sanitation. In the case of our armies occupying the front line, however, the conditions were modified by the many factors that active warfare involved. It is with the latter problems that this chapter is particularly concerned.

The organization of our division conforms largely to the necessity for mobility: a division is a spear which must be thrust and withdrawn as military needs indicate. It must be complete in itself and carry within its organization the elements of all the parts necessary for independent functioning. Often a gain in mobility involves an inevitable loss of efficiency; therefore the sanitary organization of a division necessarily must do without many of the arrangements that are possible only in a permanently organized territory with extensive laboratory facilities, bathing and disinfection apparatus, and all the other devices which are perfectly arranged only when more or less permanent occupation of an area is possible.

Normally three of our divisions comprise a corps. During the World War the corps occupies an area; but as warfare was developing just before the armistice was signed, the corps was a tactical unit and its headquarters were changing almost as frequently as divisional stations; consequently, corps areas were shifting to meet the rapidly changing necessities of strategy. Such being the case, the army only could be counted on for the occupation of an area for a reasonably definite period; long enough, at least, to justify the undertaking of extensive organization and construction, with relation to territory occupied; and it was only in the army organization therefore, in which could be formulated a system of sanitation based on area, which could so reinforce the divisional organizations as to fill in the defects existing in the latter by reason of their greater mobility.

^a Document No. 170, undated, Army Sanitary School, A. E. F.

An army sanitary organization, under conditions of warfare such as those which, during the fall of 1918, prevailed in France, should be so constructed that it combines careful sanitary scrutiny and control, with sufficient mobility to adapt itself to advances, to the shifting of flanks, contractions and expansions of the occupied territory.

When the British armies first entered the battle fields of Flanders, they had sanitary squads or detachments attached to divisions just as we formerly had them. It soon developed that an army area was a section throughout which a continuous shifting and rearrangement of the composing elements must take place. Divisions moved forward into the line, remained in position for varying periods, and were withdrawn for replacements and rest. Other divisions moved forward from reserve positions to take their places. Artillery changed its emplacements; supply and ammunition trains, engineering detachments, and labor troops moved about whenever needed.

Within the more or less constant limits of the army area a continuous circulation of units took place, a shifting of troops to and fro, an active wandering about like that of ants in a hill. It was apparent that there would be much wasted energy and loss of efficiency if every division were to be required to organize its sanitary arrangements *de novo* whenever it was moved. The knowledge gained and the work done by one division were lost to the one that moved into its place, and a new investigation of water sources, billets, dumps, latrines, baths, and everything bearing upon the control of disease became necessary whenever divisions changed locations. It was found, in consequence, that some form of constant central supervision by the army itself would remove these obvious defects. This is the principle which underlay the British Army sanitary organization, and it was this system, in its essentials, that was adopted as a basis for the plan about to be described. Certain essential elements were borrowed from the British system, but these were adapted to the more mobile conditions which prevailed on all parts of our front during the latter months of the war. The following outline describes briefly the plan instituted in the Second Field Army, A. E. F., with the official approval of the commanding general. The plan is similar in most of its details to that conceived and carried out for the supervision of the advance section, A. E. F., by the chief surgeon of that section, but differs from this in the attempts made to remain prepared for sudden extension forward of the army area, and the rapid organization of conquered territory.

OUTLINE OF PLAN FOR AREA SANITATION, SECOND ARMY

The army area is divided into administrative subdivisions to be known as sanitary sections. The area as at present constituted will be divided into three such sanitary sections, and in the future expansion or change in the territory occupied by the Second Army can be easily adapted to corresponding changes in the subdivisions.

In a central point in each sanitary section there will be stationed one commissioned officer, lieutenant or captain, Medical or Sanitary Corps, chosen for his training in practical sanitary methods.

Each sanitary section will be again subdivided into 8 to 12 subareas. These will be so outlined as to be small enough to be patrolled on foot, thus obviating the necessity for additional transportation. Into each subarea will be placed two or three enlisted men and noncommissioned officers chosen for their general intelligence and training in sanitary inspection. Further training will be given these men by the commissioned officer commanding the squads in each sanitary section.

It seems likely that a number of sanitary squads so selected can at the present time be obtained from personnel or divisional sanitary squads now assigned to the Services of Supply.

DUTIES

1. *Duties of the commissioned officer in charge of squad.*—The commissioned officer assigned to each area will: (1) Maintain in the town of his station a sanitary school for the instruction of noncommissioned officers and enlisted men of sanitary squads, and a shop for the construction of sanitary appliances, such as latrine seats, etc. (2) He will select and distribute men of his squad to the 8 to 12 subareas in the section. He will direct and advise the work of the men in the subareas by receiving reports and keeping in constant touch with them, by circulating in his area. (3) He will keep in touch with all matters of sanitary importance in his section and furnish all such information to zone majors, medical officers, and commanding officers of all units that enter the area. (4) He will keep in constant touch with corps and division surgeons in his area, furnishing them all information at his disposal. (5) He will be directly responsible to the chief surgeon of the Second Army through his sanitary inspector, reporting all matters that in his opinion need correction.

DUTIES OF SANITARY SQUADS

2. Sanitary squads will be divided into groups of about 15 to 20 men who will work at the station of the squad commanders, in the shop, and in the sanitary school. The remainder will be assigned in groups of two or three in each of the small subareas. The place in each subarea at which they are stationed will be so chosen that from it they can patrol the entire area on foot. These men, under the direction of a commissioned officer, will: (1) Keep detail maps of the subarea, showing everything of sanitary importance—water sources, latrines, urinals, stables, cesspools, dumps, baths, lavoirs, kitchens, billets, barracks, camps, etc. (2) They will inspect and keep in repair permanent sanitary appliances located in their subareas, such as latrine seats, baths, kitchens, etc., drawing upon the sanitary shop of the section for labor and materials. (3) They will keep in touch with the engineer water personnel working in the subarea. (4) They will, as well as possible, keep themselves informed of infectious diseases occurring in the civilian population in the subarea and see that such diseases are promptly reported to the proper medical authorities. (5) They will furnish all information gathered by them to town majors and commanding officers of incoming troops as soon as they enter the race. (6) They will report all sanitary defects which require attention to squad commanders of section. (7) They will plan improvements of permanent sanitary installations and confer with the squad commander regarding them. (8) They will report upon the condition of subarea or parts of it whenever troops leave this area. (9) They will exercise no administrative or other authority, their functions being those of inspection. (10) Their maps will be kept up to date and copies furnished incoming troops and others whose health depend upon such knowledge. (11) It should be understood that the enlisted men of sanitary squads are not labor troops; i. e., they do not police or care for grounds, billets, and areas, or dispose of refuse. They function as assistants to the sanitary inspector of the Second Army.

These arrangements provided an adequate sanitary supervision, which served the important purposes of keeping constant guard over the area occupied by the army, facilitating the tasks of incoming troops, obviating the necessity of frequent and useless repetition of sanitary surveys of the same territory, and keeping the army authorities constantly informed of prevailing conditions and needs. By constant cooperation with billeting majors and with officers and men of the water service of the Engineer Department, moreover, these squads formed a coordinating link which served to convey necessary information from one service to the other.

When the army area changed by advance or lateral shifting it was a relatively easy matter for the squad commander, whose area was adjacent to the newly acquired territory, to extend his work into this. If complete change in

the location of the army took place, the squad commanders concentrated their men at a central point, moved them forward and, after a rapid survey on their motor cycles, in consultation with the billeting officers of G-1, redistributed personnel.

When the army was engaged in active combat it proved best to exclude from the above scheme of organization a strip of territory about 4 km. deep, immediately behind the trench lines. This area was subjected to shell fire, and any kind of constructive activity of a permanent nature was rendered difficult. Also, in this area it was best to leave sanitary work entirely to the divisional authorities, in direct consultation with the army sanitary inspector, who kept in close personal touch with the divisions in the line.

RELATIONS OF THE ARMY SANITARY OFFICE TO THE SANITARY INSPECTORS OF DIVISIONS

In the experience of the Second Army, A. E. F., it proved best for the army sanitary organization not to interfere in the slightest with the sanitary organization of the several divisions in the army. The routine sanitary supervision of divisional troops in all matters pertaining to health was left in the hands of division surgeons and division sanitary inspectors. It was the duty of the army sanitary inspector and all the machinery at his disposal, however, to reinforce the divisional facilities, to advise the responsible divisional officers, and to place at their disposal the experience and knowledge he had gathered by reason of his intimate acquaintance with the area. Whenever infectious disease is reported from divisions in more than isolated unrelated cases, the army sanitary inspector conferred with the division sanitary inspector, examined the prevailing conditions freely and gave advice. He, either in person or through trained assistants, made epidemiological and laboratory studies whenever these seemed indicated for the purpose of arresting the spread of contagion. He was the adviser of the chief surgeon of the army in matters of sanitary policy, in circularization of information, and in the meeting of any emergency. It was his duty to organize the area supervision and the transmission of information concerning the areas to incoming divisions. It was his function to establish and maintain liaison between the divisional authorities and other services of the army which had a bearing on sanitary problems such as the water service of the Engineer Department and the bathing and disinfestation activities of the Quartermaster Department.

To carry out these functions it was necessary for him to have, first, transportation; second, assistants and personnel for area organization; third, a system of report whereby he could keep records of the daily occurrences of communicable disease in all units of the army.

His functions, thus defined, did not in any sense curtail the authority or diminish the responsibilities of the divisional medical authorities.

REPORTS

It was necessary for the sanitary inspector of an army to keep constantly informed concerning the prevalence of communicable diseases in all troops of the army, both in divisions and in army troops. For this purpose he maintained in his office a reporting system whereby he could constantly keep his hand on

the pulse of the sick rate. What the army sanitary inspector needed to know was whether contagious diseases were occurring, when and where, and in which company units.

The company unit was important because it indicated occurrence in groups which were eating and living together, and therefore this report gave information as to contact. Knowledge of the place where the disease occurred was very important when troops were stationary, less important when they were constantly moving about in an army area. Even under the latter circumstances the place was of value, since the occurrence of a considerable number of cases in one and the same place within a limited period pointed to faulty condition of barracks, billets, or water supply. The system which was worked out and was in use in the Second Army was simple and gives the necessary information.

Paragraph 12, Manual of Sick and Wounded Reports, A. E. F., September 15, 1918, provided that special daily telegraphic reports of admitted communicable diseases must be sent to the chief surgeon, A. E. F., by all field, evacuation, camp, and base hospitals. The reports were to give name, rank, company, and place of origin of infection whenever possible. For the purposes of the individual field army, it was necessary to require duplicate telegrams from all the field and evacuation hospitals in the Army and to request similar duplication of telegrams from any base hospitals that were situated so close to the army area that they received patients direct from army units without these patients having passed through field and evacuation hospitals, as was normally the case. On receipt of these telegrams, an assistant in the office of the sanitary inspector took them each morning to the statistical office of the army, checked the location of the units from which the diseases were reported, and then listed them and recorded the information in the following manner.

Record by units.—A book was kept in which separate pages were so lined that cases of epidemic diseases could be entered by date and company, one page being given to each unit in which the disease occurred.

Spot map.—A wall map of the entire army area was kept, and when an infectious disease occurred a pin was stuck into the location from which the disease was reported, pins with a variety of colored heads being used for different diseases. Each pin was thrust through a little square of paper on which were written the date and the unit. When the army was actively engaged in combat, and its units were moving to and fro with great rapidity, the knowledge of the place from which the case was reported lost value by virtue of the fact that the disease was probably not contracted in the place from which the report came, and that by the time the patient had been in hospital two or three days this unit may have moved to another location. The spot map, nevertheless, was made of value by the following procedure. At the end of each week the information found on the spot map was entered in a book. In this way there was constructed a record of all places in which infectious diseases occurred during the week. When this information had been entered in the book for a particular week the pins were taken out and replaced with common pins (without colored heads), which were left to form accumulated evidence of all infectious diseases that had occurred in each place. When a

large number of such pins accumulated in any single space, it was simple by going back to the book in which the diseases were kept by places, to find out which particular variety of disease had occurred there. Beginning with a new week, the colored pins were again entered as before. The map, thus at all times, showed not only the nature and location of the disease occurring within the weeks, but also indicated by a massing of the common pins whether or not these places had been frequent sources of disease. After a while it was of value to study the movements of units in which infectious diseases had occurred, and draw lines across the maps with red or blue pencil along the paths of movements followed by these units. This could easily be done by reference to the information in the "unit" and "place" record, and it occasionally was found that lines drawn for infected units intersected at places at which a considerable number of infectious diseases had occurred. By putting in dates it sometimes was discovered that a unit which had reported communicable disease had passed through places from which similar cases were removed from other units, within periods representing incubation times.

As implied in the above paragraph, a further record, arranged by places, was kept in an ordinary ledger in such a way that there was a page for every town in which a communicable disease had occurred and all cases reported from these towns were entered on this page.

To summarize, there was a cross indexing of records as follows: (1) Record by units from which contact studies could be made; (2) map record of places, as described above; (3) a ledger in which the occurrence of diseases was recorded by place of occurrence; (4) a week-book in which weekly records of the map were preserved after the renewal of pins.

In addition to these records, constant contact was maintained with divisional surgeons and sanitary inspectors and medical officers of army troops, who were requested to communicate directly with the sanitary inspector of the army when they wished advice on any sanitary matter, or when any of the units under their care showed the occurrence of infectious disease which they regarded as warranting medical action. Such an arrangement, especially when the sanitary inspector had the confidence of the officers involved, formed an indispensable check on the records described above and made it possible also to keep in touch with the occurrence of diseases which it was believed unwise to designate as "reportable," as influenza, for instance. The few isolated cases of so-called influenza that occurred had very little sanitary importance, and reporting them would have needlessly increased the paper work. When influenza occurred as an epidemic, the cases were usually so numerous that telegraphic reports were not feasible. In this disease and a few others, therefore, reliance was had on the direct information by contact with the officers in charge, with whose cooperation intensive study of the situation was made, as when any epidemic conditions prevailed.

LABORATORY AND EPIDEMIOLOGICAL SERVICE

Just as the laboratory is of only partial efficiency in hospitals if the bacteriologist is unfamiliar with the cases in the wards, so in our army it proved that the laboratory service could not be entirely efficient unless the laboratory

officer was trained as to and in touch with the epidemiological data. Likewise, it was essential that the sanitary inspector of the army should be capable of acting as an adviser to medical officers and sanitary inspectors of the several troop units; that he not only should be trained in practical sanitation but at the same time should be familiar with the facts of epidemiology, and the methods of making epidemiological surveys, and that he could handle a laboratory for the control of communicable diseases.

The most practical laboratory organization of a field army holding a definite sector proved to be a stationary mobile laboratory made within reasonable proximity to army headquarters, equipped for all cultural work and with personnel consisting of two or three commissioned officers and five enlisted men, three of whom were trained technicians.

The surgeon, Second Army, A. E. F., in reporting upon the Medical Department activities of that army, stated:

It is doubtful whether the divisional laboratories, as formerly organized and equipped, should be continued. When divisions are reasonably stationary, such laboratories can be of great value for the performance of clinical pathological work for field hospitals and can materially aid in the speed and detection of communicable diseases, more particularly meningitis, diphtheria, amebic dysentery malaria, and tuberculosis. Such a laboratory should never be equipped for extensive laboratory work for, when divisions are moving or actually engaged in combat, insuperable transportation difficulties invariably arise. Moreover, under such circumstances patients who are sick for more than a few days are evacuated to hospitals where laboratory facilities are available, and the largest epidemiological problems can best be handled under any circumstances by the mobile army laboratories described. The bacteriologist in charge of these cars can be trained by the army sanitary inspector to make epidemiological studies and, thus utilized, can independently attend to the rapid contact and carrier studies which should be made in direct coordination with the actual laboratory work. It is our belief that a thorough laboratory training is essential to work in epidemiology. The divisional laboratory man should be utilized in the same way as special assistant to the divisional sanitary inspector.

In discussing laboratory work in field armies it should always be borne in mind that an army engaged in combat or holding a sector is not the place for research. The laboratory should be an instrument in the hands of sanitary authorities for the prompt detection and arrest of communicable diseases. For these reasons, it is of great import that we should consider briefly the extent of laboratory work which it is wise to carry out in active field armies.

The most practical solution of the clinical pathological problems for divisions would seem to me to maintain a number of such organizations for assignment to divisions when circumstances are such that the laboratory can functionate to advantage. These laboratory units, organized as at present, could remain under the control of the director of laboratories of the Army and assigned to divisions for indefinite, temporary duty when the respective divisions are at rest, assigned at the request of the division surgeon, and could be withdrawn and remain unassigned wherever needed when the particular division is in combat or moving.

It goes without saying that mobile laboratories and all purely diagnostic laboratories which are connected with an army organization should at all times be carefully supervised in order that the promptness of diagnosis which gives the clue to epidemiological investigation and control shall be efficiently carried out.

One of the fundamental principles underlying successful epidemiological laboratory work is to restrict it to the amount which can be accurately done. We are entirely out of sympathy with the extensive carrier examinations which were instituted in the camps of the United States for the control of meningitis upon the occurrence of a single case. Our own observations have not given us the impression that this work has had much effect upon the reduction of the disease incidence, and we are absolutely sure that the technical inaccuracies inevitable in such wholesale bacteriology largely defeat the purpose of the work.

It is, in our opinion, more important to restrict the laboratory work at first to rapid and accurate diagnosis, and to abstain from extensive carrier work until a number of cases have occurred in one and the same unit. The principles of prevention of most of the diseases of importance for army sanitary control are fairly well understood, and after the discovery of a single case in a unit it is more important as a rule to concentrate speedily upon the correction of general sanitary defects for the control of the particular disease.

Most of the important military epidemics are of either respiratory, digestive, or insect transmission. For sanitary purposes we consider as respiratory in mode of transmission: Pneumonia, influenza, measles, scarlet fever, meningitis, diphtheria, mumps, chicken-pox. Diseases transmitted by the digestive route are: Typhoid and paratyphoid fever, the dysenteries, simple diarrheas.

It is not possible to generalize intelligently when speaking of different diseases. For this reason the principle of epidemiological and laboratory procedure, believed to be sound and effective, can best be presented by submitting in more or less detail the reasoning and actual methods of work for each disease in question. Some considerations leading to the method of handling meningitis in the American Expeditionary Forces will be pertinent as illustrating just what is meant.

Epidemiologic records almost universally show that in very few instances is a case of meningitis directly referable to a preceding one, as is true of measles and smallpox. Almost universally divisions that had meningitis showed a scattered distribution, there being often as many individuals, or almost as many, involved as there were units, and when the cases were so plentiful that several or many occurred in the same company or platoon it was almost exceptional that direct connection between one case and a preceding one could be established.

This shows with great definiteness that in the transmission of meningitis the carrier is of comparatively greater importance than the case.

It also shows that the disease is one to which the susceptibility of individuals varies within very wide margins. Otherwise we would frequently find, as in typhoid fever and other diseases, groups of cases radiating back to the same carrier source. Such, however, is not the case; the incidence of meningitis is more a susceptibility than a transmission problem.

It will be well for purposes of practical army sanitation to classify diseases according to susceptibility phenomena. There are some diseases—typhoid, typhus, smallpox, plague, cholera, measles, scarlatina, and some others—to which susceptibility is universal, and all individuals who have not had these diseases or have not been artificially protected are likely to contract them if exposed to a sufficient dose of the virus; that is, to a minimum infectious dose. There are other diseases, pneumonia, for example, in which the normal human being, well fed, well clothed, and not otherwise diseased, is highly resistant and will withstand, without harm, exposures that will infect promptly his fellows less well cared for or for other reasons in poor physical condition. In the former class the sanitary measure must always primarily consist of contact prevention by the discovery and removal of cases and carriers, combined with the supervision of intermediate means of transmission and specific vaccination. In the latter group of diseases the contact matter must, of course, also be kept in mind, but the primary point of attack must be the general

hygienic measures that aim at the prevention of resistance-lowering conditions. Meningitis is a disease in which normal resistance is probably high in most persons. There exists, however, a group of persons who, for reasons not hitherto clear, are abnormally susceptible, this susceptibility being a permanent, perhaps congenital, property with them, diminishing with adolescence in some of them, remaining with others, increasing with all of them when general physical environment is poor. That such diseases as influenza predispose to meningitis is probable, as recent experiences seem to indicate. The supposition that these are individuals who are normally susceptible to meningitis is based on facts observed by all who have dealt with this disease. In all epidemics there are many individuals who, though in perfect health and remarkably good physical condition, develop the disease and die quickly, while others may harbor meningococci in nose, throat, and even lungs, and escape meningitis.

Whether or not such relative immunity depends upon an acquired resistance, whether it is measurable by serum or skin reaction, are interesting fields for investigation, but too little is known at the present time concerning them to warrant discussion.

The carrier problem in meningitis, moreover, differs in important respects from that in typhoid fever and some other diseases. A typhoid carrier is apt to be a chronic carrier. In meningitis it is apparent, from the excellent studies of British and American observers, that carrier rates, in one and the same troop unit, fluctuated between very wide limits. During the warm months, when meningitis incidence was low, the carrier rate was correspondingly low. During the autumn and winter months, coincident with the spread of catarrhal conditions of the upper respiratory passages, the carrier rates rose to 20 per cent and above.

In the face of these simple facts it is well to consider how meningitis epidemics come about, why they occur, and in what respect the occurrence of such epidemics differs from those of such diseases as measles and typhoid fever, and other diseases to which all previously uninfected individuals are susceptible.

In any command at any given time there is a definite percentage of susceptible persons and there are carriers, the number varying according to the prevalence of upper respiratory catarrh and the degree of crowding in the command. When the command is first organized, if chance brings these two groups into close association with one another, a few cases of meningitis occur. Sooner or later the command settles down to a more or less regular routine of reciprocal contact between definite groups of individuals associated in fixed platoons and companies, billet or barrack companies. It is summer, and there is little catarrhal disease. Men do not spread saliva by sneezing and coughing; if occasionally they do, the relatively healthy mucous membrane of the recipient of the resulting spray does not form a favorable nidus for a flora of organisms so delicately vulnerable to symbiotic conditions as the meningococcus. Then come cold weather and exposure. Carriers acquire colds and begin to secrete and spread mucus; meningococci become more plentiful on their diseased mucosæ and are brought down from the high

places in nasal sinuses; the men begin to crowd together about stoves and in sleeping quarters. Other men similarly diseased become carriers. The carrier rate goes up and, with it, the mathematical changes of contact between susceptible men and carriers increase at more than geometrical ratio. Moreover, more men become susceptible because of influenzal or other infections of the nose, throat, and bronchi.

The following circular illustrates the procedure adopted in the Second Army, A. E. F., for the management of meningitis, as based on the preceding considerations:

The following measures should be taken when meningitis occurs in the command:

(1) When one case of meningitis appears in a unit, make a thorough sanitary inspection of the unit and enforce with great strictness the existing regulations concerning space between beds, ventilation, and mess-kit washing. Nothing else need be done.

(2) When two or more cases occur within the same ten days or two weeks, in addition to the above have all men inspected at least once a day and remove all those with severe colds and coughs from sleeping quarters, screening them from each other with shelter halves hung between beds; if necessary, screening of the part of the barrack in which they are put from the rest of it, preferably putting them together in a separate building. Treat coughs and colds as things requiring the attention of the medical officer as though they were really dangerous sources of infection to others. Other matters of inspection, such as cleanliness of floors, spitting, etc., go without saying.

(3) When two or more cases occur in quick succession in such a way that one can reasonably become apprehensive of an incipient epidemic, the following measures should be adopted:

Carry out strictly all the provisions incorporated in the preceding paragraphs; regard the command as probably badly infected, and take great pains to separate out the coughs and colds. Do your utmost to find facilities for additional quarters and spread the men out in small groups or allow as much more space as possible beyond the minimum required. If necessary, put some of the men under tentage or in pup tents, giving them extra allowances of covering. The argument that this can not be done in the whole American Expeditionary Forces is invalid because this command is to be managed as an infected one. Have a non-commissioned officer supervise mess-kit washing in boiling water. Inspect quarters during the day as often as seems necessary according to discipline of the command, and at least once during the night for ventilation. Notify the office of chief surgeon, Second Army, immediately, so that army laboratory may undertake to do carrier rate examinations on the command. Preventative measures beyond those stated above will depend upon the result of laboratory examinations.

The following sanitary order, Second Army, A. E. F., illustrates the proper balance to be struck between the employment of general sanitary measure and laboratory investigations in the actual control of epidemics in an active field army. The section on meningitis incorporated in the original order is omitted to avoid repetition.

REGULATIONS FOR THE CONTROL OF COMMUNICABLE DISEASES, SECOND ARMY, A. E. F.

The following circular is issued for the guidance of medical officers of the Second Army in their most important function—that of preventing communicable disease.

The sense in which the words "quarantine" and "contact" are used is first defined in order to avoid ambiguity.

It is impossible to lay down ironclad rules applicable to all conditions. A certain amount of discretion must be left to the medical officer in charge. In making recommendations, both military necessity and medical expediency must be considered. Military duties and training must be interfered with as little as possible. In making recommendations it is advisable to put them in such form that they may be issued directly as an order

Definition of contacts.—The following will be considered contacts: (1) Men in same tent; (2) men in the same room in billet; (3) men in same barracks, who have been sleeping within three-bed distance on either side of patient within the last ten days; (4) those men who have been in particularly intimate association with a case during the probable infective period.

Definition of quarantine.—Quarantine may be of two degrees: (1) Absolute; (2) partial or working quarantine.

Absolute quarantine: Men are strictly confined to a definite area and all association of any kind with others is forbidden. This is only applied in very serious diseases, such as smallpox, typhus fever, plague, etc., or where the extent and degree of the epidemic warrant strenuous efforts for its control. A guard is usually necessary.

Partial or working quarantine: Troops are allowed to attend out-of-door formations. It is preferable that they be drilled or worked separately, but when this interferes with military training it need not be insisted upon. When off duty they are to be kept absolutely separate from others, messing alone or at a different hour and washing their mess kits in separate boiling water. It is the type of quarantine usually employed.

I. GENERAL PROCEDURE

(a) Measures to be taken immediately when respiratory disease occurs. In this category are included pneumonia, influenza, measles, scarlet fever, meningitis, diphtheria, and mumps.

1. *Quarters.*—Inspect quarters to determine overcrowding. The ideal to be aimed at is a minimum floor space of 4 by 10 feet per bed. Under no circumstances ever allow less than 20 square feet and, if this seems impossible of attainment, report immediately to higher sanitary authority (Bulletin 94, H. A. E. F., 1918). Make sure that all the available space in your billeting area is in use and that there are no unoccupied rooms or barracks while others are overcrowded. When the space allowed is less than 4 by 10 feet, hang up shelter halves between beds by stretching strings from wall to wall. Under all circumstances enforce head-to-foot sleeping. When double-deck bunks are provided, try to allow 5 feet between individual bunk units. Separate the two men sleeping on the same tier by shelter-half partitions. Be sure that men across aisles are sleeping head to foot. Not more than 50 men should be used, in preference to crowded barracks.

Ventilation must be strictly enforced and inspections made at least once between taps and reveille to enforce the keeping open of windows. Blankets and bedding will be aired for several hours on dry days. Spitting in quarters will be made subject to disciplinary action. Floors of sleeping quarters will be swept after sprinkling with water once a day.

2. *Mess kits.*—Mess kits must be washed in boiling water. The mess-kit water should be kept on the fire and kept full of soapsuds. Rinse in running water. Do not dry on a common towel. When no fuel is available it is better for the men to wash individually in running water, wiping out with paper or leaves, than to wash in the common lukewarm can of diluted saliva.

3. Inspect men twice a day, once at roll call, once at retreat. Look them over for colds in the head, red conjunctivæ, coughs. Ask a few pertinent questions. Take temperatures of men who are not feeling well or who have severe colds. Segregate those with colds and coughs by putting them into separate sleeping quarters. If no such quarters are available, separate a part of one barrack or large billet by making a partition of suspended blankets. Hospitalize all the cases with temperature.

4. Investigate equipment of men, with especial attention directed to supply of overcoats, raincoats, serviceable shoes, three blankets per man, and three pairs of socks.

(b) Measures to be taken when intestinal disease appears, typhoid, paratyphoid, dysentery, or epidemic simple diarrhea.

1. Inspect latrines. See that they are not too full, that the seats and covers are tight, and that there is no trickling where bottom of box fits on the ground. When materials are available, have latrines burnt out once a day. Fill up all that are too full and have new ones dug not less than 5 feet deep. If no lumber is available for covered latrines, see that there is a pile of dirt and a shovel on hand, and either inspect frequently or put a guard on

the latrines to make sure that the men cover every defecation and soiled paper with dirt. If available, wash woodwork once a day with a solution of cresol, a pint in two buckets of water, and sprinkle residue of this on feces. Sprinkle inside of latrine once daily with chloride of lime, if available. If epidemic conditions prevail, have wash basin and soap handy and force every man to wash his hands after defecation. Supply no towels. Hands should be allowed to dry in the air.

2. Inspect kitchens and enforce cleanliness in the handling and preservation of food. See that meat is protected from flies. Stop the use of salad, fruit, milk, or other uncooked food. Enforce the washing of hands of kitchen personnel before the handling of food. In permanent camps, kitchens must be screened. Inspect kitchen personnel and remove those who have intestinal symptoms.

3. Attend to water supply. Personally assure yourself of proper chlorination of water and the cleaning of carts if water carts are used. Request bacteriological analysis of sources from which the water is taken after chlorination. If necessary put guards on public water supplies, faucets, etc., and instruct men concerning the dangers of unauthorized sources.

4. See that garbage, offal, the dead bodies of horses, etc., are promptly buried to reduce fly breeding. Have manure piles removed, covered, or packed tightly.

(c) Notify commanding officer of organization of existence of an incipient epidemic.

II. SPECIAL PROCEDURES

Sanitary management of meningitis

1. The following measures should be taken when meningitis occurs in the command:

(a) When one case of meningitis appears in a unit, make a thorough sanitary inspection of the unit and enforce with great strictness the existing regulations concerning space between beds, ventilation, and mess-kit washing. Nothing else need be done.

(b) When two or more cases occur within the same ten days or two weeks, in addition to the above have all men inspected at least once a day and remove all those with severe colds and coughs from sleeping quarters, screening them from each other with shelter halves hung between beds; if necessary, screening off the part of the barracks in which they are put from the rest of it, preferably putting them together in a separate building. Treat coughs and colds as things requiring the attention of the medical officer as though they were really dangerous sources of infection to others. Other matters of inspection, such as cleanliness of floors, spitting, etc., go without saying.

Diphtheria.—On occurrence of a case of diphtheria, contacts will be put under working quarantine and a request made on the chief surgeon of the Army for cultural examinations and Shick tests on the contacts and on the kitchen personnel of the unit in which the case has appeared. Carriers will be isolated and recultured after a week. Extent of cultural examination beyond this will be determined by the sanitary inspector after an epidemiological survey. The entire command will be inspected at least once a day for sore throats. Positive Shicks will be given 1,000 units of diphtheria antitoxin. The administration of diphtheria antitoxin, with date, should be entered on the service record.

General measures given above, concerning quarters, mess kits, etc., will be carried out.

Measles.—In addition to the general measures advised above, all contacts will be isolated in working quarantine for two weeks. The most important measure in the limitation of measles is the inspection of men at least twice a day, the prompt segregation of all men with colds or inflamed conjunctivæ, and the prompt hospitalization, as suspects, of all men showing temperature of 99.5 or above, by mouth.

Scarlet fever.—In addition to general measures, a working quarantine of all contacts for two weeks. Inspections as in measles. Especial attention to sore throats and temperature and segregation of those with severe "colds."

Liberty [German] measles.—As in measles.

Mumps.—Working quarantine of all contacts for three weeks. Daily inspection with especial attention to swelling of parotids and submaxillary regions, and inquiry as to sore throats. Temperatures taken on all suspicious cases and men with temperature hospitalized.

Smallpox.—Absolute quarantine of entire unit. Revaccination of entire unit. At least two negative tries must be made. Daily inspection as above and release from quarantine two weeks after completion of revaccination.

Typhoid and paratyphoid fever.—(1) Inspection of the command from which the case has come, especially in regard to the water supply, latrines, kitchen and sources of food, etc., as listed above; (2) scrutiny of the vaccination records of the entire unit; (3) carrier investigation of the kitchen personnel requested; (4) attention to fly protection and breeding.

Nothing further will be done beyond the correction of sanitary defects unless a second case occurs in the same unit. When another case occurs in the same unit, repetition of the carrier examination on the kitchen personnel will be made and the entire unit revaccinated with one dose of triple lipo vaccine.

Dysentery.—Same procedure as in typhoid fever, with particular attention to fly breeding, latrines, and the protection of food. Kitchen personnel cultured for the carrier state.

Amebic dysentery.—Same as above, with particular attention to the discovery of carriers. This problem should be referred to the army laboratory through the chief surgeon.

Trench fever and typhus fever.—Cases that suggest these diseases should be immediately reported, even if diagnosis is doubtful, and measures taken to have entire command deloused immediately. If there is difficulty in doing this, the problem should be reported to the chief surgeon of the army. If there is a case suspicious of typhus fever, the entire command should be put under strict quarantine until satisfactory delousing has been accomplished and several careful inspections for lousiness have been negative at intervals of one week. Typhus suspects should be evacuated in a separate ambulance, the cases marked as suspicious of the disease, and all blankets, clothing, etc., on the patient or in the ambulance must be deloused.

Influenza and pneumonia.—Principles of prevention. The principles of prevention consist in: Supplying of men with sufficient clothing and covering at night and keeping them as dry as possible. Each man should have three blankets or a suit of heavy underwear, three pairs of socks, two pairs of shoes, one raincoat, one shelter half, and sweater. The avoidance of crowding in quarters and billets, and the provision of ventilation, as per "general procedures." Care in the washing of mess tins in boiling water after meals. The prompt exclusion of men with colds in the head from common sleeping quarters, and the undelayed removal from companies of men showing the first signs of definite disease. The evacuation of those sick cases separately from wounded and from those with other diseases. Proper care and segregation in hospitals. The first is a quartermaster's problem; the others are medical problems. All are disciplinary problems. Cooperation is therefore necessary, and with its suppression of the disease is possible. Those matters must be supervised by systematic inspection.

Dryness.—A wet man invariably is cold, and a cold man is susceptible to infection. Three or four tin stoves in a dugout or a small hut make an excellent drying room. Strings and nails in them make it possible for men to hang up their extra clothes to dry. They can then go to bed with dry things or have dry clothes to put on in the morning. A drying room per platoon or company can easily be arranged with a little ingenuity and is of great sanitary importance, to say nothing of comfort.

Work.—When influenza is spreading rapidly in a command it is wise to remember that when men are overworked to the point of exhaustion they are rendered extremely susceptible to infectious disease. It is advisable, therefore, if military conditions at all permit, to ask that the drill schedule and other work be slightly reduced until the epidemic is under control.

Inspection and segregation.—When cases of gripe have begun to appear the medical officer should attend roll call and rapidly inspect all the men every morning. This can be done with speed by walking down the line, observing men for signs of "colds in the head," coughing, sneezing, or red eyes, and asking a few questions. Suspicious men should be made to step out and sent to the sick call, where temperature should be taken.

Men with definite colds in the head, without temperature, should be taken out of their billets and made to sleep in special barracks or billets, or other available space, with shelter halves hung up so as to form screens between neighboring beds. If possible, they should be given an extra allowance of bed covering. They should be placed on light duty for a day or two. If no special quarters are available for such men, put them all together at one end of the barracks and separate this end from the rest of the barracks by hanging up blankets or in some other way making a screen.

Where the military situation will permit, cases of influenza may be hospitalized in the divisional area. The attack is shortened and complications prevented by early bed treatment.

Ample floor space must be allowed and screening between beds attended to. Gauze masks should be worn by patients and attendants when coming into intimate contact, especially during transfer and evacuation. Cases whose temperature continues for more than 48 hours, or with signs of pneumonia developing, should be evacuated except from such hospitals as have been designated by the chief surgeon, Second Army, as respiratory disease hospitals.

On all men showing temperature on first inspection careful chest examination should be made. If any signs pointing to extensive bronchitis or actual pulmonary involvement are found, the patients should be promptly evacuated.

Evacuation.—During evacuation, gripe cases should not be placed in the same ambulance with wounded or with other sick. Remember that, in evacuating pneumonia, the greatest care must be taken to prevent their exerting themselves. Do not let them walk or dress or undress themselves. Keep them on their backs. Failure to observe this may make the difference between recovery and death.

Hospitalization.—In evacuation and other hospitals, gripe cases must be placed in separate wards. Cases developing pneumonia must be taken out of the gripe wards promptly and placed in separate pneumonia wards. Beds must be screened one from the other. Attendants must wear light gauze masks. Sputum must be disinfected or burned. Thermometers must be sterilized.

Respiratory infection and evacuation.—During action, especially under circumstances like those which prevailed in the Meuse-Argonne operation, where many of the men in the line were exposed to wet and cold for long periods and developed gripe, a problem of evacuation of considerable sanitary importance arises. Efforts must be made to evacuate such respiratory cases separately from the wounded, and especially from the gassed. In both instances, more particularly in the latter, the respiratory cases may transmit to the latter streptococci and pneumococci which may determine the death of the patient. In one division of the Second Army it was found possible to mask all respiratory cases which came out of the line and keep them masked until their admission to a hospital.

RESERVE AREAS OF ARMY WHEN IN THE LINE

When divisions were engaged in active combat during which their casualties may have amounted to several thousands, and were then taken out of the line to an army area for replacements and reserve, their sanitary conditions were apt to sink to a low level when left to their own devices. Men who had lived under combat conditions, who had gone through harassing weeks of peril and exertion, were physically worn out and mentally strained. Invariably, when withdrawn from the line, they relaxed, both mentally and physically, and it seemed poor policy to expect them immediately to take up the routine of camp life and to begin their rest period by cleaning up and policing their new area, digging latrines, and in other ways establishing the sanitation of their camps and billeting areas. It happened during the war that such divisions had to be stationed in areas recently abandoned by divisions that had gone forward to take their places. The consequence was that insanitary conditions, with dangers especially great for men in their condition, prevailed for a week or ten days; that is, until the division had been brought back to a more or less normal physical and mental state.

It was therefore necessary for the sanitary inspector of an army to make the preparations and the supervision of reserve army areas a part of this activity, to keep in touch with the movements of troops in and out of these areas, and to endeavor, with the aid of his sanitary squads, to assist in preparing them for the reception of troops coming out of the line. The troops thus finding the areas in good condition were relieved for the first week from extensive sanitary policing, and could take up this work themselves at the end of that time.

CHAPTER IV

TROOP SHELTER

TROOP SHELTER IN FRANCE

Generally speaking, in the United States during the World War our troops were housed in two main classes of shelter—temporary barracks and tents. To this manner of housing there were exceptions, of course, but to only a relatively slight extent, these being the use of some of our permanent barracks and the conversion to barrack use of existent civil buildings which were rented for the purpose, instances of the latter use of buildings being more especially true of our general hospitals. In the American Expeditionary Forces, however, use was made not only of tents and buildings temporarily constructed but also of billets and bivouacs.

In France the basis of our troop-shelter program was the provision, by new construction, of temporary barracks for one-third of the strength of the American Expeditionary Forces, the assumption being that the remaining two-thirds of the troops would be billeted or otherwise provided for, as in bivouacs.¹

To appreciate the necessity for providing different kinds of shelter for the American Expeditionary Forces, it will be necessary to know the zones into which these forces were divided. Basically these zones were the zone of the advance and the zone of the line of communications (Services of Supply).¹ The differentiation of the zone of the advance and that of the line of communications may be explained as follows: The zone of the advance includes the forces actively engaged in the defeat of the enemy, whereas the zone of the line of communications embraces all the territory in the theater of operations from and including the base to the point or points where contact is made with the trains of the combatant field forces.² In warfare of motion fixed shelter, except in certain instances where local buildings may be used for additional shelter for troops, can not be considered; consequently tentage must be resorted to, this necessarily being limited to that carried on the men, on animals, and in trains.³ In the World War, however, our troops had some experience in warfare of a fixed character, which necessitated a unique form of shelter. This will be considered later.

The mission of the tactical and administrative groups assigned to the line of communications, which in the American Expeditionary Forces became the Services of Supply,⁴ was to relieve the combatant field force—the force in the zone of the advance—from every consideration except that of defeating the enemy.⁵ This mission was carried out, for the most part, in fixed places, thus permitting the provision of shelter for troops thereat.

TROOP SHELTER IN THE SERVICES OF SUPPLY

CONSTRUCTED BARRACKS

Three factors influenced the provision of constructed barracks for the American Expeditionary Forces: Materials, labor, and fuel. As early as October 10, 1917, instructions were issued by General Headquarters, A. E. F., to the effect that construction work for sheltering our troops would be reduced to the lowest practical limit.⁶ The reasons for this measure are obvious and do not require present discussion.

Wherever possible, officers, men, and other persons connected with the American Expeditionary Forces were to be billeted, and buildings were not to be erected for any purpose where existing buildings could be obtained. Where it was impracticable to secure sufficient billeting accommodations, barracks of the Adrian or other similar type were to be constructed, but their use was to be limited to the minimum for housing troops.

The Adrian barrack was selected because it was a demountable type of barrack, could be constructed elsewhere, and the sections comprising it put together where desired with minimum labor requirements on the part of the American Expeditionary Forces. It measured 20 feet by 100 feet.¹

Though floor space will be given separate consideration, it is necessary to mention at this time that, to determine the number of barracks required, 1 linear foot of Adrian barracks was given per enlisted man.⁶ Nurses, officers, and patients in hospital were given a greater amount of floor space than this.

To provide barracks for the American Expeditionary Forces, within the limitations prescribed, as mentioned above, contracts were made with the French and British Governments and with civilian contractors in France and Switzerland for approximately 23,000 barracks, of which 15,000, including 4,500 hospital barracks, were delivered.¹ Most of these were of the demountable type, either Adrian or Byrant. Deliveries of these were slow, except during August, September, and October, 1918, when more than 1,000 barracks per month were received, consequently it was necessary to construct barracks in place from lumber supplied by our forestry troops. Of these barracks constructed in place there were two types, devised to utilize a minimum quantity of lumber: Type B and type C.¹ Type B barracks were of wood, requiring 6,100 feet board measure of lumber, while type C, having corrugated iron roof and sides, required only 1,600 feet board measure of lumber.¹ Most of the barracks constructed in place conformed to the standard measurements of the Adrian barracks; that is, 20 feet by 100 feet, and were one story. In some places, however, departures from the standard were found. In Camp Pontanezen, Brest, the measurements of the wooden barracks, metal-sheathed were given as 20 feet by 120 feet;⁷ at the Baranquine stevedore camp near the Bassens docks, where it became necessary to house 8,000 men on a plot of only 25 acres, double-story construction was employed. These double-story barracks were 31 by 92 feet in plan and were designed to house 250 men.¹

Barracks for the American Expeditionary Forces were constructed in greatest number in such centers as rest camps, replacement and supply depots, divisional areas, training schools, and camps for prisoners of war. In the

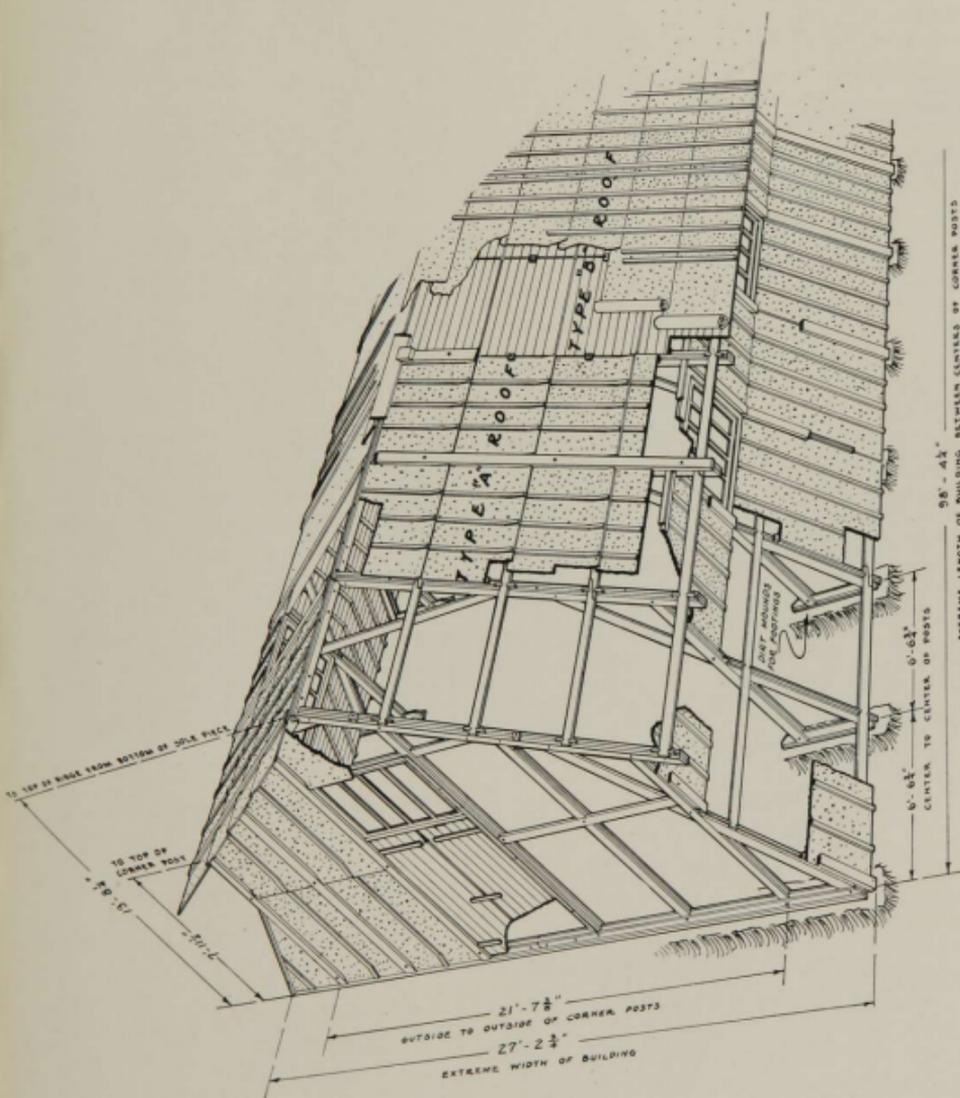


FIG. 1.—Perspective view of plans for Adrian barracks

divisional training areas, in the Advance Section, Services of Supply, barrack construction was undertaken on a large scale. Here troop accommodations (barracks, huts, etc.) to March 1, 1919, amounted to 16,444 buildings. These buildings comprised demountable barracks of various types, generally 20 by 100 feet in plan, when available; otherwise barracks were constructed of rough lumber.¹ Each barrack building was the equivalent of a standard barrack of 2,000 square feet of floor space.

Not much may be said in the way of description of the simple barracks provided for the American Expeditionary Forces. As has been stated above the single-story, standard barracks were generally 20 feet by 100 feet. At the side walls, inside, these buildings were about $7\frac{1}{2}$ feet high; at the ridge about $11\frac{1}{2}$ feet high. In each side wall there were 12 windows.⁸ In the standard



FIG. 3.—General view of old camp at Grange Neuve, Gironde, France, showing Adrian type of barrack

wooden barracks these windows were 3 feet 3 inches square, and their sills were approximately 4 feet 3 inches from the ground. In the corrugated-iron barracks, however, the windows measured 3 feet 2 inches in width by 3 feet 8 inches in height. The number of windows in the Adrian barracks was 12, 6 in either side wall. These windows, however, were approximately double the size of windows in the standard barracks, measuring 3 feet $6\frac{1}{2}$ inches in height by 6 feet $6\frac{3}{4}$ inches in width. Instead of glass for the windows of barracks, oiled linen almost universally was used, this use of linen being forced because of the scarcity of glass. The manner of operating the windows for ventilation varied in the different types of barracks used. In the Adrian barracks windows opened out from the bottom. In the barracks which we constructed in place, however, windows generally were opened by sliding them to one side. Exceptionally, they were opened by dropping the upper half (fig. 7), or by letting the upper end partially fall inward (fig. 8).

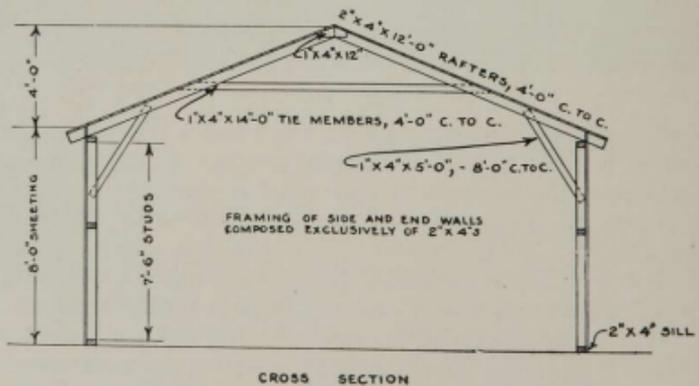
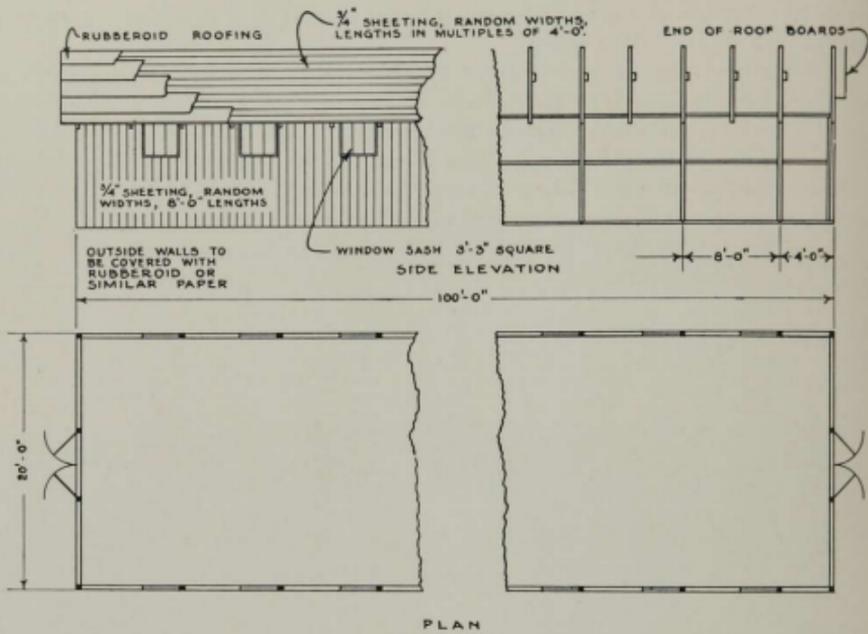


FIG. 4.—Standard barracks, 20 by 100 feet; type "B"

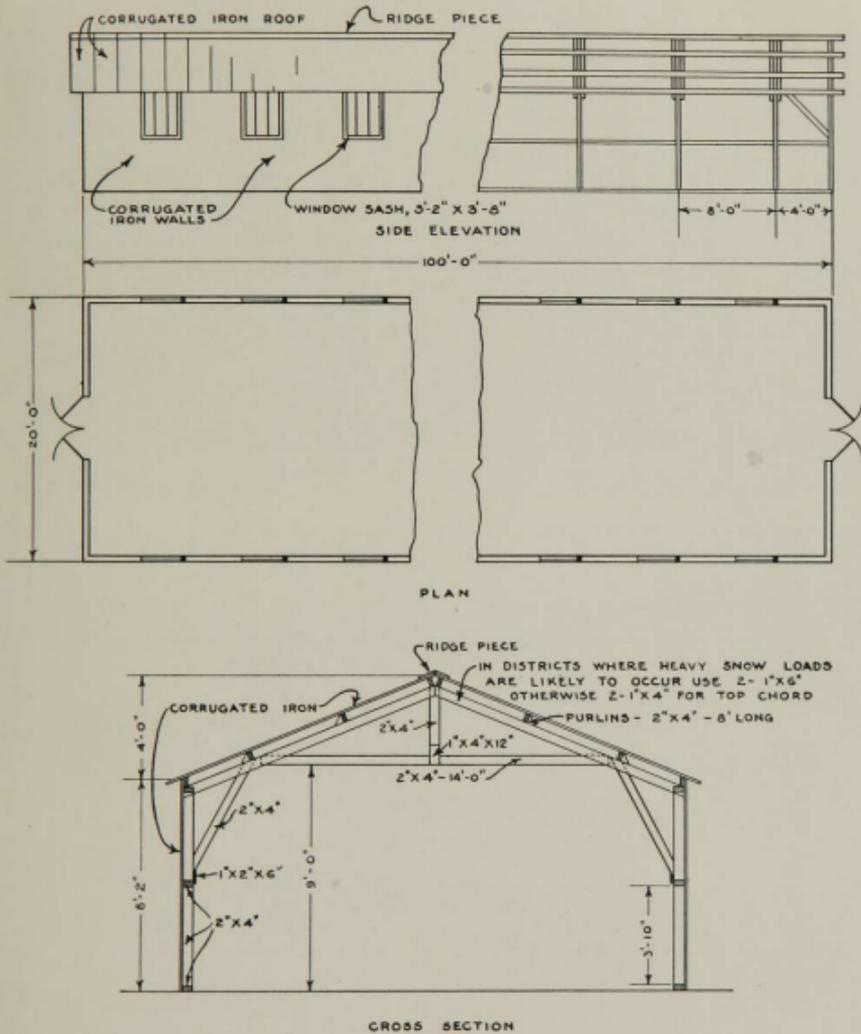


FIG. 5.—Standard barracks, 20 by 100 feet; type "O"



FIG. 6.—Two-story barracks at Camp Baranquine

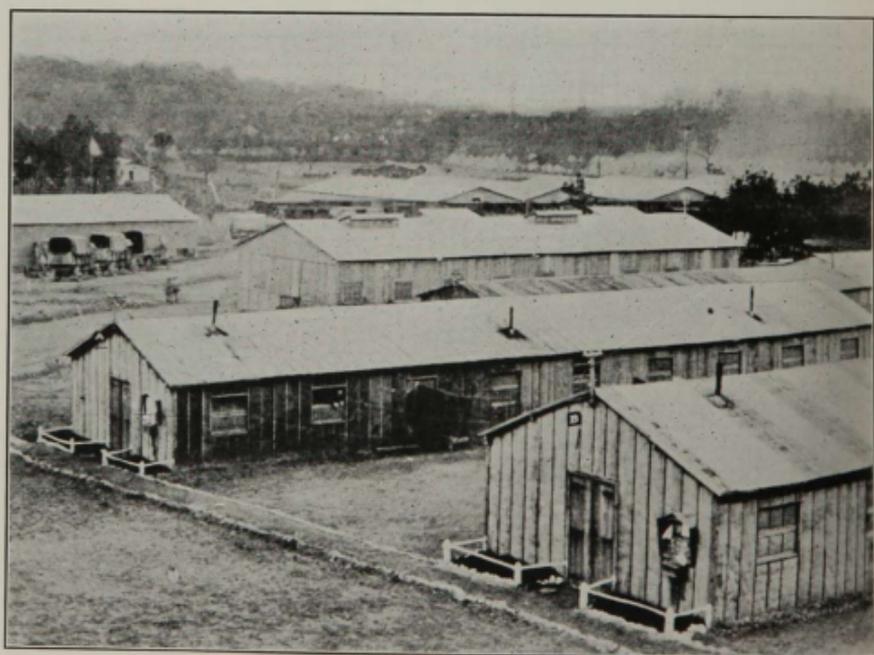


FIG. 7.—Wooden barracks at American Embarkation Center, Le Mans. Note use of oiled linen for glass in windows



FIG. 8.—Wooden barracks at Camp Ancona, Gironde



FIG. 9.—Type of troop shelter employed at Camp Génicourt. Note absence of ridge ventilators in buildings in foreground

With few exceptions, such as in the Byrant barracks where there were side as well as end doors, there were but two doorways in barracks in the American Expeditionary Forces, one at either end.⁸ These doors were double opening outward, the frame measuring about 5 feet by 6½ feet.

Barracks for the American Expeditionary Forces were not provided with wooden floors, nor were they ceiled.⁸ Their roofs generally were covered with rubberoid or similar material, except when galvanized iron was used for the walls, when the same material was used for roofing. As will be mentioned when ventilation is discussed later, roofs of barracks almost generally were without openings in them, as shown in Figure 9.

BILLETS

Billeting, which is the assignment of troops to public or private buildings for quarters, though a common practice in foreign armies, had ceased to be considered a feasible means of providing shelter for our troops long before the World War. In France, however, as has been noted above, it was found that, because of the scarcity of materials and labor, billets would have to be utilized for our troops to the greatest extent possible.⁹ To make billeting practicable the French accorded to the American Expeditionary Forces, in January, 1918, the right to military requisitions, including the right to billeting and quartering of troops, under the French laws, exercisable in the same manner as by the French Army.⁹

The administrative machinery for securing billets for our troops comprised the American requisition service, attached to the Services of Supply and operating under the commanding general, Services of Supply.⁹ A town major, with a staff of assistants, was designated for duty in each village or commune in which our troops were billeted. It was the duty of the town major to procure from local French authorities the amount of billeting space required for the members of the American Expeditionary Forces ordered to the locality. His was the responsibility for the location and maintenance of suitable latrines, baths, water, washing and incinerating facilities, and for the arrangement for the disposal of refuse. Buildings and premises available for troops were to be plainly marked with number and designation as well as with their capacity. In so far as it was practicable, companies were to occupy both sides of a street, and the company officers were to be billeted on the same block as were the men of the company concerned. All town majors of each general or divisional training area occupied by our troops were responsible in their functioning to the town major designated for each such area.

The variety of the character of billets used by the American Expeditionary Forces was limited only by the kind of buildings available in the localities to which the troops were assigned. Generally, however, empty buildings were used for the enlisted men, comprising stables, barns, sheds, and the like. For purposes of concentration and control, as well as the desire to avoid inconveniencing inhabitants, it was only exceptional that enlisted men were billeted with families.

Prior to the organization of our billeting service on January 31, 1918, billets when taken over by our troops were far from being satisfactory from a sanitary

standpoint.¹⁰ The stables and barns which were used to house our troops, for the most part, had not been constructed with the view to permitting the entrance to them of either light or air, though many were quite open; and the state of repair of some made them dangerous for use, instances being reported where fractures and deaths occurred from men falling from lofts because of ancient and frail ladders used to reach them.¹⁰ Since the billets were usually in small, rural towns, practically depopulated of their young men, local standards of sanitation were inevitably far from satisfactory. There was an inadequate disposal of refuse, including the omnipresent pile of manure treasured by the peasantry for fertilizing purposes. Stoves were not available at first for properly heating the billets, and many of the billets could not have been heated adequately because of their incompleteness.¹⁰

With the provision of an administrative machinery of control of our billeting problem, as that promulgated in General Orders No. 18, G. H. Q., A. E. F., January 31, 1918, and the subsequent organization of that administrative control, many of the objectionable features connected with billeting gradually were removed. When the towns were taxed beyond their billeting capacity, additional accommodations for our troops were constructed; in addition, in the divisional areas in the Advance Section, Services of Supply, there were erected mess halls, bathhouses, and other miscellaneous buildings to supplement the existing billets.¹ Under the caption "Sanitary squads," in Chapter I, much has been said of the part the Medical Department played in making billets reasonably suitable for occupancy and in maintaining their environments in a satisfactory state of sanitation. However, there remained the irremediable sanitary defects of the system, among which may be mentioned the inability to attain a complete control of the sanitation of a village because of its dual nature, made inevitable by the presence of a civil host. Here the utmost tact had to be exercised, frequently amounting to overcoming strong prejudices, to effect measures among the civil population that would make less of a divergence of the sanitary practices of the town and our own practices. Also, due to the overlapping of our military organizations, frequently unavoidable because of an irregular or broken distribution of their component groups, sanitary discipline was exercised with difficulty.

The following abstracts made from reports of general medical inspections convey an excellent impression of the manner of billeting a division in the American Expeditionary Forces.¹¹

REPORT OF INSPECTION

18 and 20 September, 1918

83d Division (2d Depot Division).

* * * * *

5. *Housing of men and general sanitary conditions.*—The men are billeted throughout an area extending 30 miles north and south. They are occupying 18 towns, distributed about one battalion to a town. The sanitary inspector reports that the organization officers are paying an increasing amount of attention to sanitary conditions, which are improving notably in the care of latrines and kitchens and in water sterilization.

The headquarters troop is billeted in an old hotel in Le Mans. Men are sleeping on bed sacks on the floor, pending the arrival of double-tier bunks. About 1½ feet between

beds. Supper for this organization consisted of baked pork and beans, pickles, boiled potatoes, apple sauce, cup cake, bread, and coffee. The bucket system is in use here for feces, a seat of the Havard type being in use. Latrines are kept in good condition. The sanitary condition of this billet and its surroundings were usually good.

Ambulance Companies Nos. 329 and 331 and Field Hospital No. 329, remaining of the sanitary train, are in camp, using pyramidal tents with from five to eight men in a tent. Most of the men are using litters to sleep on or improvised bunks. An excellent arrangement has been made for heating water in a galvanized-iron can and a pipe connecting with the field range. A French shower bath has been installed in the open. A good squat latrine is in use. The entire camp is neat and in good condition. There has been very little sickness. The men are very much happier and contented in tents than in billets.

One battalion of the 330th Infantry and the venereal camp are located at Laigne. Fifteen men are billeted in a dirt-floored building in two rooms, with one window and two doors. Men are in double-tier bunks in a continuous line, touching each other, except that there is one single bunk. The men are not sleeping head and foot. The window is closed. Ventilation is poor, and this billet is thoroughly unsatisfactory. Ten men are billeted in a stable with concrete floor with only two small openings $1\frac{1}{2}$ feet long in addition to the door. The men have extemporized bunks within a foot of each other and are not sleeping head and foot. Sixteen men sleep in the loft above, with plenty of room. There is only one window, most of the light coming from the open barn door. Six men are crowded into an adjoining room of the barn. The bunks are side by side in pairs. No light or ventilation except from door and transom and a small opening 1 foot square leading into the adjacent barn. Fourteen men are sleeping in a loft room lighted and ventilated by small attic windows and doors. Beds are almost touching in some cases, others not more than 18 inches apart. The men are crowded and are not sleeping head and foot. Thirty-seven men are sleeping in an attic room of a stable practically only lighted from the attic door, although there are a few holes in the roof. The entrance is by means of a ladder through the one door. Fortunately one end of the loft room is partly opened into another better-lighted attic room. Bed sacks almost touching, and the men are not sleeping head and foot. The place is crowded, poorly ventilated, and dark. At the headquarters company kitchen waste water is put into a pit without grease trap, so that it must be changed frequently. Open pits are in use for latrines, feces being kept covered with earth. Shower baths for the troops here are in process of being installed.

The billets seen here seem overcrowded and the men are not well distributed. They should be thinned out and rearranged, making additional room by putting half of them into shelter tents. A considerable number of influenza cases have occurred here, the infirmary being crowded with them. They are sleeping on Gold Medal cots, alternately head and foot, but the cots are only about 1 foot apart. The danger of this overcrowding was pointed out to the surgeon in charge and he was urged to correct it. The more seriously sick should be sent into the camp hospital, which recommendation was made to the division surgeon. Heretofore there has not, however, been room in camp hospital. It is not considered that the influenza situation at this place has been energetically handled as the surgeon seems to accept too complacently the overcrowding, which could be remedied by putting men into shelter tents. This suggestion was made to the commanding officer and the surgeon, but was received without enthusiasm on their part. The necessity for this measure was urged upon the division surgeon. Later, September 20, this surgeon reported the influenza situation at Laigne to be improving.

The venereal camp is within an inclosed stockade. All the venereals of the division are kept here with the exception of a number of syphilitics at the camp hospital. This is a work camp, and the men are not carried on sick report. Three barrack buildings are provided and there is accommodation for 200 patients. Men are sleeping in double-tier bunks. At present an open latrine is in use, the deposits being covered with dirt. A satisfactory latrine shed has been built and buckets in boxes with covered seats will be used.

One battalion of the 329th Infantry (the worst infected organization) is stationed at Yvre-le-Polin. Very few cases of influenza had occurred in this battalion until the arrival of a replacement draft from Brest. In each company a billet has been set aside as an

"influenza ward" where light cases are treated. The more severe cases are sent to the hospital. The number of cases here has dropped in the last four days from 156 to 16.

Two companies are in outlying farmhouses, one company being scattered over an area of 2 square miles. The billets are in typical barns, sheds, lofts, some rooms in houses, etc. Company B is supposed to have billets for 300 men, but only has reasonable accommodations for 263. The number of troops occupying the billets varies according to the number of replacements sent in from time to time. At present it is much reduced. This company is billeted over a wide area, making the work of the men very difficult. The men must make their packs and assemble very early in the morning. They come equipped for the entire day when they assemble at headquarters for reveille. A central kitchen is maintained for this organization. The men are being provided with three blankets each. Bedding is generally put out in the air and sunlight. Open trenches are used for latrines, feces being kept covered with dirt. Seven men are billeted in an old farmhouse kitchen, with low ceiling, two doors, and one window. They are using straw mattresses on a tiled floor. The men are not overcrowded. Seven men are in a loft reached by a ladder. It has no windows; light from the doorlike opening and a small hole at the other end. Men are sleeping head and foot and are not excessively crowded. Another billet similar to this is occupied by 11 men. A billet for 15 men in a wagon shed is occupied by only 8 men at present. It has no windows; only light from the door. There is abundant ventilation through cracks in the wall and roof. Another billet in a wagon shed is without windows, but has doors on opposite ends. A wagon shed 18 by 27, intended for 15 men, is occupied by 14 at present. Not excessively crowded. Bed sacks are on the ground. It has no windows, but large double doors for wagons. Ventilation by means of doorway and cracks in the walls. Eighteen men are in a shed of a neighboring farmhouse. Bed sacks are close together. Men are sleeping alternately head and foot. The latter two billets have manure piles immediately adjoining. Eight men are billeted in a dark wooden shed at a farmhouse which they share with the winter woodpile. It has no windows; light from the open door. Abundant ventilation by means of cracks in the walls. The men are not overcrowded at present.

Company D's kitchen is in a wagon shed, using field ranges. The inside has been white-washed. Screened cupboards are in use for bread and food. Dinner consisted of vegetable soup, corned beef hash, stewed tomatoes, and bread. The latrine for this company is an open pit with box seats at the back. Contents not covered with dirt. There is a seepage pit for waste water. Eighteen men are billeted in the attic of a house, occupying three poorly lighted and ventilated rooms; one window in one room, small windows, about 18 inches square, in the others. Nineteen men are lying on the dirt floor of an outbuilding, with damp walls. Three small openings as windows in addition to the door. Bed sacks are touching. This is a poor billet. Eleven men are in the loft over this, reached by a ladder. Besides the door there is only one opening about 18 inches square. A billet for 30 men in a loft over a granary is occupied by 21 men. It is dark, having only one window opening. Fortunately there are some cracks about the eaves, though the general ventilation is poor.

The other two companies of this battalion are billeted in and around town. Thirty-two men are in a wagon shed lying on the ground. It is not overcrowded, there being about 30 square feet per man. It has no windows; light only from the door.

REPORT OF INSPECTION 4-5 September, 1917

79th Division.

* * * * *

Arrived 10th Training Area July 27. Headquarters at Prauthoy. The division occupies 38 towns. Most of the regiments are divided among 7 towns. There is no full regiment in any one town. Champlitte has the largest number, with a regiment less two companies. One town occupied is 27 miles from headquarters.

* * * * *

5. *Housing of men and general sanitary conditions in detail.*—The men are billeted throughout the area, usually occupying barns and lofts. These billets are in poor sanitary condition, as a rule being poorly lighted and ventilated.

Three companies of the 304th Engineers are stationed at Coublanc. Influenza has been prevalent in this organization. A number of cases have been severe. There were two cases with typical meningitis symptoms, passing away in 24 hours, leaving the men very weak. In four cases it was complicated by bronchial pneumonia with two deaths resulting. Most of the cases have occurred in Company D, which has 53. In Company B there have been two cases. It is now appearing in Company A. It has been spreading like wildfire. Two ward tents of a field hospital are operating, one for contacts and one for convalescent patients. The men are lying alternately head and foot. They are fed from the company kitchen. Squat latrines of the Lucas-Patterson type are being constructed for this infirmary. The men are made to dip their hands in cresol solution after using the latrine. All men with temperatures of 101 and over are sent to the hospital.

The men are being moved into shelter tents with spring cots and bed sacks. Company D is utilizing a barrack as dining room, with the kitchen in the open. Orders have been issued for the men to dip their mess kits in boiling water over a fire; however, this is not being done in this organization. The necessity for this was reiterated to the commanding officer and the surgeon. Garbage and waste water are put into a pit and covered over. Straddle pits with covers are used for feces. The latrines are sprayed with cresol solution, and a can of the solution is placed at the entrance in which the men rinse their hands.

The billet in which the influenza started was the ground story of an old house. Sixteen men were originally crowded into poorly ventilated rooms. One of the rooms had only one window. Eight men slept in single bunks. In the other room eight men were in two-tier double bunks. The ventilation of the whole place was poor.

Opposite this, 52 men were quartered in a one-story and attic building with an adjoining stable. The men are now out in shelter tents.

Twenty-seven men were billeted in a stable and loft, open only at one end by means of the door. Beds to accommodate four men in a row in two tiers were used for some of them. The rooms were low, dark, and crowded.

Nine men were billeted in the attic of an old French building, with only one attic window, the place dark and poorly ventilated. Beds were about 1 foot apart.

In one of the best billets 21 men were quartered in a loft with single bunks. Three windows in the loft with good ventilation and not overcrowded.

Companies I and K of the 314th Infantry are stationed at Genevrières. There have been 88 cases of influenza in this organization, but no dysentery. A large Y. M. C. A. tent has been pitched for the reception of patients. Patients with temperatures of 101 are sent to the camp hospital at Prauthoy. The surgeon is making daily inspections of the two companies.

The men have been removed from the billets and put into shelter tents, using wire-bottom bunks and straw mattresses. Latrine ditches are open to the flies. The commanding officer was seen and requested to make them fly proof.

Sixteen men of Company K were billeted in a loft 36 by 18 feet, over a dirty cow stable. It has one small window. Beds about 1½ feet apart.

The regimental surgeon has six towns to inspect, extreme towns being 16 miles apart. He is without motor transportation.

The 313th Infantry, less two companies, is billeted in Champlitte. Three thousand two hundred men are billeted in this town. On the day of inspection there were 20 men on sick report, 17 in quarters and 3 in hospital. Eighty-nine men appeared on sick call, the prevailing trouble being diarrhea and colds. There were 13 cases of diarrhea and 31 the day previous. The surgeon attributes the diarrhea to the eating of unripe grapes. Three cases of influenza had been diagnosed in the morning. There has been but one new venereal case since the regiment arrived in France. Seven cases are under treatment in this entire regiment.

Sixty men of the machine gun company are quartered in a portion of a monastery, a dilapidated old building with many small rooms. Beds in some cases within less than a foot of each other. There is a pit latrine in the rear of the building, not fly proof. This company is using the rolling kitchen, as the field ranges have been turned in. Dinner consisted of boiled beef and gravy, potatoes, bread, butter, and coffee. Near one of the mess halls the men have been throwing garbage down the slope of a hill.

Twenty-four men are billeted in a stable and two-story loft building. The lower floor is without windows, and there is but one small window on the second story. Ventilation is poor. Bunks not overcrowded except on the first floor. The sergeant in charge says the men are very comfortable.

Eight men are crowded into a dark attic room, with one window partly below the floor. Ventilation is very poor.

The 311th Machine Gun Battalion is billeted in Ocecy. There have been about 100 cases of dysentery, with 3 deaths, in this organization. On the day of inspection there were 23 cases. One of the captains is now in hospital convalescent from dysentery. A number of civilians have had the disease and three children have died. The surgeon states that the number of cases of dysentery occurring have diminished.

The water in this town has been under suspicion as the cause of the dysentery. It is being boiled and chlorinated. The supply is insufficient. The men are marched once a week to a canal to bathe.

Rolling kitchens are in use. Waste water from kitchens is poured into seepage pits. Effort is made to cover the food and serve it hot. The use of milk and raw vegetables is forbidden. Dishes are rinsed in water over a fire, so that it is boiling hot. The wine shops have been placed out of bounds to prevent the men from drinking unsterilized water and wine. Manure piles are sprinkled with cresol. A bucket of cresol solution is placed at the latrines. The men dip their hands in this before leaving.

Forty-three men are billeted in a barn and loft with concrete floor. The bed sacks are nearly touching. Another billet in a barn is without a window, and the only ventilation is by means of the door. Twenty-six men are billeted in another barn, one of the rooms of which is unlighted and unventilated except by a door partly below the surface of the ground. Most of the men are sleeping on boards placed on concrete floors. The general police on the billets in this town seems considerably above the average.

The commanding officer is anxious to move to another town, and this has been recommended by the division surgeon.

AMERICAN EXPEDITIONARY FORCES, REPORT OF INSPECTION

6-7 September, 1918

1. 36th Division.

* * * The bulk of the division arrived in this training area from August 4 to August 12. Headquarters are at Bar-sur-Aube. The division is scattered among 41 towns, and the area extends 25 miles north and south and 14 miles east and west. The headquarters troops, military police, and the sanitary train are located in Bar-sur-Aube. In no other town is there more than a battalion.

* * * * *

5. *Housing of men and general sanitary conditions.*—Two companies of the 131st Machine Gun Battalion are stationed at Fontaine. The health rate here is good. There has been no influenza or dysentery, and no new cases of venereal disease, only two prophylactics having been given since arrival here.

Nearly 200 men are billeted on three floors of an old mill. This is a crude old building, but has lots of light, air, and room. Beds are arranged alternately head and foot. Seven men are quartered on the ground floor of an old house. Beds are nearly touching in some cases.

The two companies are using one kitchen equipped with field ranges. Water for final rinsing of mess kits is not kept over a fire. This method was suggested to the commanding officer, with the approval of the division surgeon. Garbage is removed by French civilians. Waste water from kitchen is dumped into a dump pit 50 yards behind the kitchen. There is a dump pile near by on which coffee grounds have been thrown.

Latrines were built by the engineers for the can system with the squatting arrangement. No cans could be obtained, so that the latrines are placed over pits and are not flyproof. Feces in these pits are covered three times a day.

Two companies of the 141st Infantry are stationed at Fontette. Fifty-eight cases of influenza have occurred and 11 cases of pneumonia, with 3 or 4 deaths. It appears that the pneumonia has been a complication of the influenza. The number of cases of influenza is diminishing.

The surgeon is inspecting the men twice daily. Some of the worst billets have been discontinued. Others have been rearranged and the crowded ones thinned out, due to the departure of a certain number of troops of the division. An Adrian barrack is used for the treatment of convalescent and mild cases, the men being given a large amount of floor space and the place well ventilated. The doors have been removed from the barrack. An adjacent barrack is used as quarters, in which the men are sleeping on straw mattresses without any bunks. The doors have also been removed from this barrack.

Twelve men are billeted in a barn, the only light for which is from the door. The men in the loft are fairly well located. Six are on the ground floor, with bunks practically touching. These are for the cooking force of the kitchen, which is in a shelter tent adjoining using field ranges. Mess kits are washed in water not kept over a fire. An old barnlike dwelling is used as a billet. The men in the loft have abundant space, air, and light.

A deep open pit some distance from the billets is in use for the reception of feces. It is too wide for a straddle trench and has no facility for seats. The edge of the trench is soiled with fecal matter. Orders require that the feces be covered with dirt, but this is not thoroughly done. It has not been practicable to obtain sufficient lumber to cover it.

Three companies and headquarters company of the 141st Infantry are stationed at Verpillieres. About 75 cases of influenza have occurred here and 26 cases of pneumonia, with 16 deaths. It is considered that the number of cases of influenza is diminishing, as there has not been a new case in three days. A château formerly used as a billet is in use as an infirmary for influenza cases, as there was not sufficient transportation to take them to the camp hospital. The mild cases are treated here. If any symptoms of pneumonia develop they are transferred. A great many cases of pneumonia and influenza occurred in this château, where 192 men were billeted. About 40 men had been quartered in the attic, which has only small windows and is dark. Noncommissioned officers are utilizing the ground floor of the château, using double-tier bunks. They have abundant space and ventilation.

A spot map accompanying the division surgeon's report shows the group infection in several billets. There has been a general thinning out of men in billets. Those that have showed the largest number of cases of influenza have been emptied, some of the men being put in shelter tents and others in Adrian barracks. Shelter tents are occupied by one man. In the Adrian barracks the men are using bed sacks; only one tier of beds. Many unsatisfactory billets have been abandoned. The surgeon on duty reports that only two companies can be comfortably billeted here, and the division surgeon will make arrangements to move the third company. Many men had been sleeping without bed sacks. Field ranges used either in the open or under canvas. Men eat in the open. The division surgeon will issue a general memorandum to have rinsing water for mess kits kept on the stoves.

An old two-story and attic dwelling, in which 40 men were billeted, is now occupied by 30 men provided with bed sacks. They have plenty of room and are comfortable. There are a number of windows in the attic. A kitchen is maintained in an adjacent yard, using field ranges. Desiccated turnips were noted being cooked. The cook says the men like them. Dinner consisted of bacon, mashed potatoes, sirup, and bread. For supper, roast beef and gravy, turnips, stewed prunes, and coffee.

A latrine pit has been dug some distance from the château. This is practically an open trench. The fecal deposits were insufficiently covered with dirt and in very bad condition.

Company L of the 142d Infantry is stationed at Montmartin. Three days ago there was no sickness in the morning. By night 30 cases of influenza had occurred. On the afternoon of the incidence of these cases the division surgeons sent Major Wilson immediately to assist with the work. Lieutenant Wright, the surgeon, had already greatly improved conditions. A three-story building that had been used as a billet for 32 men was evacuated and the men put in shelter tents. This building is now used as a camp infirmary. It has 56 patients with influenza. The influenza at this place has been different from that at Verpillieres. The onset is the same, the fever is as high, general weakness much less marked, as is also the cough and expectoration. There has been no pneumonia here.

Major Wilson has made a spot map showing the group incidence. Many of the billets are entirely free. All men in this company have been moved into shelter tents and the billets cleaned. The surgeon is making several inspections of the men a day to pick out the sick.

Twenty-two men were billeted in a two-story building, with plenty of space and ventilation. Twelve of its occupants are in the infirmary with influenza, the remainder have been put in shelter tents.

The nearest bathing place is 8 miles away. Heretofore the men have been marched there. An improvised shower bath with perforated tin cans has been arranged. Water must now be hauled twice weekly for bathing.

A latrine pit has been dug, with an improvised box of the Havard type. No lumber is available for seat covers, and the surgeon issuing instead pieces of burlap as covers. A tin-lined urinal drain leads into the pit. Considerable ingenuity has been shown in improvising this latrine.

Two companies of the 142d Infantry are located at Nuisement. Influenza has not been epidemic in this town. The billets have been thinned out and 100 men were put in shelter tents.

Twenty-five men are quartered in an old barn, some sleeping on bed sacks on the floor, others on wire bottom bunks with mattresses. They have lots of room with light and ventilation from doors and window. Ten men formerly in this billet have been put in shelter tents.

Eight noncommissioned officers are billeted in an old stable that has opposite windows and a large door. They are fairly comfortable.

Thirty-eight men are billeted in a barn and loft, utilizing bed sacks on a dirt floor and also wire-bottom bunks. There is an abundance of room and the place is well policed. It has a few attic windows and large doors. Eight men were removed to make more room.

Twenty-nine are quartered in the loft of a stable. Entrance is by means of an improvised stairway through a window. There are small holes for windows at each end of the long room. There are no blinds on the windows which could be closed, so that the ventilation is good. This billet was originally intended for 60 men, but it has recently been thinned out from 54. The bed sacks are now from 2 to 3 feet apart.

In the attic of an old building with opposite windows 60 men had been crowded. Twenty-four men now occupy it and have abundant space. There are 26 on the floor below, which is well ventilated and lighted. Fifty men are now in the building; there were formerly 90.

Kitchens are in the open, using field ranges. Supper at one of the kitchens consisted of corned beef hash, desiccated carrots, stewed tomatoes, and bread.

Pit latrines are dug and dirt frequently used to cover feces. The latrine for Company M is a few yards from an open kitchen. It was built for the can system, with a squatting platform. The cans have not been furnished and a pit receives the feces. The commanding officer will move it farther away.

The machine gun company of the 142d Infantry is stationed at Val Perdu.

The billets in this town are small rooms, the men usually occupying bunks with straw ticks. Most of the bunks are within a foot of each other. The buildings are old and dilapidated, the rooms small, and poorly lighted. Attics are occupied, which are usually dark and unventilated.

Eight men in single bunks are in two small first-floor rooms of an old house. The men are placed alternately head and foot, but are rather crowded, bunks being about 1 foot apart. There is one window in each room.

Nine men are crowded into a small room with only one window. Bunks are very close together. The men are arranged alternately head and foot.

Thirteen men occupy a low ceiling room with two doors and two windows. The bunks are very close together and there is considerable crowding.

Fourteen men are in an attic with one small window; otherwise unlighted except through cracks. Bunks from 1 to 2 feet apart.

Latrine is a deep pit on a hillside some distance from the billets and kitchens. The pit is entirely open, with a rail seat on crotches. The deposits are occasionally covered with earth.

In Bar-sur-Aube 27 men of the camp infirmary and the 143d Ambulance Company are billeted in the loft of a barn up two flights of stairs. It has only one window and two small holes in the roof and is dark. Fortunately there are numerous cracks in the eaves to admit fresh air. The bed sacks are practically touching.

Twenty-nine of the 143d Ambulance Company are quartered in the loft of a barn up two flights of stairs. Twenty-four are in one long room, with only one window at the front end of the barn. Bed sacks practically touch in many cases.

Fifty-two men of Ambulance Company No. 141 are in a loft with three windows. Bed sacks are practically touching.

Forty-three men of Field Hospital No. 142 are in an attic up several flights of narrow steps. There are only two windows in the place and it is poorly lighted and ventilated. Men are provided with cots that are fairly well spaced.

The messes of the sanitary train are consolidated in a group of barrack buildings using field ranges. Excellent desiccated onions were observed at one of the messes. It is reported that the desiccated vegetables are excellent.

* * * * *

REPORT OF INSPECTION

25, 26, 27, April, 1918

Second Division.

* * * * *

Housing of men.—The men are in dugouts in the trenches. In the rest areas they are distributed in billets, there being but few scattered barracks. These are located in stables, lofts, in rooms of deserted houses, etc., in many cases more or less open to the weather and dirty. The beds are generally very close together. They are, of course, unheated and unlighted, and shelter from the elements with a roof and floor is practically all that is assured. Many of the billets are infested with lice and there are numerous rats.

FLOOR SPACE IN TROOP SHELTER

In October, 1917, when much of the shelter which ultimately would be used by our troops was to be provided, it was determined by General Headquarters, A. E. F., that, in conformity with the necessity for the strictest observance of economy in the use of material and labor, the amount of floor space to be allotted to members of the American Expeditionary Forces was taken as a basis for providing the needed shelter.⁶ The instructions on this question which were promulgated at that time gave the following allowances of floor space, to govern officers charged with constructing shelter for our troops: (a) Enlisted men: Bunks, arranged as on shipboard, 2 feet 8 inches wide by 6 feet 6 inches long, double tier, in sets of four, 2 feet 8 inches apart, giving 1 linear foot (20 square feet) of Adrian barracks, and 1 additional linear foot for each 3 men of the organization as dining room. (b) Nurses: Double tier of bunks, the same in size as for enlisted men and similarly arranged, but 7 feet apart, giving approximately 1.5 linear feet of Adrian barracks per nurse.^a Kitchen space allowance was to be the same as for enlisted men; that for the dining room, 2 linear feet of barracks for each three nurses. (c) Officers: One room, 10 by 14 feet, for each 2 lieutenants or captains; one similar room for each major or lieutenant colonel; two such rooms for each colonel. The kitchen space allowance was to be the same as for enlisted men; whereas the dining room allowance was to be the same as for nurses.

Because of the promulgation of these instructions concerning floor space, the impression was prevalent in the American Expeditionary Forces, not only among officers of the line but officers in the Medical Department as well, that the provision of 20 square feet of floor space per capita in billets and in bar-

^a On April 18, 1918, these instructions were so amended by G. O. No. 58, G. H. Q., A. E. F., as to allow the following accommodations for nurses: One room 10 feet by 14 feet for each 2 nurses.

racks was adequate for living purposes. This impression stood in the way of improvement in the housing of troops in many places where 40 square feet per capita, the lowest safe allowance, was obtainable with but little difficulty. That not more than 20 square feet of floor space in barracks or billets or both per capita could be provided in many areas in the American Expeditionary Forces was obvious. It was remarkable, however, that as soon as some sanitary emergency arose, such as an epidemic of diphtheria, meningitis, pneumonia, or influenza, a certain temporary and added respect was given to the protests of medical officers at the insufficient floor space, and an ample increase was usually provided by tentage, extra billets and accommodations in all sorts of buildings.¹² After months of effort in the office of the chief surgeon, A. E. F., and the presentation of conclusive reports to General Headquarters, A. E. F., as to the relationship between crowding and preventable disease, a concession in the way of Bulletin No. 94, General Headquarters, A. E. F., November 21, 1918, permitting the provision of 40 square feet where possible and admitting the insufficiency of 20 square feet as a sanitary ideal, was granted, but even to the very last months of the American Expeditionary Forces, the influence of General Orders No. 46, Headquarters, A. E. F., October 10, 1917, so far prevailed that it was no uncommon thing for medical officers to include, under paragraph 1 of their monthly sanitary reports, such a statement as follows: "No overcrowding, 20 square feet per capita provided as authorized by G. O. 46," or "Ample space in barracks, 20 square feet of floor space provided per capita." Among the sanitary reports for April, 1919, a command of 5,393 men at Neufchateau, Vosges, was reported to have less than 19 square feet per capita in billets in the town.¹²

Accepting all the limitations imposed by insufficient housing as unavoidable, it is considered to have been unfortunate, if only from an educational standpoint, to publish as authorized, and apparently to accept officially as adequate, an allowance of space per man in buildings less by half than had been found safe for living purposes for the troops in the United States and in the armies of our British and French allies, and only one-third of the minimum approved in our barracks in peace time.¹² Relationship between crowding and disease, especially the respiratory infections, and the favorable results of "thinning out" upon the development of secondary cases of all this class of diseases, are too well known to call for specific instances here. The special reports of investigations of epidemics by medical officers from the central medical laboratory, A. E. F., are full of cases in point.¹² In general, wherever 40 square feet of floor space per capita were provided, there were found a low sick rate and a good standard of living conditions. Although much could be done and was accomplished in diminishing the hazards of overcrowding by open window ventilation, by separation of the heads of sleepers by partitions of various kinds between bunks, and by alternate head-to-foot arrangement of adjacent sleepers it was accepted generally that air space above 10 feet from the floor and cross-window ventilation and other resources were of less importance than the provision of more floor space per man indoors.¹²

Instances occurred in which, through military necessity, or for other reasons, men were so crowded into sleeping quarters as to reduce the air space

per man to the neighborhood of 100 cubic feet. Such an instance was that which existed for a time at Camp Pontanezen, Brest, the report of which follows:¹³

OFFICE BASE SURGEON,

August 11, 1918.

Report of board of officers on general sanitary conditions of camps and barracks in vicinity of headquarters of Base Section No. 5, France, under memorandum, office of the base surgeon, Base Section No. 5, August 5, 1918.

The following posts were visited: Casemate Fautras, Port de Commerce, Portuguese Barracks, Fort du Portzie, Penfeld prison camp, quartermaster bakery, sorting yard, Pontanezen Barracks and camp.

The sick records of these posts were carefully examined from the time of their establishment, and the following conclusions arrived at:

(1) There has at no time since November, 1917, been at any one of these places any case of disease that can in any way have been transmitted by either drinking water or food. (2) There has been a very large amount of disease, the distribution of which has been by close contact of individuals—in other words by simple overcrowding. (3) This overcrowding has of course been not only in the barracks and camps, but necessarily so on the transports on the way over.

There are two general conditions affecting, either actually or potentially, the health of the troops residing permanently or transiently in the above camps and posts.

The first condition is that of overcrowding. The vast majority of cases of disease have been mumps, measles, tonsillitis, diphtheria, bronchitis, pneumonia, scarlatina, and pleurisy; all of these are to a certain extent preventable by the avoidance of overcrowding. In the Pontanezen Adrian barracks provision is now made for about 300 men per building. This gives about 8 square feet of floor space and 110 cubic feet of air space per man. Bunks are in four tiers and in pairs, so that men are in almost bodily contact, with the inevitable result that disease transmission from case to case becomes not a matter of possibility or probability, but a matter of actual certainty. It can be predicted that if these conditions be allowed to continue increase of the above disease will continue; and that with the added condition of "huddling" in barracks due to the cold and rain of the approaching autumn and winter, will become worse. In other barracks the conditions are slightly better, but not much. The tendency to minimize the effect of this overcrowding, on the ground that in Pontanezen it is but temporary, must be resisted. It should be remembered that men arriving here from overseas have been subjected to continuous overcrowding for at least 10 days, and that they will probably not have any too good sanitary surroundings no matter where they go when they leave here, so that the overcrowding is actually continuous—its location simply changing from time to time.

The remedy for this situation is perfectly obvious, and is of course simply a matter of material and labor. It is the opinion of this board that immediate steps should be taken to insure for each man in tents or in barracks at least 40 square feet of floor space and 400 cubic feet of air space. That men be placed in not more than double-tier bunks, the lowest at least 30 inches from the ground, the higher as high as possible. That no bunk be in actual contact with other bunks. This in order to attain the essential end of the maximum amount of separation of each individual from his neighbors. It would be very much better if 60 square feet and 600 cubic feet could be provided, but the board is of the opinion and urgently recommends that the minimum of 40 and 400 be allowed as an absolutely irreducible minimum. In a building 120 feet by 20 feet, the approximate dimensions of an Adrian barrack, this would allow 60 men, and in a hospital or a pyramidal tent would allow not over 4 men.

In addition to the above requirement, regarded by the board as essential, the following measures will serve to improve the situation as it now exists: (1) Each wooden barrack should have ridge ventilation provided. (2) The glass windows should be removed and replaced by single layers of cheesecloth gauze tacked in place. (3) There should be a small heating stove installed for every 40 linear feet of barrack room. These means will insure against drafts, and will provide for an active and constant renewal of air, with the resulting

removal of a certain amount of air from infectious material. (4) Each large tent should be provided with a Sibley stove for the same reason. (5) Every opportunity should be taken to sun the interior of large tents. By reason of the very restricted amount of sunshine in this region, no special day of the week should be set for this purpose, but every hour of sunshine should find the tents furled. (6) Permanent stone barracks should have cheese-cloth gauze windows and stoves. (7) Shelter tents should be struck during all hours of sunshine and exposed to the sun, inner side upward. (8) Advantage should be taken of all hours of sunshine to sun blankets, clothing, and bed sacks. On the recent inspection, while the sun shone brightly tents were in most cases unfurled and were occupied by men.

It is believed that men are much safer in shelter tents if they are properly ditched than in the present Adrian barracks under their present overcrowded condition.

* * * * *

VENTILATION

Because of the necessity to practice the most rigid economy in the American Expeditionary Forces, both as to the construction of shelters and the use of fuel with which to heat them, it was impracticable to devise any scheme which automatically would bring about a satisfactory conditioning of the air within barracks and billets; that is to say, striking a happy medium between, on the one hand, bringing the outdoor conditions indoors, and, on the other, maintaining the air within at a proper temperature and degree of humidity and in a state of freedom from impurities. For the well troops the latter condition, which is the ideal for indoor life, was for the most part not imperative in the American Expeditionary Forces, since these forces were engaged in activities which kept them outdoors; also, the hours within doors were spent by the majority of our troops in sleep when added body covering helped retain their body heat. There remained then only the question of supplying the fresh air. This was accomplished by the simplest form of ventilation: Adequately opening the windows and doors of the barracks and billets. It was necessary to rely upon this means since the majority of barracks constructed were unprovided with ridge ventilators;¹ especially was this true of the demountable barracks. (See fig. 9.) When barracks were constructed in place, however, they were provided, though not unexceptionally, with ridge ventilators.¹ (See fig. 8.)

Where ridge ventilation was provided for barracks, no uniform plan seems to have been universally adopted. The most common practice was to construct ridge vents, from 4 to 6 feet in length, varying in number from 2 to 4 for each barrack¹ (fig. 10), though at Camp Pontanezen, Brest, there were barracks with full ridge ventilation¹⁴ (fig. 11). These vents had simple louvres, in many instances failing to keep out rain.¹⁵

It was found that securing a supply of fresh air to sleeping quarters could not be left to the initiative of the troops occupying them; nor could the troops in general be relied upon not to close windows during the night, which had been opened at, or before bedtime, for purposes of ventilation. To circumvent the practice among troops of closing barrack windows and the openings of tents, orders were issued by various headquarters requiring the inspection of sleeping quarters by a commissioned officer after taps each night.¹⁵

HEATING

In September, 1917, authorization was made by General Headquarters, A. E. F., for heating, wherever practicable, recreation buildings, dining rooms, barracks, and trenches.¹⁶ Since it was problematical at that time that an adequate number of stoves would be supplied from the United States, and that no one class of fuel could be obtained with any degree of certainty, it was essential that the heating stoves supplied should be suitable for burning coal coke, or wood, as the case might be. For use in buildings, it was prescribed that stoves would be supplied at the rate of 1 for every 600 square feet of floor space;^b in trench sectors, 1 for every 16 men; and in the trenches, when practicable, 25 braziers limited to open air use, for each battalion of troops.¹⁶



FIG. 10.—Wooden barracks at Camp No. 4, near Bordeaux

Since the liberal standards of heating barracks in the camps of the United States could not be practiced in the American Expeditionary Forces, it was necessary that every member of our overseas force adapt himself to the rigorous conditions existing in France during the war. Fuel wood could be obtained only by our own labor and from the limited and carefully preserved forests of France, which were to be depleted as little as possible. The total amount of sea tonnage available was limited; this in turn limited the sea tonnage which could be devoted to coal for our forces to the minimum necessities.¹⁷

^b This allowance was changed on Oct. 10, 1917, to one stove for each linear foot of Adrian barracks, or one stove to each room. (G. O. No. 46—H. A. E. F.)

As a working basis, the fuel allowance for heating and for cooking in France was reduced and limited to the French allowance for their Army.¹⁷ Under the French regulations each French soldier was entitled in winter to 4 pounds 2 ounces of wood or 2 pounds 6½ ounces of coal per day if billeted; and 4 pounds 6½ ounces of wood or 2 pounds 11½ ounces of coal per day in the open (bivouac).

The European has accustomed himself to an indoor temperature that, to the American, causes discomfort, and it soon proved that the above fuel allowance prescribed for our troops was inadequate, especially in the temporarily

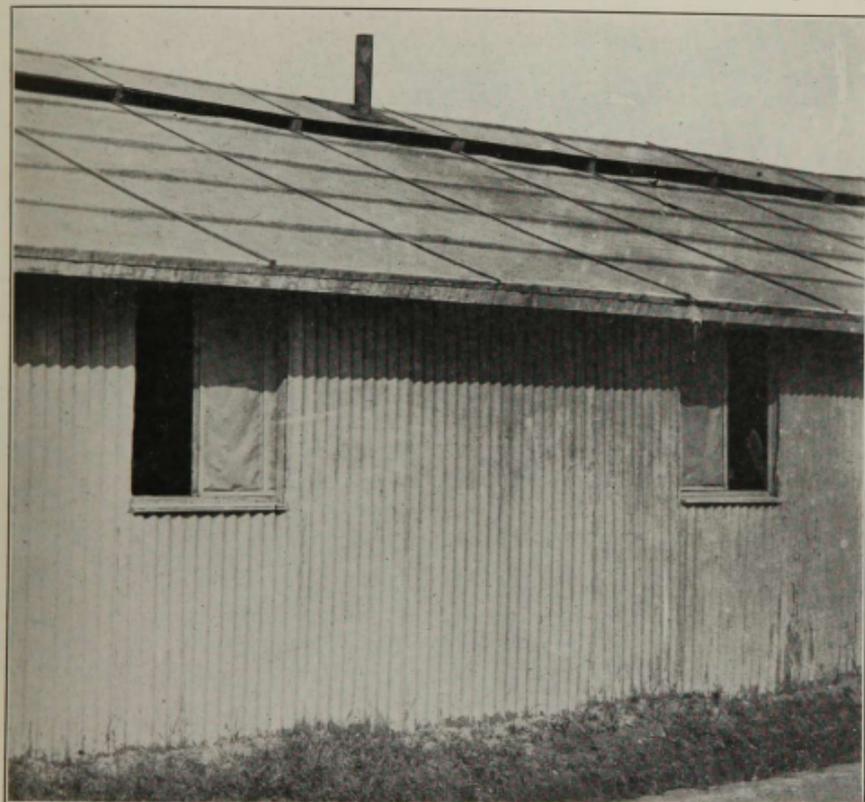


FIG. 11.—Ventilated roof, as provided in barrack buildings at Camp Pontanezen, Brest

constructed barracks, which were difficult to heat. Consequently, in January, 1918, for the months of January, February, and March, 1918, the fuel allowance was increased 50 per cent.¹⁸

On February 5, 1918, the following winter allowances were promulgated:¹⁹ For troops in winter, in billets or barracks: Coal, 2 pounds 8 ounces per man per day; or wood, 4 pounds 2 ounces per man per day. For troops in winter, in the open (bivouac): Coal, 2 pounds 11.5 ounces per day; or wood, 4 pounds 6.5 ounces per man per day. These allowances were increased 50 per cent during the months of January, February, and March.

Offices and officers' quarters.—Each office and each room occupied by an officer as quarters was entitled to one stove for each 600 square feet of floor space, and the allowance of fuel for each stove was 55 pounds of coal per stove per day, or an equivalent of wood.

Adrian barracks.—One stove was allowed for each 33 linear feet of Adrian barracks, or one stove for each room.

Centrally heated offices.—The allowance of fuel for centrally heated buildings used by the American Expeditionary Forces, other than hospitals, was to be based upon the amount of fuel used by the proprietors of the buildings during their occupancy in the year previous to the utilization of the buildings by the American Expeditionary Forces. In the case of new buildings not previously occupied, the fuel allowance for such buildings was to be fixed by the Manual for the Quartermaster Corps, United States Army.

Cooking allowances.—The allowance for each indoor kitchen mess range was fixed at 100 pounds of coal a day, or its equivalent in wood.

Hospitals.—The fuel allowance for hospitals was based on estimates made by commanding officers of hospitals, who were governed in their estimates by the Manual for the Quartermaster Corps.

The above allowances obtained until July 16, 1918, when further changes were made; in some instances increases, in others decreases, were made.²⁰ Because wood was more readily obtainable than coal or coke, wood was to be used wherever practicable in preference to coal or coke.

The following changed allowances of coal and wood were authorized:

For troops not in trenches: (a) Summer period (April 1 to October 1): Coal, $1\frac{1}{2}$ pounds per man per day; or wood, 3 pounds per man per day. (b) Winter period (October 1 to April 1): Coal, $1\frac{1}{2}$ pounds per man per day; and wood, $2\frac{1}{2}$ pounds per man per day.

For troops in trenches: (a) Summer period (April 1 to October 1): Coke, 2 pounds per man per day; and charcoal, $\frac{1}{2}$ pound per man per day. (d) Winter period (October 1 to April 1): Coke, 3 pounds per man per day; and charcoal, 1 pound per man per day.

The allowances prescribed on July 16, 1918, were to be regarded as the total allowances for cooking (including indoor kitchen mess ranges and field ranges), warming buildings occupied as billets, and washing, with certain exceptions to be mentioned later.

Coke and charcoal were not to be issued as a part of the daily fuel allowance to troops, except when serving in the trenches or under conditions which would not admit the use of wood, or, in the event of wood not being obtainable, coal.

Consolidated alcohol.—This material was contained in 8-ounce cans, fitted with friction tops. It was to be issued for use only by our troops in the trenches and where the increased ration was authorized, and only upon orders by a unit commander, when, in his opinion, its use was considered to be necessary.

Offices and officers' quarters.—The previous allowance of 1 stove for each 600 square feet of floor space of each office and each room occupied by an officer as quarters was not changed, but the allowance of fuel for each stove was reduced from 55 pounds of coal per day to 30 pounds, or its equivalent in wood.

Rolling kitchens.—The allowance of fuel for rolling kitchens was fixed at 140 pounds of wood per day, or one-half of that amount of coal.

Bakeries.—Bakeries were given an allowance of 21 pounds of coke (or 84 pounds of wood) for each 100 pounds of bread baked.

Disinfectors.—Disinfectors of the largest size, having a sterilizing capacity of 450 pounds of material an hour, were allowed 25 pounds of coal per hour.

Shower baths.—For heating water for shower baths, 2 cords of wood (2 tons of coal) were authorized per month per 1 standard boiler, 30-gallon capacity and with 12 shower heads, operating on the basis of an eight-hour day.

Portable Thresh disinfectors.—For each portable Thresh disinfecter, operating on an eight-hour day basis, 2½ cords of wood (2½ tons of coal) were allowed per month.

Portable laundries.—The French portable laundries operated by us were allowed, for each eight-hour day, 9 cords of wood (9 tons of coal) per month.

Laundries and baths.—Where central baths and laundries were established, 5 tons of coal per week per division of troops were allowed.

STOVES

No definite type of stove for heating barracks and billets in the American Expeditionary Forces was provided.²¹ Some stoves were shipped from the United States,²² especially the Sibley stove for heating tents;²³ however, many heating stoves were purchased abroad.²⁴ For heating rooms of various sizes stoves were distributed in large, medium, and small sizes.²⁵

The following communications show methods adopted in the American Expeditionary Forces for obtaining stoves abroad, also the character and sizes of these stoves:

10 RUE STE. ANNE, PARIS, August 30, 1917.

From: Chief Quartermaster, A. E. F.

To: Quartermaster, United States troops (through Director General Wm. Lassiter, U. S. Embassy, London).

Subject: Stoves.

1. The question of supply of heating stoves for the winter for the troops in France is now before us. We are at present negotiating with a local Paris firm for some 7,200 assorted stoves of the Falkirk pattern, to be delivered soon. In addition to that, we will require about 15,000 stoves, assorted sizes, made to burn either wood or coal. The Falkirk pattern, so-called trash burner, is in general use in France, and that is the kind of stove we think best to purchase. Will you please take up the question directly with well-known firms and report fully by mail, and promptly by telegraph, whether you think these stoves can be supplied in England and shipped to France, to arrive at approximately the following dates: 3,000 by November 15; 3,000 by December 15; 5,000 by January 15; 2,000 by February 15; 3,000 by March 15.

2. For each of these stoves we desire at least 2 elbows and 15 joints of pipe about 4 inches in diameter and about 2 feet long, as that is the size of flues habitually in use in France. Unquestionably these stoves are made for a larger-sized pipe, so that each stove will have to have a reducer.

3. It is desired that this question be gone into quickly, because if the stoves can not be obtained in England, it will be necessary to cable to the United States for them. The per cent of sizes will be about as follows: For an 8-inch stove, 20 per cent; for a 14-inch stove, 50 per cent; for a 10-inch stove, 30 per cent.

4. Please report fully as to possibility of getting tonnage for transporting these stoves at the proper time to France.

5. Please direct reply to the General Purchasing Agent, American Expeditionary Forces, France.

By direction.

(Signed)

H. E. WILKINS,
Lt. Col., Q. M. C.

APRIL 5, 1918.

From: Assistant to Chief Quartermaster, A. E. F.
 To: Chief Quartermaster, Base Section No. 3, S. O. S., A. E. F.
 Subject: Stoves for 1918.

1. In arranging for a proper supply of stoves for the A. E. F., for delivery in the early fall of 1918, this office is investigating all possible sources of supply before placing orders. It is expected that approximately 75,000 stoves of various types will be required, and probably several sources of supply will be needed.

2. Information is therefore requested from your office as to what stoves might be purchased in England, stating available supply, giving the models, prices, deliveries, etc.

3. Your early reply is requested in order that our plans may be matured.

By direction.

F. T. HILL, Major, Q. M. R. C.

U. S. ARMY P. O. #702,
 France, April 9, 1918.

From: Assistant to Chief Quartermaster, A. E. F.
 To: C. Q. M., Base Section No. 3, S. O. S., A. E. F.
 Subject: Stoves for 1918.

1. Supplementing our letter of April 5, 1918, please advise this office what prices and deliveries can be obtained in England on stoves as described below. Types: Magent or Falkirk types, similar to those now being supplied from your office. Your quotations should show which types are meant and whether grateless or with grates. Sizes: 30 per cent in about 10-inch stoves, diameter; 50 per cent in about 14-inch stoves, diameter; 20 per cent in about 18-inch stoves, diameter. Equipment: Each stove to be complete with 15 feet of 4-inch pipe, 2 elbows, 1 poker. If 4-inch pipe does not fit the stove, we need a reducer or adapter to enable us to use 4-inch pipe, as we have standardized on this size. Quantity: In quantity up to 75,000 which you can secure delivery on. Deliveries: To commence as soon as possible and to be completed by October 1.

2. The question of tonnage available for transporting across channel such stoves as are ordered in England should be considered before placing orders in England and should be a limiting feature on the number ordered in England.

3. Prompt reply is requested as we wish to place these orders as soon as possible.

H. E. WILKINS,
 Lieut. Colonel, Q. M. C.

5 JULY, 1918.

From: The Chief Surgeon.
 To: The Chief Quartermaster.
 Subject: Heating stoves.

1. It is requested that arrangements be made to furnish the Medical Department for hospital use large and medium sized heating stoves according to the needs indicated in the general survey given below, same being based upon data given in attached itemized list:

(a) For hospitalization projects authorized and estimated to reach completion by September 1, 1918:

- | | |
|---|-------|
| (1) Stoves, heating, large, with pipe, dampers, elbows, floor zinc, and spark arrestors..... | 8,726 |
| (2) Stoves, heating, medium, with pipe, dampers, elbows, floor zinc, and spark arrestors..... | 7,130 |

(b) The additional hospitalization projects contemplated in letter from the chief surgeon to the C. in C., May 28, 1918, of which 35,000 base hospital and 32,000 convalescent hospital beds have already been authorized, will require heating stoves, with pipe, etc., complete, as follows:

- | | |
|---|--------|
| (1) Stoves, heating, large, with pipe, dampers, elbows, floor zinc, and spark arrestors..... | 12,143 |
| (2) Stoves, heating, medium, with pipe, dampers, elbows, floor zinc, and spark arrestors..... | 10,538 |

2. The total number of stoves that will be required is as follows:

- (1) Stoves, heating, large, with pipe, dampers, elbows, floor zinc, and spark arrestors..... 20, 869
- (2) Stoves, heating, medium, with pipe, dampers, elbows, floor zinc, and spark arrestors..... 17, 666

3. In letter from the chief quartermaster to the chief surgeon dated January 2, 1918, it is stated that arrangements have already been made to provide the Medical Department for hospital use with 9,760 large heating stoves and 13,600 medium heating stoves complete. The balance yet required is 11,109 large heating stoves complete and 4,066 medium heating stoves complete.

For the Chief Surgeon.

J. D. GLENNAN, Colonel, M. C.

JUNE 29, 1918.

Number of stoves required for type "A" hospital

	Stoves			Stoves	
	Large	Medium		Large	Medium
20 wards.....	60		Garage and shops.....	1	
Administration building (12 rooms).....	1	6	Ablution building.....	1	
Nurses' quarters (4 barracks).....		4	Isolation ward.....	2	1
Red Cross recreation room for nurses.....			Electric light plant.....		1
Nurses' dining room.....	2			87	31
Officers' quarters (2 barracks).....		2			
Officers' dining room and recreation room.....	1	1	Crisis expansion (72 marquee tents).....		48
Enlisted men's barracks.....	2			87	31
Patients' dining hall (2 rooms).....	4		Total.....	87	79
Red Cross recreation room for men.....	2				
Storeroom for crisis expansion (guardroom).....	1	2	Crisis expansion (50 U. S. A. ward tents).....		50
Receiving and evacuation hall.....		2		87	31
Patients' and personnel bath.....	1		Total.....	87	81
Officers' bath.....	1				
Nurses' bath.....	1		Crisis expansion (46 Beseneau tents).....		46
Personnel dining hall.....	2			87	31
Laboratory and morgue.....		1	Total.....	87	77
Operating room and X-ray.....	3	4			
Dispensary clinic building.....	1	4			
Quartermaster storehouse.....		1			
Medical storehouse.....		2			

Number of stoves required for convalescent camp

	Stoves			Stoves	
	Large	Medium		Large	Medium
Administration.....	1	5	Office quarters.....	0	0
Infirmary and dispensary.....	1	3	Treatment room.....	1	
Quartermaster storeroom and shops.....		3	Laundry.....		2
Shops and disinfectant.....		1	Y. M. C. A.....	3	
Dining hall (4 buildings).....	8		A. R. C.....	3	
Veneral and skin clinic.....	1	3		23	18
Washhouse (2 buildings).....	2				
Officers' mess hall.....	3	1			

Number of stoves required for camp hospital

	Stoves			Stoves	
	Large	Medium		Large	Medium
10 wards.....	20		Disinfectant and bathhouse.....		3
Administration building.....		7	Dining room.....	1	1
Officers' quarters.....		1	Barracks.....	2	
Clinics.....	2		Ablution.....	1	
Operating room and X-ray laboratory.....	1	3		28	15
Patients' mess and kitchen.....	1				

Number of stoves required for evacuation hospital

Twenty-four evacuation hospitals authorized and expected to reach completion by September 1, 1918.

Twenty-four evacuation hospitals additional contemplated and expected to reach completion by January 1, 1919.

No plans have been prepared, but it is estimated that the capacity of an evacuation hospital will be approximately one-half that of a base hospital, and in consequence one-half of the number of stoves would be required, as noted below:

Stoves: Large, 44; medium, 16.

DRYING ROOMS

Because of the excessive dampness in the winters in France, of the inadequate heat in barracks and billets, and, more especially, of inadequate space which prevented so spreading the wet clothing of members of the American Expeditionary Forces that it might dry within a reasonable length of time, it proved necessary to provide special drying rooms in which clothing and footwear could be dried when men came off duty. Drying rooms were first prescribed by General Headquarters, A. E. F., in January, 1918,²⁶ in connection with instructions directed to the prevention of "trench foot," as follows:

* * * * *

The commanding officers of all units will be held personally responsible that the following instructions are carried out under the personal supervision of a commissioned officer:

* * * * *

That there are available at all times suitable rooms set aside for use as drying chambers and that this space be of such arrangement and size as to adequately provide for the drying of all footwear or outer clothing.

Since no specific instructions as to the character of the drying room were issued from General Headquarters, A. E. F., this matter was left to the initiative of organization commanders. Ordinary barrack space was converted to drying-room purposes in some instances,²⁷ with suitable frames on which to hang the clothing, as shown in Figure 12; specially constructed compartments were used, as in the 7th Engineers, A. E. F., where a compartment composed of side panels measuring 4 by 6 feet and made of canvas stretched over a wooden frame. A Sibley stove was used to heat the interior,²⁸ and in the 80th Division, A. E. F., where framework measuring 12 by 20 feet was constructed for each organization of that division, this framework being inclosed in tar paper. One stove in such a room caused blankets to dry in about 20 minutes.²⁹

BEDS AND BEDDING

In camps of any degree of permanence it has been a custom in our Army to provide cots for the enlisted men, and these were a part of the organization equipment.³⁰ Cots, however, were not sent overseas for the use of our troops, except the sick in hospitals, where both beds and cots were provided.³¹

To provide our men with some form of a bed which would obviate the necessity of their sleeping on the floor, as well as to utilize to the greatest possible extent the floor space available, extemporized beds were used in barracks and, as far as possible, in billets in the American Expeditionary Forces.⁰ These bunks were of wood and were double tier, arranged in sets of

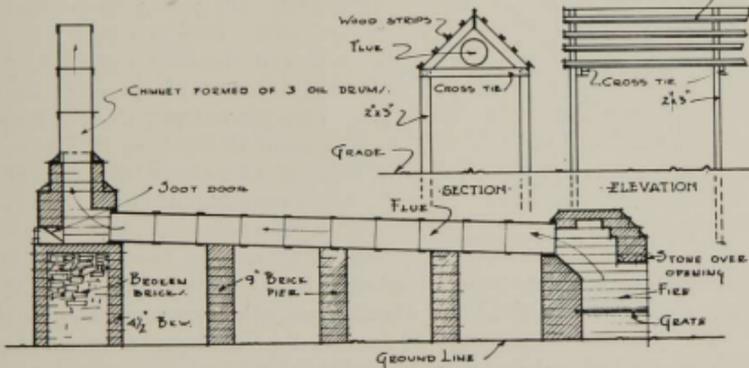
CLOTHES-DRIER.

NOTE: FLUE MAY BE CARRIED THROUGH DRYING ROOM IN BARRACK.



SKETCH

DETAIL-OF-CLOTHES-RACK-¹/₈" SCALE.



SECTION.

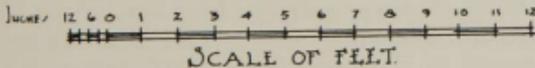


FIG. 12

four. Each bunk was 2 feet 8 inches wide by $6\frac{1}{2}$ feet long; the bottom of the lower bunk cleared the floor by 1 foot 10 inches, while between the lower and upper bunks there was an allowance of 3 feet 6 inches to permit the occupant of the lower bunk to sit upright therein.^{1,6} Four slats, 1 inch by $6\frac{1}{2}$ inches, formed the bottom of each bunk (fig. 13).

Each set of bunks was separated by a space measuring 2 feet 8 inches. For a part of the winter 1917-18 nurses were housed in barracks similar to enlisted men, and they were provided wooden bunks of the same size and similarly arranged, but 7 feet apart, thus giving each nurse 1.5 linear feet of Adrian barracks. This arrangement of bunks for nurses obtained only until April 18, 1918, when Headquarters, A. E. F., authorized the alteration of nurses' quarters so as to provide one room, 10 by 14 feet, for each two nurses.²²

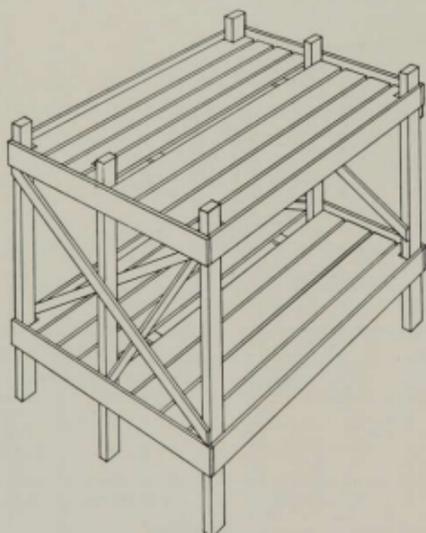


FIG. 13.—Plan of bunk for four men

The danger, from the viewpoint of sanitation, in requiring so compact an arrangement of beds for our overseas troops has been considered above under floor space. This danger was known by the Medical Department, A. E. F., but it was only one of the many sacrifices of safety which were demanded in the interest of speed and economy.

To overcome the danger incident to the close proximity of the troops while occupying their beds, various devices were resorted to. These included the head-and-foot arrangement of adjacent sleepers, to increase the distance between their heads; the separation of the two bunks on the same level of each set of bunks by means of wooden partitions, or suspended material such as the shelter half.²³ These devices have been described at length

in the first part of this volume, having to do with sanitation in the United States during the World War; details concerning them will not be given here.

The bedding of the enlisted men of the American Expeditionary Forces consisted of a bed sack and three woolen blankets,²⁴ except for troops either on the march or engaged in active operations when, because the bedding had to be transported on the persons of the troops, each man was limited to one blanket.²⁵

In September, 1917, straw was authorized for bedding for both men and animals;¹⁶ straw proving difficult to supply, however, instructions were issued by General Headquarters, A. E. F., in March, 1918,²⁶ authorizing the issue of hay for use as material for refilling the bed sacks of troops. The allowance of hay was to be 15 pounds per month for each man; the hay used for bedding for troops was to be renewed monthly. Hay thus used was to be fed to animals of the American Expeditionary Forces after it had been emptied out of the bed sacks.

Though provision thus was made for supplying the troops with blankets, and, where it was practicable to use them, with bed sacks, there were times at the base ports and at the front when, due to unavoidable circumstances or lack of appreciation of the severity of the weather to be expected, many thousands of members of the American Expeditionary Forces were so inadequately provided with blankets that they suffered severely from exposure to cold and wet.¹²

SHELTER DURING ACTIVE OPERATIONS

TRENCH WARFARE

Prior to the opening of the German offensive in March, 1918,³⁷ the guiding principle of General Headquarters, A. E. F., for the employment of American divisions after their arrival overseas was that each division after its arrival in France would be sent to a specially chosen training area for training for a period of from one to two months.³⁸ Upon the completion of its period of preliminary training, each division was to be brigaded with a French division in a quiet sector of the front for a period of duty in the trenches lasting from one month to six weeks. Following this term of trench duty each division was to be reassembled in a training area, there to be given a month of additional instruction. Upon completion of the last month of training the division was to take its own sector in the front line.³⁸

Following the German advance toward Amiens on March 21, 1918, this plan was abandoned;³⁸ General Pershing placed at the disposal of General Foch all our combatant forces,³⁷ and from that time until the beginning of the reduction of the Chateau Thierry salient all American divisions not with the British operated as elements of French army corps in the occupation or defense of various sectors of the line.

Since trench warfare was regarded as being almost indissolubly connected with defensive warfare, and since the basis of our instruction of the American Expeditionary Forces was essentially offensive both in spirit and in practice,³⁷ our experience with trenches was relatively limited.

Many of our men did live in trenches, however, and shelter had to be provided for them while there. It is true, these trenches in which our troops served had been, for the most part, already provided by the French or the British; nevertheless, a discussion of troop shelter for the American Expeditionary Forces would be incomplete without the inclusion of a description of the kinds of shelter there were at the front during trench warfare.

The kinds of trench shelter in Europe with which our troops became familiar during 1917-18 were developments by our Allies from the combination of protection against the elements and against enemy missiles of various kinds which, in themselves, underwent an evolution.³⁹ When the war of 1914-18 began, open tactics were employed, and belligerent troops in the field, but not actively engaged, generally were camped or bivouacked.³⁹ The nature of the shelter for these troops in camps or in bivouac was such as to protect only against the weather; no special provision was made to protect them from shell fire. With the stabilization of the Western Front in 1914, however, trenches were constructed by both the Allies and their enemies. The purpose of the trenches was for protection from enemy fire, but since the standard infantry rifle then in use had a flat trajectory, all that was required of the

trench was that it enable the occupants to conceal themselves from direct observation. Trench structures affording protection from large-caliber shells were not yet required, but in some instances it was necessary to protect men in the trenches from bursting shrapnel. Particularly was it essential that these men be protected from the rain and the snow during the winter of 1914-15; and as the type of shelter which had been previously employed in open warfare proved totally inapplicable, the improvisation of a variety of trench shelters was started by the soldiers according to individual designs.³⁹

These early improvised trench shelters usually consisted of a course of light poles supported either by the beams of the trench or by an understructure of light material and covered with a few inches of earth.³⁹

Because of the flat trajectory of the infantry rifle then in use, and the absence of projectiles of a high trajectory and a high angle of fall, belligerent trenches came to be constructed very close together.³⁹ This situation brought into use such projectiles as hand bombs, grenades, and trench mortars. To protect them from these missiles which could now be thrown directly into the trenches, the occupants of the trenches increased their overhead cover of the shrapnel-proof shelter which had been in use until the high trajectory and high-angle fall missiles came to be used. This was accomplished by increasing the number of layers of poles and earth.

There now followed the introduction of heavy artillery in trench warfare, which led to the construction of small caves or dugouts by the troops occupying the trenches.³⁹ These small dugouts rarely accommodated more than three or four men, but they were very numerous both in the forward positions and in the rear; and since there was no standardization of designs and material, they were usually constructed according to the ideas of the men occupying them. Very little head cover was secured, and in instances where timber was employed in the construction of these early dugouts it consisted of material salvaged from the battlefield. These dugouts were excavated under the parapets of the trenches or on the reverse slopes of steep embankments.

From the small dugouts the cut-and-cover shelter was evolved.³⁹ Often this consisted of an elaboration of the heavy splinter-proof shelter by increasing the thickness of the overhead cover. Cut-and-cover shelter was usually constructed in positions concealed from direct observation, such as on the reverse slopes of hills, in woods, and in ravines.

This additional protection which the men in the trenches secured caused a pronounced increase in the use of artillery both as to the number of artillery pieces and the caliber of shells employed.³⁹ The use of makeshifts as troop shelter in the trenches would no longer answer the purpose. It now became necessary to give serious consideration to a standardized and adequate protection for troops in the trenches. The troops there could no longer be left to their own resources; on the contrary, the services of specially trained and equipped men were required.

While the intensity of the use of artillery was becoming more and more pronounced, the opposing trenches were coincidentally being drawn farther apart, and mine warfare, which had been instituted when trench lines were close together, had fallen, after the trenches had been drawn apart, almost into disuse.³⁹

Since the construction of deep dugouts was an operation requiring a knowledge of mining methods, troops which had been engaged formerly in mine warfare now were utilized for the construction of these deeply dug shelters, and the problem received the careful consideration of mining engineers.³⁹ The amount of overhead cover in different kinds of earth necessary to give protection from shells of certain calibers was carefully studied; the size and type of timbering best adopted to support the ground and at the same time resist the dynamic effect occasioned by a bursting shell over a dugout. The use of gas as a means of warfare required the effective exclusion of this agent from the galleries and chambers of underground shelters. Other problems demanding study and investigation included the adoption of a style of entrance best adopted to war requirements, the disposal of seepage water, and the provision of protection from thrown hand bombs and from mobile charges.

Deep-mined dugouts could not be employed everywhere along the Western Front, due to geologic, tactical, or economic conditions; consequently, it became necessary to use in their stead at some places the cut-and-cover shelter. This required a study of the amount of artificial, protective material that would afford the same degree of protection otherwise provided by a head cover of natural earth in a deep dugout.

Since both the number of guns and the caliber of shells were being increased constantly, it followed that dugouts became correspondingly deeper to gain the required protection from direct hits by shells.³⁹

The depth to which dugouts could be constructed was governed generally by the level of the ground water; also the tactical situation usually prohibited the use of deep dugouts in the forward trenches. During the latter part of the World War the general practice was to prohibit the construction of deep dugouts in the surveillance and delaying lines of the front. This prohibition was due to the fact that the time was so short between the passage of the enemy's artillery barrage and the arrival of the infantry assault, that troops occupying deep dugouts in these lines were often captured or killed underground. Therefore it became the practice to provide in the surveillance and delaying lines only individual splinter-proof shelters or small concrete structures in sufficient numbers to accommodate the troops holding these two lines under normal conditions. Construction of deep dugouts between the delaying and main resistance lines was permitted, but here the dugouts were usually only sufficiently large to house 24 men, preferably 12, for the reason that a greater number of men were considerably delayed in reaching their fighting emplacements at the beginning of an attack.³⁹

In the chalk areas of Champagne, deep dugouts were numerous, the level of the ground water in that region being so low as to permit of deep excavations. In the Vosges Mountains, however, deep dugouts were less numerous than in the limestone and chalk areas to the northwest. This was due principally to the availability of timber in the forests of the Vosges, but also to a great extent to the natural protection obtained by constructing the shelter on the reverse slopes of the steep mountains.³⁹

The continuous increase in the caliber of shells impelled the construction of dugouts correspondingly deeper. Ground-water conditions permitting, it was

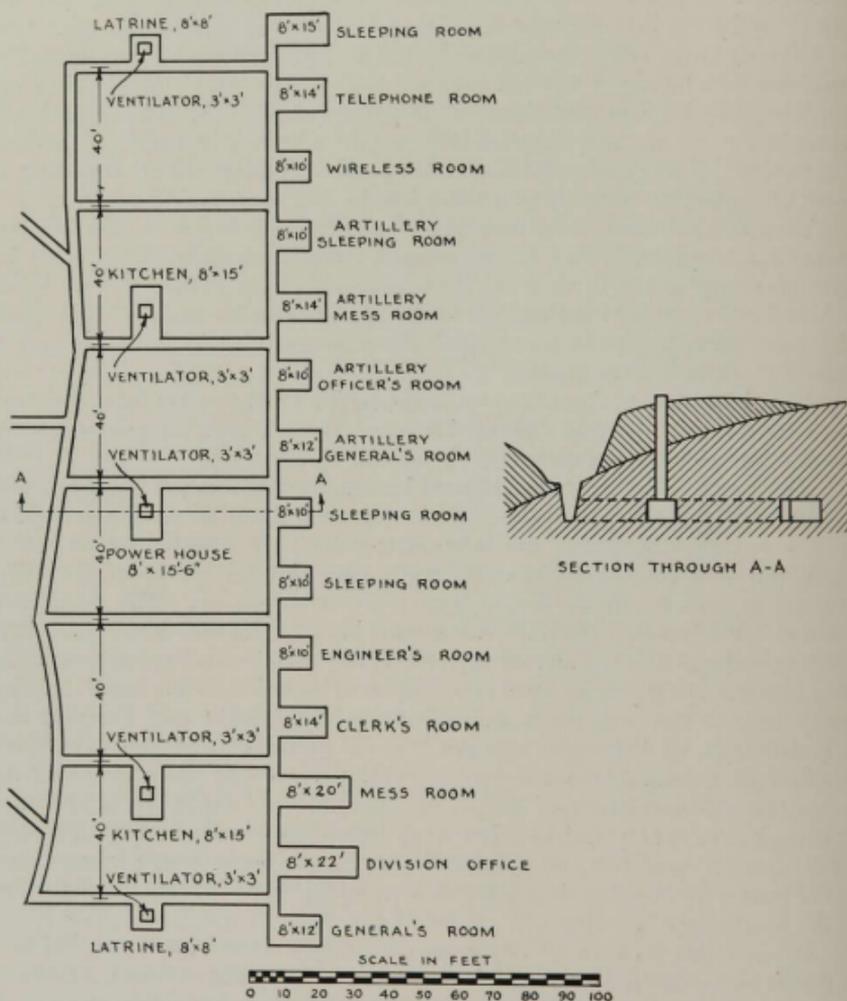


FIG. 14.—Division post command, Boucy, built by 1st United States Engineers, A. E. F.

possible to construct dugouts to such a depth as to afford protection from the largest caliber shells. However, it eventually became the practice in the French, British, and American armies to construct dugouts designed to give protection from the 210-mm. shells only, since that was the largest-caliber shell used to any considerable extent by the Germans.³ To secure overhead protection from direct hits by a shell of this caliber required 30 feet head cover in ordinary soil or 15 feet in rock.³⁹

Entrances.—The practice of providing two entrances to each dugout was general.³⁹ Entrances to dugouts constructed on reverse slopes usually consisted of horizontal galleries driven on a slightly rising grade so as to facilitate drainage; while dugouts built in open or rolling country were connected with the surface by means of incline entrances, the practice in the Allied Armies being to make the descent at an angle of 45°. The two entrances to dugouts were usually separated by a distance of not less than 40 to 50 feet, provision usually being made to include a traverse or bend of the trench between the entrances to lessen the possibility of them being destroyed by the explosion of one shell.³⁹

The form and dimensions of chambers in deep dugouts varied according to the purposes for which the dugouts were intended. Dugouts designed for the protection of combat troops generally consisted of one chamber or of a series of chambers constructed at right angles to the entrances, while those intended for posts of command or for other special purposes consisted of a series of chambers so arranged as to fulfill the requirements for which the dugouts were designed³⁹ (figs. 14 and 15). For a description of dugouts used by the Medical Department, A. E. F., see Volume VIII, this history.

Drainage.—The floors of dugout chambers were generally constructed on a grade so that seepage water would drain to one or two sides, where it collected in sumps.³⁹ From the sumps the water was removed either by buckets or by hand pumps. Dugouts which had been constructed in the chalk regions were kept dry easily, as the water generally drained away through fissures in the chambers. Dripping of seepage water from the ceilings of dugouts was often prevented by lining the ceiling of the chambers with corrugated iron (fig. 16). When properly placed, this carried the drip to the walls, at the bottom of which gutters were placed that emptied into the sumps.

In some instances trench water was excluded from the inclines of dugouts by grading the floor of the trench so that the water would drain away from the entrances to sumps from which it was bailed or pumped. In other instances a low bank of earth was left undisturbed between the floor of the trench and the dugout entrance, while many times a board placed against the bottom of the entrance, earth being banked against it, formed a dam to exclude trench water from the incline.³⁹ Figure 17 illustrates the duck-board walk and drain for trenches.

Ventilation.—Special means of ventilating dugouts seldom were provided.³⁹ In very large dugouts, and in underground quarries that were used as dugouts, air shafts had been constructed in a few instances. However, the natural circulation of air through the galleries and entrances of dugouts was generally considered to be sufficient. Nearly all dugouts were provided with heating stoves, the pipes of which were placed in the inclines of the dugouts. These stoves aided to some extent the ventilation of the chambers.

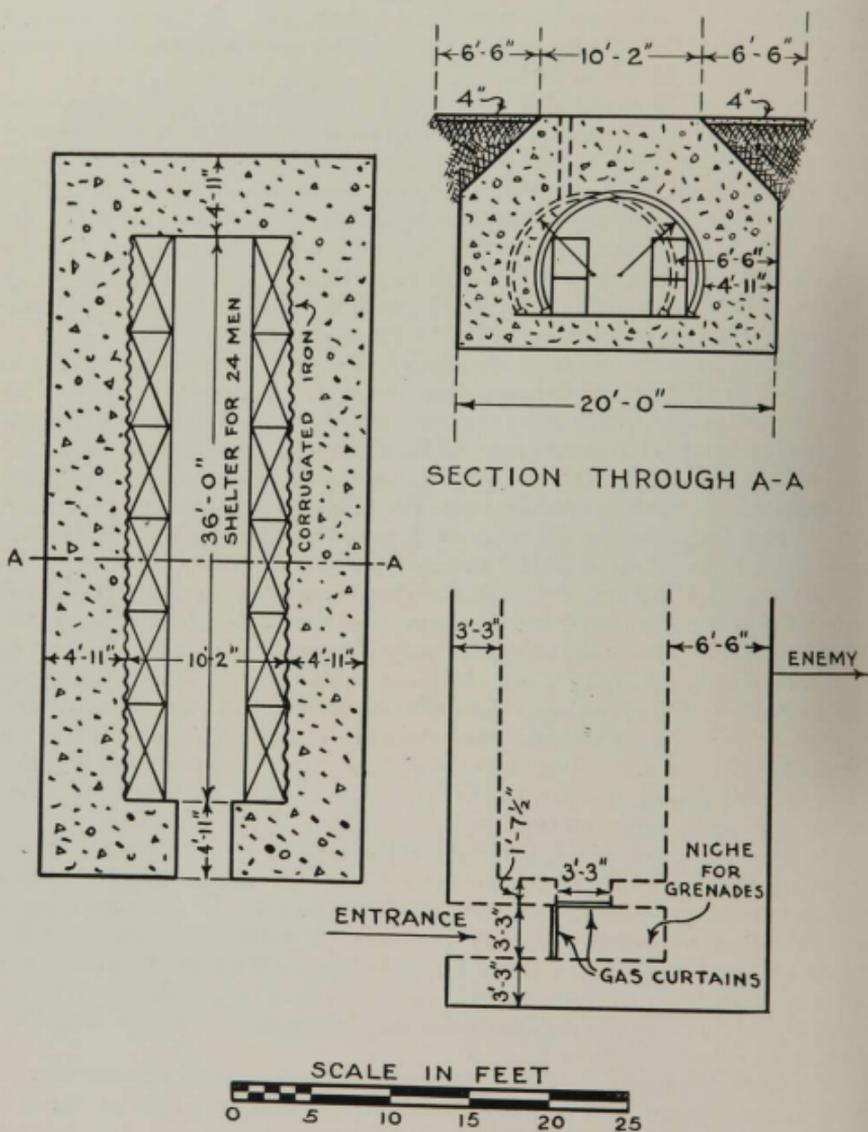


FIG. 15.—Concrete shelter built by Engineers, A. E. F.

OPEN WARFARE

During the spring and summer of 1918 activities on the Western Front were similar in many respects to open warfare. In many parts of the front extending from the English Channel to the region of the Moselle River the large parts of the front line were fluctuating to a greater or less extent. This condition prevented the construction of either deep dugouts or shelters of the cut-and-cover or concrete types.³⁰

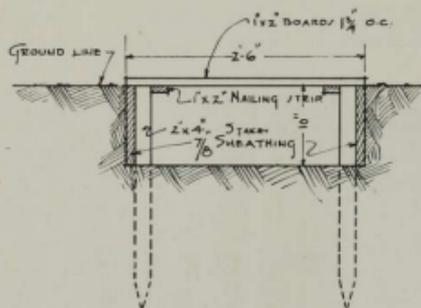
During this period, which continued to November 11, 1918, troops actively engaged in the field made extensive use of existing dugouts and shelters whenever it was possible to do so, but in many instances, and especially was this true in many sectors of the American First Army, it was necessary to hold the line



FIG. 16.—Interior of dugout built by American Engineers, at Boucq, Second United States Army area. Note the corrugated-iron ceiling which sheds seepage water into troughs which discharge into gutters under the floor

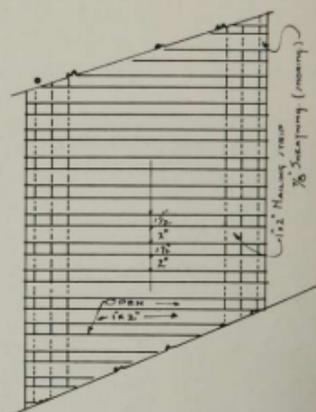
in places where no shelters previously had existed.³⁰ In these instances Infantry troops improvised shelter from the weather and protection from enemy shell fire.³⁰ Tents and shelter halves being entirely inadequate for these purposes, because of the great amount of enemy artillery shells, shallow excavations, barely large enough to accommodate one man lying down, were dug. These one-man excavations—"funk holes" or "fox holes"—were dug by the men individually with bayonets or entrenching tools, as soon as the line of which they formed a part became stabilized. By covering these small excavations with brush a degree of protection against the weather was afforded. Reverse slopes or hills, banks of ravines, and embankments beside roadways were utilized whenever possible as natural protection in the construction of these shelters.³⁰

· DUCK · BOARD · WALK · & · DRAIN ·



NOTE:— WALK TO BE MADE IN SECTIONS 10'-0" LONG.
 SHEATHING IS HELD IN PLACE BY 2x4" STAKES
 AND ACTS AS SHORING.
 STANDARD SIZE DUCK BOARD SECTION MAY BE USED.

· SECTION ·



· PLAN ·

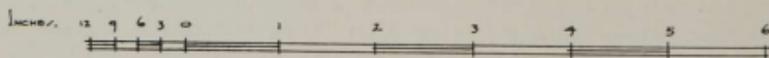
· IMPROVISED · WALK ·

TO BE MADE IN SECTIONS 10'-0" LONG BY 2'-6" WIDE.



SECTION ·

PERSPECTIVE



SCALE OF FEET ·

SOU6118-32

On the other hand, when the lines became stabilized for periods of short duration the troops in support and in reserve, following the advance, made use of salvaged material of a miscellaneous character in the construction of semi-permanent camps. These hasty structures generally consisted of such materials as sections of "elephant iron" shelters, individual shelters of corrugated iron and scraps of lumber³⁹ (Fig. 18).

TROOP SHELTER, AMERICAN EXPEDITIONARY FORCES IN SIBERIA

Following arrival in Vladivostok in August, 1918, our troops were quartered in barracks which had been constructed for Russian soldiers and which dotted the suburbs to the north and east of that city.⁴⁰ These barracks were indescribably filthy; the floors were covered with human excreta, and the rooms

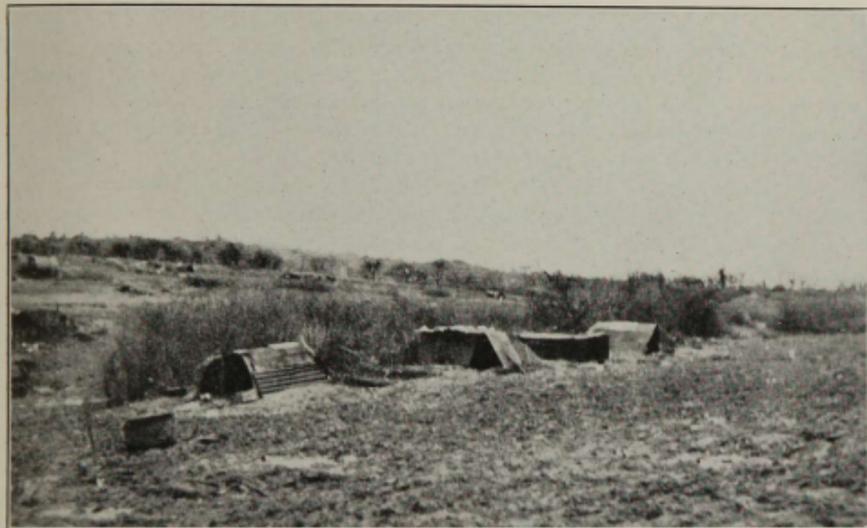


FIG. 18.—Hasty shelters for semipermanent camp during open warfare

were vermin infested; there were no provisions for the disposal of human wastes, nor were there running water, a sewerage system, or any provision for artificial light.

All the barracks in the environs of Vladivostok conformed to a general plan, measuring about 240 feet long and 45 feet wide.⁴⁰ They were of brick construction and were trimmed with stone; usually they were of one story, but many had two stories. Within, the arrangement of the typical barrack was somewhat as follows: The two entrances to the barracks were at the ends, where there were four rooms, about 12 feet square. Two of these small rooms were on either side of a dividing hallway which led from the entrance to the general squad room. When there was a second story it was a duplication in plan of the first story. The ceilings were usually 12 feet high. At one end of the building one of the small rooms referred to was used as a kitchen, where there was to be found the typical Russian stove. Ordinarily these kitchen stoves were about 4 feet broad, 3 feet high, and 6 to 8 feet long, and immovable

parts of each were two iron or copper caldrons which were heated by means of small fire boxes. As a rule, there was no provision for baking, nor apparently could food be cooked on the tops of the stoves. No evidence could be found in the kitchens of any provision for cleaning kitchen utensils. There was neither running water nor the kitchen sink to which our troops are accustomed; so far as could be determined, kitchen wastes and waste water were to be thrown through a hole in the floor. As there was no mess hall, it was evident that soldiers who formerly had occupied the barracks had to receive their food in the kitchens and to eat in the squad rooms.

Squad rooms were lighted by the conventional double windows, and with about the same proportion of natural light that one is accustomed to see in the United States.⁴⁰

The heating of the buildings was accomplished by means of large brick or cast-iron stoves lined with fire brick. These stoves were about 4 feet square and 10 feet high. The fire box in each instance was small, consequently several hours would elapse before newly made fires could heat the stoves to the desired temperature. The stoves thus heated proved totally inadequate for heating the rooms of barracks when fresh air, in the amount customarily required in our Army barracks, was admitted to the rooms.⁴⁰

On the arrival of the 27th United States Infantry at Habarovsk, September 17, 1918, the regiment was assigned quarters in Russian brick barracks to the east of the city. Prisoners of war had been quartered in these buildings for many months prior to the use of them by our troops, and some of the buildings had been appropriated by Russian civilians for shelter. This use of the barracks had resulted in their neglect not only from an upkeep standpoint but from a sanitary one as well. In fact, in so far as sanitation is concerned, our troops found from observation that the knowledge of sanitation possessed by the average native of eastern Siberia was practically nil.⁴⁰

What attracted the eye first, in going about the country, was the unkept and filthy condition of the streets of cities and villages; pigs and other domestic animals ran about loose, leaving their excreta anywhere and everywhere. The yards surrounding the peasants' houses almost universally were littered with trash and wornout and useless articles of various sorts which served largely as a partial shelter for domestic animals and fowls, and the accumulation of large quantities of insanitary material. Within the yards was the conspicuous privy, usually of boards and rarely if ever cleaned of its contents. The habitual practice among the peasants was to allow the excreta to collect in privies; sometimes it was then buried, but usually it was scattered upon the surface of the ground not far from the dwelling from which it came. This indifference to environment and to the disposal of excreta was not confined to the peasant class; on the contrary, the public buildings in the cities in which our troops served were found to be equally at fault, especially such parts of them as ordinarily are hidden from public inspection, clubs and restaurants being no exceptions to the rule. Some of the more prosperous citizens had had constructed septic vaults in connection with their homes, and some public buildings likewise had septic vaults. Sewage from such buildings emptied into the cesspools, but since there was no such thing as a municipal sewerage system, the contents of the cesspools had to be emptied from time to time, when full or, more often than not, overflowing.⁴⁰

With the facts given above in mind, it is relatively easy to appreciate the extreme degree of filth encountered in Russian barracks and their environs when the barracks were occupied by our troops in Habarovsk.⁴⁰ The buildings were seemingly beyond repair; their concrete floors were broken up; window frames had been almost universally demolished, and if any remained the window panes had been broken; heating stoves had been either partially or completely destroyed; cooking stoves had been demolished, their caldrons in most cases missing; their walls were sooty from fires built on the barrack floors. The latrines were filthy, cesspools being full to overflowing. Domestic animals and fowls had domiciled themselves in some of the buildings, with an inevitable addition of filth. Rubbish, which seemingly had been collected for several years prior to our occupancy, could be seen in pile upon pile everywhere both within and surrounding the buildings.

A very few of the buildings had a running water system; for the most part, however, water was obtained from two public watering stations, the water of which came from the Ussuri River.⁴⁰

In making these buildings habitable, days and days of unceasing effort were required of the troops. The Russian stoves, both heating and cooking, were gradually renovated. Water was piped to the principal buildings such as the hospital building and the mess halls. To prevent the pipes from freezing, trenches 12 to 14 feet were dug by soldier labor. The windows of all the habitable buildings were repaired, window panes being replaced where necessary. The concrete and wooden floors were repaired. The cesspools were excavated and made ready for constant use, temporary trench latrines being used meanwhile. Some of the buildings were wired for electric lights, the current being obtained from the city of Habarovsk, and ultimately from a plant erected by our troops.⁴⁰

TROOP SHELTER, NORTH RUSSIA AMERICAN EXPEDITIONARY FORCES

Members of the American Expeditionary Forces who arrived in Archangel on September 5, 1918, and who were retained in Archangel, were quartered in large and substantial barracks that were well heated and well ventilated. In these barracks it was possible to afford each man ample air space,⁴¹ since only a small part of the forces stayed in Archangel, the remaining being distributed among our Allies.⁴² (See Vol. VIII, Medical Department Operations, A. E. F.) On the Vologda front our troops were quartered for the most part in railroad cars.⁴¹ Bunks were placed in freight cars, and other cars were fitted up as mess cars, kitchen cars, and bath cars; all were adequately heated by stoves. At Obozerskaya a large barrack was constructed as soon as weather conditions permitted.⁴¹ When completed this barrack provided ample facilities for all troop needs. In the Onaga, Seletskoe, Vaga-Dwina, and Pinaga sectors the troops were quartered in native houses.⁴¹ These houses were small, but they had been substantially built of logs, and were well heated. The Russian stove was found to be the most conspicuous feature of practically all houses and, because of the heavily wooded character of the surrounding country, fuel proved to be abundant. At our advanced posts, the block houses and the dug-outs were built so as to afford the maximum protection from both cold and storm.⁴¹

Many of the native houses taken over for use by our troops as quarters were found to be infested by vermin.⁴¹ Because of the character of their construction it proved to be impossible to disinfect these houses; however, our troops were kept supplied with insect powder with which to keep the vermin down.

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- (18) G. O. No. 8, H. A. E. F., January 10, 1918.
- (19) G. O. No. 22, G. H. Q., A. E. F., February 5, 1918.
- (20) G. O. No. 117, G. H. Q., A. E. F., July 16, 1918.
- (21) First Indorsement, chief surgeon's office, A. E. F., September 18, 1918, to commanding officer, Hospital Center, Nantes. On file, World War Division, A. G. O., chief surgeon's records, A. E. F.
- (22) Telegram from commanding general, Base Section No. 1, A. E. F., November 11, 1917, to commanding general, H. A. E. F. On file, World War Division, A. G. O., chief surgeon's records, A. E. F.
- (23) Telegram from Fourth Section, General Staff, G. H. Q., A. E. F., September 14, 1918, to chief surgeon, First Army, Neufchâteau, France. On file, World War Division, A. G. O., chief surgeon's records, A. E. F.
- (24) Letter from assistant to chief quartermaster, A. E. F., April 19, 1918, to the chief quartermaster, S. O. S., A. E. F. Subject: Heating stoves for the office of the chief surgeon, A. E. F. On file, World War Division, A. G. O., chief surgeon's records, A. E. F.

- (25) Letter from chief surgeon, A. E. F., September 20, 1918, to commanding officer, Base Hospital No. 15, A. E. F. Subject: Heating stoves and accessories for same. On file, World War Division, A. G. O., chief surgeon's records, A. E. F.
- (26) G. O. No. 11, H. A. E. F., January 11, 1918.
- (27) Memorandum No. 24, Hdqrs., 6th Division, office of the division surgeon, A. E. F. On file, Historical Division, A. G. O.
- (28) From plan for clothes dryer, designed by Maj. O. O. Kuentz, 7th Engineers, and Maj. R. H. Davies, M. C. On file, Historical Division, S. G. O.
- (29) Bulletin No. 30, Hdqrs., 80th Division, A. E. F., February 7, 1919.
- (30) G. O. No. 39, W. D., June 24, 1915.
- (31) Telegram No. 152, February 21, 1918, from the assistant chief of staff, G-4, G. H. Q., to the commanding general, Services of Supply, A. E. F. On file, A. G. O., World War Division, Hq. S. O. S., 7116-D.
- (32) G. O. No. 58, G. H. Q., A. E. F., April 18, 1918.
- (33) Report on the division of sanitation and inspection, chief surgeon's office, A. E. F., from Col. Haven Emerson, M. C., May 8, 1919, to the Surgeon General, U. S. Army. On file, Historical Division, S. G. O.
- (34) G. O. No. 31, W. D., June 24, 1915. Also: Letter from the commander in chief, A. E. F., January 4, 1918, to commanding generals of divisions, A. E. F. Subject: Equitable distribution of clothing. Copy on file, Historical Division, S. G. O.
- (35) G. O. No. 39, W. D., June 24, 1915.
- (36) G. O. No. 41, G. H. Q., A. E. F., March 14, 1918.
- (37) Final Report of General John J. Pershing.
- (38) Historical Report of the Chief Engineer, A. E. F., 1917-19, Government Printing Office, 1919.
- (39) Report on engineer research, from 1st Lieut. G. R. DeBeque, C. of E., U. S. A., March, 1919, to the chief engineer, Second Army. On file, Office of the Chief of Engineers, W. D.
- (40) Report of Medical Department activities, American Expeditionary Forces in Siberia, 1918-19, from Col. James S. Wilson, M. C., undated, to the Surgeon General, U. S. Army. On file, Historical Division, S. G. O.
- (41) Report on Medical Department activities, North Russian American Expeditionary Forces, from Lieut. Col. Erastus Corning, M. C., undated. On file, Historical Division, S. G. O.
- (42) Report on North Russia. General Richardson.

CHAPTER V EQUIPMENT AND CLOTHING

EQUIPMENT

The equipment of a soldier includes all articles except clothing which are issued to him in order that he may properly perform his duties. For present purposes our interest is not with the separate articles of equipment, but rather with their combined weight, for it has been considered necessary that the soldier carry most of these articles upon his person to make him independent in the field. The fact that their transportation frequently can be accomplished only with the expenditure of a great degree of vital force, and to the great discomfort of the soldier, has led in the past to attempts to limit the burden of the equipment to a weight which, when added to that of his arms and ammunition, would not tax his carrying capacity to the extent of seriously interfering with his essential function—combat. For a number of years it has been conceded by sanitarians that, if the soldier is expected to maintain reasonable freedom of action on the march and in battle, he should not carry a burden much greater than one-third of his own weight.¹ The mean weight of 868,445 recruits accepted for our Army during 1917–18 was 141.54 pounds; the mean weight of the men of our Army upon demobilization in 1919 was 144.89 pounds.² These figures would indicate that, if the assertions of sanitarians are to be given any weight, the burden carried by our men during the World War should have been not much in excess of 50 pounds. That such was not the case is shown by the following tables of weights of articles either worn or borne by the infantryman of the American Expeditionary Forces. Since the weights of articles of equipment can not be considered in their relation to the soldier without also considering the weights of articles of clothing and arms and ammunition, they are all considered here together for purposes of convenience. In so far as the weights of the different articles of clothing are concerned these can not be given exactly, since there will be a slight variance due to the difference in sizes.

TABLE 1.—*Winter clothing worn by the soldier, common to all our Infantry enlisted men*¹

Article	Number	Weight, in pounds	Article	Number	Weight, in pounds
Belt, waist.....	1	0.175	Ornaments, collar, bronze, set.....	1	0.045
Breeches, service, wool.....	1	1.766	Overcoat.....	1	6.257
Cap, overseas.....	1	.330	Shirt, flannel, olive-drab.....	1	1.016
Coat, service, wool.....	1	2.597	Shoes, pair.....	1	3.391
Chevrons.....	2	.017	Stockings, wool, heavy, pair.....	1	.170
Drawers, wool.....	1	.680	Tags, identification.....	2	.002
Gloves, wool, pair.....	1	.203	Tape, for identification tags, yard.....	1	0
Handkerchiefs.....	2	.063	Undershirt, wool.....	1	.975
Leggings, spiral, wool, pair.....	1	.513			
Mittens, leather palm, one finger, pair.....	1	.33	Total weight, dismounted men.....		18.500

¹ Sources of information: (1) Report on weight and bulk of Infantry equipment, made by Capt. P. W. Clarkson, Infantry, Department of Experiment, the Infantry School, Camp Benning, Ga., August 4, 1921; copy on file, Historical Division, S. G. O. (2) Specifications for overseas cap, and mittens, one-finger; Office of the Quartermaster General, U. S. Army, 1918.

² The Medical Department of the United States Army in the World War, Vol. XV, Part I, Army Anthropology, Washington, Government Printing Office, 1921, 119.

TABLE 2.—Pack and miscellaneous articles common to all our Infantry enlisted men^a

Article	Number	Weight, in pounds	Article	Number	Weight, in pounds
Blankets, olive-drab.....	1	4.000	Mirror.....	1	0.168
Brush, shaving.....	1	.084	Packet, first-aid.....	1	.248
Brush, tooth.....	1	.026	Pins, tent, shelter, wood.....	5	.432
Canteen, model 1910.....	1	.544	Pole, tent, shelter.....	1	.850
Can, condiment, model 1910.....	1	.477	Pouch, first-aid.....	1	.106
Carrier, pack, model 1910.....	1	4.456	Raincoat, foot.....	1	3.200
Comb.....	1	.028	Rations, reserve.....	2	4.000
Cover, canteen, dismantled, model 1910.....	1	.358	Razor.....	1	.395
Cup, model 1910.....	1	.453	Rope, tent.....	1	.069
Drawers, wool.....	1	.680	Shoes, pair.....	1	3.391
Dubbin, box.....	1	.141	Soap, hand, cake.....	1	.051
Foot powder, box.....	1	.250	Spoon, model 1910.....	1	.109
Fork, model 1910.....	1	.094	Stockings, wool, heavy, pair.....	1	.170
Gas mask.....	1	3.875	Tent, shelter, half.....	1	2.800
Haversack, model 1910.....	1	2.137	Towel.....	1	.072
Helmet, steel.....	1	2.250	Undershirt, wool.....	1	.975
Knife, model 1910.....	1	.100			
Laces, shoe, extra pair.....	1	.032	Total weight dismantled man.....		33.805
Meat can.....	1	.775			

^a Sources of information: (1) Report on weight and bulk of Infantry equipment, made by Capt. P. W. Clarkson, Infantry, Department of Experiment, the Infantry School, Camp Benning, Ga., August 4, 1921; copy on file, Historical Division, S. G. O. (2) Specifications No. 1312 for 4-pound olive-drab blanket.

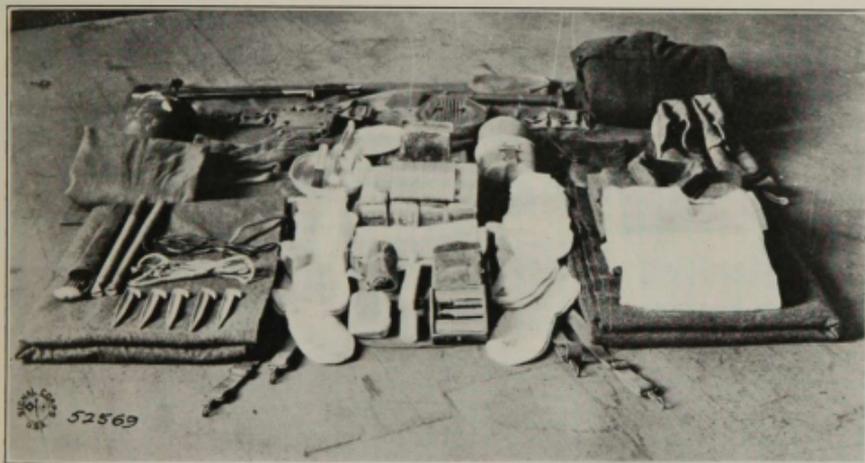


FIG. 19.—Contents of pack, heavy marching order

TABLE 3.—Arms and ammunition common to all our Infantry enlisted men armed with rifle^a

Article	Number	Weight, in pounds	Article	Number	Weight, in pounds
Bayonet.....	1	1.019	Cover, front-sight, for United States rifle, caliber .30.....	1	0.041
Bayonet, scabbard.....	1	.466	Rifle, United States, caliber .30.....	1	8.825
Belt, cartridge, caliber .30, model 1910, dismantled.....	1	1.450	Sling, gun.....	1	.486
Brush, thong, for United States rifle, caliber .30.....	1	.013	Stick, breech, for United States rifle, caliber .30.....	1	.113
Cartridges, ball, caliber .30, in clips.....	100	5.938	Thong, for United States rifle, caliber .30.....	1	.029
Case, oiler and thong.....	1	.145			
Cover, rifle, caliber .30, model 1903, breech.....	1	.300	Total weight.....		18.825

^a Source of information: Report on weight and bulk of Infantry equipment, made by Capt. P. W. Clarkson, Infantry, Department of Experiment, the Infantry School, Camp Benning, Ga., August 4, 1921; copy on file, Historical Division, S. G. O.

TABLE 4.—*Special equipment, No. 1, front rank (rifleman), rifle company*^a

Article	Number	Weight, in pounds	Article	Number	Weight, in pounds
Carrier, pick-mattock, intrenching	1	0.269	Magazines, for Browning automatic rifle ..	2	0.924
Cartridges for Browning automatic rifle ..	40	2.281	Panel, Infantry, set, type A. P. 5.....	1	.436
Grenades (1 hand and 1 rifle).....	2	2.350	Pick mattock, intrenching.....	1	2.306
Magazine bandoleer, for Browning automatic rifle.....	1	.813	Total weight.....		9.379

^a Source of information: Report on weight and bulk of Infantry equipment, made by Capt. P. W. Clarkson, Infantry, Department of Experiment, the Infantry School, Camp Benning, Ga., August 4, 1921; copy on file, Historical Division, S. G. O.

TABLE 5.—*Special equipment, No. 2, front rank (rifle grenadier) rifle company*^a

Article	Number	Weight, in pounds	Article	Number	Weight, in pounds
Axe, hand, intrenching, or bolo, with carrier or scabbard.....	1	2.057	Grenades, rifle.....	7	7.088
Carrier, rifle-grenade discharger.....	1	.297	Rifle-grenade discharger.....	1	3.194
			Total weight.....		12.636

^a Source of information: Report on weight and bulk of Infantry equipment, made by Capt. P. W. Clarkson, Infantry, Department of Experiment, the Infantry School, Camp Benning, Ga., August 4, 1921; copy on file, Historical Division, S. G. O.

TABLE 6.—*Special equipment, No. 3, front rank (rifleman), rifle company*^a

Article	Number	Weight, in pounds	Article	Number	Weight, in pounds
Carrier, pick-mattock, intrenching	1	0.269	Magazines for Browning automatic rifle ..	2	0.924
Cartridges for Browning automatic rifle ..	40	2.281	Pick mattock, intrenching.....	1	2.306
Grenades (1 hand and 1 rifle).....	2	2.350	Total weight.....		8.943
Magazine bandoleers for automatic rifle ..	1	.813			

^a Source of information: Report on weight and bulk of Infantry equipment, made by Capt. P. W. Clarkson, Infantry, Department of Experiment, the Infantry School, Camp Benning, Ga., August 4, 1921; copy on file, Historical Division, S. G. O.

TABLE 7.—*Special equipment, No. 1, rear rank (rifleman), rifle company*^a

Article	Number	Weight, in pounds	Article	Number	Weight, in pounds
Carrier, shovel, intrenching.....	1	0.312	Panel, Infantry, set, type A. P. 6.....	1	0.436
Cartridges for Browning automatic rifle ..	40	2.281	Shovel, intrenching.....	1	1.881
Grenades (1 hand and 1 rifle).....	2	2.350	Total weight.....		8.997
Magazine bandoleers, for automatic rifle ..	1	.813			
Magazines, for Browning automatic rifle ..	2	.924			

^a Source of information: Report on weight and bulk of Infantry equipment, made by Capt. P. W. Clarkson, Infantry, Department of Experiment, the Infantry School, Camp Benning, Ga., August 4, 1921; copy on file, Historical Division, S. G. O.

TABLE 8.—*Special equipment, No. 2, rear rank (rifleman), rifle company*^a

Article	Number	Weight, in pounds	Article	Number	Weight, in pounds
Carrier, shovel, intrenching.....	1	0.312	Magazines for Browning automatic rifle ..	2	0.924
Cartridges for Browning automatic rifle ..	40	2.281	Shovel, intrenching.....	1	1.881
Grenades (1 hand and 1 rifle).....	2	2.350	Total weight.....		8.561
Magazine bandoleer for automatic rifle ..	1	.813			

^a Source of information: Report on weight and bulk of Infantry equipment, made by Capt. P. W. Clarkson, Infantry, Department of Experiment, the Infantry School, Camp Benning, Ga., August 4, 1921; copy on file, Historical Division, S. G. O.

TABLE 9.—*Special equipment, No. 3, rear rank (automatic rifleman), rifle company* ^a

Article	Number	Weight, in pounds	Article	Number	Weight, in pounds
Belt, magazine, for Browning automatic rifle	1	1.825	Magazines for Browning automatic rifle	10	4.625
Cartridges, ball, caliber .30	200	11.406	Rifle, Browning, automatic	1	15.500
Carrier, shovel, intrenching	1	.312	Strap, sling, for Browning automatic rifle	1	.486
Case, carrying, for automatic rifle	1	1.319	Shovel, intrenching	1	1.881
Case, spare parts, for automatic rifle	1	1.219	Total weight		39.209
Filler, magazines, for automatic rifle	3	.636			

^a Source of information: Report on weight and bulk of Infantry equipment, made by Capt. P. W. Clarkson, Infantry, department of experiment, the Infantry School, Camp Benning, Ga., August 4, 1921; copy on file, Historical Division, S. G. O.

TABLE 10.—*Special equipment, No. 4, rear rank (rifleman), rifle company* ^a

Article	Number	Weight, in pounds	Article	Number	Weight, in pounds
Carrier, shovel, intrenching	1	0.312	Magazines for Browning automatic rifle	2	0.924
Carrier, hand grenade	1	1.131	Shovel, intrenching	1	1.881
Cartridges for Browning automatic rifle	40	2.281	Total weight		9.692
Grenades (1 hand and 1 rifle)	2	2.350			
Magazine bandoleer for automatic rifle	1	.813			

^a Source of information: Report on weight and bulk of Infantry equipment, made by Capt. P. W. Clarkson, Infantry, department of experiment, the Infantry School, Camp Benning, Ga., August 4, 1921; copy on file, Historical Division, S. G. O.

TABLE 11.—*Weights carried by members of rifle company, Infantry regiment* ^a

Individual	Pack and miscellaneous articles	Arms and accessories	Special equipment	Total equipment
First sergeant	33.805	6.094	8.939	48.838
Mess and supply sergeants	33.805	18.825	1.251	53.881
Signal sergeant	33.805	18.825	18.978	71.608
Platoon sergeant	33.805	6.094	7.247	47.146
Other sergeants	33.805	18.825	7.247	59.877
Signal corporal	33.805	18.825	17.608	70.238
Squad leaders, corporals	33.805	18.825	8.443	61.073
Other corporals	33.805	18.825	3.721	56.351
Buglers	33.805	6.094	5.987	45.886
Mechanics	33.805	18.825	6.616	53.246
Cooks	33.805	6.094		39.899
No. 1, front rank	33.805	18.825	9.379	62.009
No. 2, front rank	33.805	18.825	12.636	65.266
No. 3, front rank	33.805	18.825	8.943	61.573
No. 1, rear rank	33.805	18.825	8.997	61.627
No. 2, rear rank	33.805	18.825	8.561	61.191
No. 3, rear rank	33.805		39.209	73.014
No. 4, rear rank	33.805	18.825	9.692	62.322
Agents and orderlies	33.805	18.825	.918	53.548
Agents, 1 per platoon	33.805	18.825	5.118	57.748
Others	33.805	18.825		52.630

^a 1. Add 18.5 pounds for clothing worn in winter. 2. Sources of information: Report on weight and bulk of Infantry equipment, made by Capt. P. W. Clarkson, Infantry, department of experiment, the Infantry School, Camp Benning, Ga., August 4, 1921; copy on file, Historical Division, S. G. O. 3. Specifications for clothing: Office of the Quartermaster General, U. S. Army.

Examination of Table 11 shows that, in the American Expeditionary Forces, the members of a rifle company, more particularly those in the front and rear ranks of a platoon, making up the bulk of such an organization, carried a weight, exclusive of the clothing worn on their persons, varying from 61.573 pounds to 73.014 pounds, according to the position occupied in the platoon. If to these weights that of the clothing is added, it will be seen that in the winter

months the majority of our men were expected to march and to go into battle with a burden varying in weight, as above, from 80.073 pounds, the minimum, to 91.514 pounds, the maximum. Reports as to the effect of these excessive weights on members of the American Expeditionary Forces are very meager. This is due to the fact that in France it was the exception rather than the rule for our troops to make long marches and then go immediately into battle; therefore, it could not be ascertained readily to what extent the troops had suffered in the way of combat efficiency by reason of having used up vital force through transporting their heavy equipment. During trench warfare,



FIG. 20.—Front view, Infantryman, A. E. F., with heavy marching equipment



FIG. 21.—Rear view, Infantryman, A. E. F., with heavy marching equipment

when our troops held sectors of the front, and combat was engaged in, this occurred only after the troops had been in position for a sufficiently long time to permit them to recuperate from any physical impairment resulting from burden bearing. Then, too, the major engagements of open warfare in which our troops participated were, excepting those of the spring of 1918 when some of our divisions were used to assist in stemming the advance of the Germans, planned attacks, necessitating perforce, having the troops in position in advance of the time set for attack.² Not only was this the condition, but, in addition, motor transportation was used to a great extent, for tactical purposes, to convey our troops to the front, and from one part of the front to another.

That the men themselves considered their equipment excessive in weight, and willingly hazarded discomfort at the front by discarding parts of the equipment, is exemplified by the following memorandum, which was made the basis of a request for a study of the actual needs of the Infantry soldier with the view to lessening the number of articles which he was required to carry.

Memorandum for A. C. of S., G-1:

GENERAL HEADQUARTERS,
AMERICAN EXPEDITIONARY FORCES,
FOURTH SECTION, GENERAL STAFF,

16 August, 1918.

1. The A. C. of S., G-4, S. O. S., in memorandum to this office on salvage and supplies, discusses the question of reduction of equipment in the Infantry pack.

2. This is quoted herewith:

2. Further inquiry into this subject seems to indicate that the entire subject of the equipment carried in the pack of the Infantry soldier should be gone into with a view to lessening the number of articles carried.

3. Statements of officers returning from the front are all to the same effect, that great quantities are thrown away by the soldier in order to reduce the weight he carries. The remedy usually suggested is an increase in the size of the salvage personnel. This remedy does not appear to be sound for the reason that as a salvage proposition to recover articles thrown away by men on the march would require an enormous number of men engaged in salvage work. The proper solution must be sought in a study of the actual needs of the Infantry soldier and a reduction of the contents of his pack to the minimum.

4. This memorandum is forwarded simply to present the point of view of this office and with the request that some investigation of the actual facts be made.

3. This section concurs in paragraph 4 and requests that a study be made.

On the march, also, our soldiers were prone to discard certain parts of their equipment in order to lessen the weight of the articles they were carrying. From data compiled on a number of marches made by organizations of the American Expeditionary Forces during the war, it was discovered that 95 per cent of the men in question had thrown away articles of their equipment as follows: (a) five tent pegs, 95 per cent; (b) folding tent pole, 95 per cent; (c) extra shoes, 50 per cent; (d) one blanket, 30 per cent; (e) extra suit of underwear, 25 per cent; (f) breech sticks (issued for use of Enfield rifles), 100 per cent; (g) heavy English wire cutters, 75 per cent; (h) small United States wire cutters, 2 per cent.



FIG. 22.—Rear view, Infantryman, A. E. F., showing him carrying, in addition to articles in Figure 20, an overcoat and an extra pair of shoes

In the spring of 1919, a board of officers was appointed at General Headquarters, A. E. F., to study the experiences of these forces, in so far as the experiences affected the tactics and organizations of Infantry.¹ One of the subjects considered was the weight of the soldier's equipment; however, during the period embraced by the history no material change was made in the equipment to reduce its weight.

CLOTHING

When we entered the World War, certain articles of wearing apparel of our soldiers, usually considered clothing, were listed among the items of personal equipment in our table of fundamental allowances.⁴ These articles were overcoats, sweaters, and waterproof outer clothing (poncho or slicker). For all other articles of clothing, the details of which will be considered later, the soldier had a given money allowance for his enlistment period, and the clothing issued to him was charged against this clothing allowance. The clothing articles which formed a part of his equipment, however, were issued to him on memorandum receipt;⁵ blankets also were issued on memorandum receipt. For convenience of description, all these articles will be considered here under the subject of clothing.

SUPPLY OF CLOTHING TO THE AMERICAN EXPEDITIONARY FORCES

SUPPLY FROM THE UNITED STATES

Each of our soldiers who was sent overseas for service in the American Expeditionary Forces took with him certain articles of clothing prescribed by War Department orders. The more important of these were the following articles: Blankets, olive-drab, woolen, 2; breeches, olive-drab, woolen, pairs, 2; drawers, pairs, 3; gloves, pairs, 1; hat, 1; leggings, pair, 1; shirts, olive-drab, flannel, 1; shoes, pairs, 2; stockings, pairs, 4; undershirts, 3; overcoat, 1; poncho (or slicker), 1.

AUTOMATIC SUPPLY

That an adequate allowance of clothing, as well as all other articles needed by our soldiers, might be in the American Expeditionary Forces at all times, General Pershing decided in the summer of 1917 to establish a system of automatic supply.⁶ By this system, for each 25,000 men sent from the United States, there were to be shipped with them all necessary articles for a period of 90 days, and, in addition, one month's automatic supply for consumption and emergency. Thereafter, there was to be a monthly upkeep. In so far as the principal articles of clothing are concerned this automatic supply as finally evolved was as follows:⁷

TABLE 12.—Automatic clothing supply, American Expeditionary Forces

Article	Initial shipment (for 25,000 men)	Monthly upkeep (for 25,000 men)	Article	Initial shipment (for 25,000 men)	Monthly upkeep (for 25,000 men)
Breeches, olive-drab, woolen.....	750	500	Mackinaws.....	1,000	650
Boots, rubber, hip.....	10,000	1,500	Leggings, woolen puttee.....	12,750	8,500
Breeches, jersey-lined.....	500	150	Mittens, leather, one-finger, pairs.....	7,500	5,000
Caps:			Mufflers.....	1,200	300
Leather, motor cyclist, winter.....	250	100	Overcoats, olive-drab, woolen.....	4,000	2,500
Overseas.....	7,250	5,000	Ornaments, collar and cap.....	15,000	9,000
Coats:			Shoes, field.....	11,250	7,500
Olive-drab, woolen.....	10,000	6,500	Shirts, olive-drab, flannel.....	13,000	8,500
Fatigue.....	18,000	3,500	Slickers.....	5,000	3,500
Oilskin.....	5,750	500	Stockings:		
Drawers:			Woolen, light.....	37,500	25,000
Woolen, winter.....	15,000	10,000	Woolen, heavy.....	37,500	25,000
Su mmer.....	15,000	10,000	Trousers:		
Gloves:			Fatigue.....	20,000	5,000
Heavy leather.....	7,500	5,000	Olive-drab, woolen.....	13,000	8,500
Woolen.....	25,000	12,500	Oilskin.....	5,750	500
Hats:			Undershirts:		
Oilskin.....	5,750	500	Cotton.....	13,000	8,500
Fatigue.....	18,000	3,500	Woolen.....	13,000	8,500
Jerkins, leather.....	28,000	2,500			

TABLE 13.—Clothing shipped from the United States to American Expeditionary Forces, April 6, 1917, to November 11, 1918 *

Article	Number shipped overseas	Article	Number shipped overseas
Blankets.....	3,127,000	Shoes.....	9,136,000
Coats, wool.....	3,871,000	Stockings.....	29,733,000
Drawers, summer.....	3,889,000	Trousers and breeches.....	6,191,000
Drawers, winter.....	10,812,000	Undershirts, summer.....	4,567,000
Overcoats.....	1,780,000	Undershirts, winter.....	11,126,000
Shirts, flannel.....	6,401,000		

CLOTHING PURCHASED ABROAD

The above figures do not include all the articles of clothing supplied the American Expeditionary Forces. Early in 1918, because of a delay in obtaining clothing from home ⁹, it became necessary to place orders abroad for different articles of clothing. In April, 1918, the status of these foreign purchases of clothing was as follows: ¹⁰

* * * * *

8. Up to now, the British have provided for us 100,000 suits of uniform clothing, and we have on order from them, 100,000 coats and 200,000 pairs of trousers, which have not yet been delivered. We have also requested them to supply us with other articles of clothing as follows: 3,000,000 pairs of regulation ankle-type boots; 3,000,000 pairs woolen drawers; 1,500,000 woolen vests; 1,500,000 pairs woolen leggings; 6,000,000 pairs heavy weight woolen stockings; 6,000,000 pairs light-weight woolen stockings; 1,800,000 pairs of tartar-drab mixture No. 5 trousers; 1,440,000 tunics, same material as trousers, No. 5; 60,000 yards cloth for manufacture of caps; 1,500,000 olive-drab flannel shirts. No drawers, summer; undershirts, summer, or overcoats have been ordered.

9. We have purchased in France 1,007 pairs of rubber boots, exhausting the market. We have purchased no arctic overshoes.

10. We have purchased in England 800,000 pairs of woolen puttees, of which 200,000 have been delivered. We have not been able to purchase any woolen gloves in England, but have purchased 540,128 woolen gloves and gauntlets in France, all have been delivered and are mostly worn out.

11. We have purchased 100,000 pairs of field shoes from the British and have borrowed 100,000 pairs from the French. Request has been made on England for 800,000 pairs Rumanian shoes, but confirmation has not been received.

12. We have purchased 1,200,000 pairs of woolen stockings, light and heavy, assorted from the British and 600,000 have been delivered; balance indefinite. We have secured a small amount from the French, but can not purchase any more.

13. We have purchased 36,500 suits of oilskin of poor quality and high price. We have not been able to purchase any more oilskins; the French authorities will not permit us to purchase any textile fabrics of any kind.

14. We have purchased 200,000 uniform blankets from Spain, of which about 45,000 have been delivered. Five hundred thousand blankets were purchased in England; all have been delivered.

ADEQUACY OF CLOTHING IN THE AMERICAN EXPEDITIONARY FORCES

There were periods when divisions, or smaller organizations, of the American Expeditionary Forces, had an inadequacy of one or more articles of clothing (including blankets and overcoats).¹¹ This was especially true of organizations at the front, and during the six months from June to November, 1918, when rapid changes of position were being made. The difficulty was one of local transportation.¹²

There are no discoverable records that would enable us to indicate with any degree of accuracy the percentage of clothing replacement required by combatant divisions after their relief from the front line. However, because of the marked increase in the consumption of clothing by the First and Second Armies, during the time when they were actively engaged in combat, it was felt in the chief quartermaster's office, A. E. F., that the automatic supply was inadequate in the articles mentioned below.⁷ Had active operations continued, it would have been necessary to have made the following increases:⁷

TABLE 14.—*Inadequacies of the automatic clothing supply*

Article	Necessary increase of initial supply		Necessary increase of automatic supply	
	From—	To—	From—	To—
Belts, waist.....	3,000	3,500	2,000	3,000
Caps, overseas.....	7,250	8,000	5,000	6,500
Puttees.....			8,500	10,000
Shoes.....	11,250	12,000	7,500	8,000
Shirts, flannel.....	13,000	15,000	8,500	10,000
Trousers and breeches.....	13,000	15,000	8,500	10,000

The following figures show the rates of consumption per 25,000 men per month (averaged for the entire American Expeditionary Forces), during the period, July 1, 1918, to November 30, 1918, as compared with the average consumption per month during the period May 1, 1918, to March 31, 1919.¹³ These periods were chosen for the following reasons: The period July 1, 1918, to November 30, 1918, comprised the months of our greatest combat activities;¹⁴ the period May 1, 1918, to March 31, 1919, was chosen because it was for these months only that figures are available.¹³

TABLE 15.—Rate of supply and consumption of principal articles of clothing

Item	Automatic supply		Consumption	
	Initial	Monthly	July 1, 1918, to Nov. 30, 1918	May 1, 1918, to Mar. 31, 1919
Belts, waist.....	3,000	2,000	5,195	3,935
Boots, rubber.....	10,000	1,500	3,455	2,082
Breeches.....	13,000	8,500	13,653	13,195
Caps, overseas.....	6,250	5,000	11,635	9,501
Coats:				
Denim.....	18,000	3,500	4,280	3,160
Oilskin.....	5,750	500	512	384
Wool.....	10,000	6,500	10,670	8,220
Combination suits.....			151	109
Drawers:				
Summer.....	15,000	10,000		
Winter.....	15,000	10,000	* 35,437	* 20,509
Gauntlets, assorted.....	7,500	5,000	3,280	1,711
Gloves, wool.....	25,000	12,500	12,100	8,950
Hats:				
Denim.....	18,000	3,500	437	363
Oilskin.....	5,750	500	445	406
Jerkins, all kinds.....	28,000	2,500	4,455	3,320
Jumpers.....			522	330
Mittens, all kinds.....	7,500	5,000	1,316	1,773
Oilskin suits.....			26	31
Overalls, 1 piece.....	75	50	112	74
Overcoats.....	4,000	2,500	5,945	4,215
Puttees, spiral.....	12,750	8,500	16,365	12,802
Shirts, flannel.....	13,000	8,500	13,800	10,495
Shoes, field.....	11,250	7,500	15,450	11,100
Slickers.....	5,000	3,500	5,099	4,290
Stockings:				
Cotton.....				
Wool, light.....	37,500	25,000		
Wool, heavy.....	37,500	25,000	* 56,750	* 40,451
Tags, identification.....	7,500	5,000	11,901	7,386
Trousers:				
Denim.....	20,000	5,000	4,020	3,365
Oilskin.....	5,750	500	402	401
Undershirts:				
Summer.....	13,000	8,500		
Winter.....	13,000	8,500	* 35,195	* 21,017

* These figures include both heavy and light weight items.

CLOTHING ON HAND IN VARIOUS DEPOTS, A. E. F., NOVEMBER 15, 1918

In addition to the clothing in the possession of the different organizations in the American Expeditionary Forces, the following principal articles of clothing were on hand in the various depots on November 15, 1918,¹³ when the strength of the American Expeditionary Forces was somewhat less than 2,000,000 men:¹⁵

TABLE 16.—Articles of clothing on hand in various depots, American Expeditionary Forces, November 15, 1918

Article	Number on hand	Article	Number on hand
Boots, rubber.....	765,178	Oilskin suits.....	25,265
Breeches.....	1,678,397	Overalls, 1 piece.....	108,579
Caps, overseas.....	391,128	Overcoats.....	344,105
Coats:		Puttees, spiral.....	1,865,948
Denim.....	1,354,172	Shirts, flannel.....	1,815,040
Oilskin.....	45,904	Shoes, field.....	1,998,082
Wool.....	1,697,446	Slickers.....	432,403
Drawers:		Stockings:	
Summer.....	2,181,208	Cotton.....	94,585
Winter.....	4,971,991	Wool, light.....	4,187,693
Gauntlets, assorted.....	239,169	Wool, heavy.....	9,327,076
Gloves, wool.....	2,737,927	Tags, identification.....	1,998,839
Hats:		Trousers:	
Denim.....	437,536	Denim.....	1,520,094
Oilskin.....	59,768	Oilskin.....	18,465
Jerkins, all kinds.....	1,118,799	Undershirts:	
Jumpers.....	306,775	Summer.....	2,672,737
Mittens, all kinds.....	70,783	Winter.....	2,994,395

INDIVIDUAL CLOTHING ALLOWANCE

As mentioned elsewhere, each of our soldiers had, prior to July 15, 1917, a specified money allowance for clothing to be drawn by him during his current enlistment period.¹⁵ On and after that date, however, a soldier's allowance for clothing in our Army was the quantity necessary and adequate for the service upon which he was engaged.¹⁶ Under such circumstances, and in order that due economy would be observed in the American Expeditionary Forces in respect to the use of clothing, as well as supplies, materials, and other equipment, commanding officers were charged with the duty of seeing that neither men nor organizations of their commands practiced waste, made misuse of the supplies furnished them, or accumulated a surplus thereof.¹⁷ Organizations demanding much in excess of the average amounts required by other like units, under similar conditions, were investigated, with the view to disciplinary action being taken in the event of there being waste, misuse, or accumulation.

In respect to the number of the different articles of clothing each of our soldiers was supposed to have in his possession, mention has been made previously of the fact that the table of fundamental allowances governed. In the late summer of 1917, a board of officers was convened in the American Expeditionary Forces, to consider the subject of providing against severe weather conditions during the service of our troops in France.¹⁸ Based on the recommendations of this board, the following changes were made in table of fundamental allowances: The allowance of blankets per man was increased from 2 to 3, arctic overshoes were authorized for issue to enlisted men for wear on occasions when rubber boots were not suitable, and the use of leather gloves or one-finger mittens was authorized in winter. In January, 1918, to insure an equitable distribution of clothing in the American Expeditionary Forces, the following instructions were promulgated:

HEADQUARTERS AMERICAN EXPEDITIONARY FORCE, C. S. G. S.,

France, January 4, 1918.

From: C. in C.

To: C. G. 1st Division, C. G. 2d Division, C. G. 26th Division, C. G. 41st Division, 42d Division.

Subject: Equitable distribution of clothing.

1. If you have not already done so, it is desired that each company commander have an equitable distribution of clothing made on the following basis: 2 breeches, wool, olive-drab; 2 coats, wool, olive-drab; 3 pairs drawers, wool; 1 pair gloves: 1 hat, service, or cap; 2 pairs leggings, woolen puttees or canvas; 2 shirts, olive-drab; 2 pairs of shoes; 5 pairs socks, wool; 3 undershirts, wool; 1 overcoat; 1 slicker; 3 blankets.

2. All serviceable or unserviceable clothing should be turned in to the regimental supply officer, who will make an adjustment in the regiment. The same thing done in brigades and in divisions. If a surplus remains same should be turned over to the nearest Q. M., L. of C., who will report by wire to the Chief Q. M., L. of C., amount of serviceable articles so received.

3. If a shortage develops, wire the chief Q. M., L. of C., for articles desired, stating sizes. It is believed that there is an accumulation of clothing in the barracks' bags of enlisted men; therefore, the amounts of the foregoing as noted on service record of each man should be checked against the amount on hand. If any article is missing, disciplinary action should be taken.

4. In the future all inspectors will ascertain if these allowances are adhered to; and where an excess is found on hand, disciplinary measures will be taken with organization

commanders. It must be distinctly understood that all these articles are the property of the Government and when worn out must be turned in and can not be disposed of in any other way.

SUPPLY OF CLOTHING TO TROOPS AT THE FRONT

For troops at the front, supplies of all kinds were divided into four classes.¹⁷ Class 2 comprised clothing, blankets, overcoats, slickers, ponchos, bed sacks, and brassards. Until the latter part of May, 1918, when an improved system was instituted, these supplies were obtained from the advance depots in the following manner: Requisitions were submitted by company commanders. These requisitions, having been consolidated and approved by regimental commanders, were checked by the proper staff officer and were sent (through G-1, division or corps, or G-4 for army troops), directly to the proper advance depot, which filled the requisition. From the advance depot the supplies were shipped through the regulating station to the railhead, which usually coincided with the refilling point, where the train was promptly unloaded and the supplies required for the troops were immediately transferred to division trains or were put under cover for issue the following day.

In the latter part of May, 1918, the chief quartermaster, A. E. F., made arrangements to exchange new, or serviceable, clothing for unserviceable clothing of divisions at the front, without requisition.¹⁸ To do this it was necessary to ship supplies of all kinds of clothing to the railheads, which were the closest points of storage to the organizations at the front. From the railheads the clothing was carried forward to the divisions by whatever conveyance available, and it was distributed directly to separate supply officers, the exchange for unserviceable clothing being made at the same time. By this system the time required for troops to obtain clothing was considerably reduced.

In addition to the above modification of the routine system for supplying clothing to troops at the front, arrangements were made in the spring of 1918 for the exchange of clothing at the front, in connection with the bathing and delousing service of divisions.¹⁹ Clean underclothing was to be furnished in all cases after bathing, and, where necessary, serviceable uniforms were to be exchanged for unserviceable ones.

SUPPLY OF CLOTHING TO TROOPS IN THE SERVICES OF SUPPLY

Units in the Services of Supply, in the rear of the advance section, obtained their clothing directly from supply depots on requisitions sent directly to the depots.¹⁷

When men were sent from the front to hospital in the Services of Supply, they were returned to the front, when their physical condition warranted it, through replacement divisions.²⁰ Upon discharge from hospital, soldiers were furnished such clothing as was necessary for their use until their arrival at replacement divisions, or other designated points to which they had been directed to report, where their equipment was completed. Enlisted men forwarded to organizations from replacement and base divisions, base depots, or other designated supply points, were provided, before leaving, with full individual equipment, including clothing.

ARTICLES OF THE UNIFORM

SERVICE COATS

In 1917 two kinds of service coats were issued to our Army. These were the cotton (khaki) and the olive-drab woolen coats.²¹ Though some cotton (khaki) uniforms were sent to the American Expeditionary Forces²² khaki clothing was not worn by our Army in France.²³

The woolen coat which was issued in 1917 was made of a 16-ounce melton, with a luster serge body lining and a silesia lining for the sleeves.²⁴ In the winter of 1917-18 the weight of the coat proved to be too light for comfort, and

in January, 1918, the chief quartermaster recommended that the cloth be made of a 20-ounce melton.²⁴ The serge lining of the coat of 1917 was not desirable in active service in the American Expeditionary Forces, and it was recommended that the lining of both body and sleeves should be substituted by a thoroughly shrunken cotton drilling of an olive-drab color and an 8-ounce or 10-ounce weight.²⁴

Subsequently, when these changes were effected, the increased consumption of wool, made necessary by increasing the weight of the uniform, as well as the overcoat, shirts, and blankets, to be considered later, in turn made it necessary to use goods of wool previously made only into coarse material like carpets.²⁵ The lower grades of wool were blended with the finer grades to provide the necessary weight and warmth, even at the expense of fineness of texture



FIG. 23.—Uniform of Infantryman, A. E. F., showing economical pattern.

and appearance.²⁵ This explains why at the end of the period of hostilities some of the American soldiers' coats looked rough and uneven in color; however, the necessary cloth was provided and it was warm.²⁵

Because of the necessity for conserving wool to the greatest extent possible, our uniform coats during the World War were cut on patterns which, though they did not depart materially from the former general cut of the coat, were made on economical lines. When compared with the coats of foreign armies with which our troops came in contact overseas, this economically made coat suffered by the comparison.²⁵ General Pershing therefore recommended a better-appearing service coat. A new coat was then designed in which the

lines gave the effect of slimness without any sacrifice of the warmth or comfort previously obtained.²⁵ The patch pockets of the original coat, having no reserve space, became unsightly bulges when filled with articles a soldier usually likes to carry with him. On the new coat the patch pocket existed in appearance only, for the pocket was on the inside. The new coat was not produced in time to be of use in the American Expeditionary Forces.

In 1917 the service coat was obtainable in the varying sizes shown below. In order to approximate the required number of these sizes a tariff was issued. The table following shows sizes, tariff, and measurements of the service coat when we entered the World War:²¹

TABLE 17.—*Sizes, tariff, and measurements of the service coat, wool, at the beginning of the World War*

Size	Proportion per 1,000	Measurements, in inches			
		Breast	Waist	Length	Collar at bottom
1, regular	16	33	29	26	15
2, regular	34	34	30	26½	15½
3, regular	73	35	31	26¾	15¾
3½, long	51	35	30	27¾	15½
4, regular	156	36	32	27¾	16¼
4¼, stout	37	36	34	26¾	16½
4½, long	106	36	31	28¾	16
5, regular	130	37	33	27¾	16¾
5¼, stout	30	37	35	27¾	17
5½, long	98	37	32	28¾	16½
6, regular	79	38	34	28¾	17¼
6¼, stout	23	38	36	27¾	17½
6½, long	53	38	33	29¾	17
7, regular	41	40	36	29¾	17¾
7¼, stout	16	40	38	28¾	18
7½, long	25	40	35	30¾	17½
8, regular	18	42	39	29¾	18½
9, regular	14	44	41	30¾	19

Giving a coat of a certain size a designating number, as was required when we entered the World War, proved to be impracticable when large numbers of men were to be fitted. These numbers, representing sizes, could not be readily translated into inches when soldiers secured their clothing, consequently many instances arose where men obtained improperly fitting coats, and spent hours or days thereafter trying to obtain more nearly correctly fitting ones by exchange among their comrades.²⁶

Various efforts were made to solve the fitting problem. The labels originally used were merely paper tags pinned to the garments, and in the handling of the garments by men unfamiliar with the fitting of ready-made clothing mistakes often resulted. As in the case of ready-made civilian clothing, clothing for the Army was divided into classes—regular, long, and stout. By reference to the table given above, it will be seen that not all sizes had all classes; however, each size was one of the three classes. For each class a colored label was attached to the coat. Thus a label marked red indicated a "long," and yellow showed the garment to be a "stout."²⁶

Systems for facilitating securing the proper sizes of coats by means of marks and labels, however, proved not entirely satisfactory. Particularly was this true in the American Expeditionary Forces, where the salvaging of clothing

was extensively practiced. In consequence, before hostilities ceased, it came to be considered that the only adequate means that would insure a soldier's obtaining a garment as nearly satisfactory in fit as possible was to have him try on garments until one was obtained that fitted.²⁷

BREECHES

In 1917 issue woolen breeches for our Army were of two classes: Foot and mounted.²¹ The same pattern was used for both the foot and the mounted breeches, the only difference between the two being the reinforcement of the seat and the inner side of the leg of the mounted breeches for prolonging their wearing qualities. The service uniform, which was the only uniform designated for the American Expeditionary Forces, did not comprise trousers.²⁸ However, as will be mentioned later, trousers were considered for replacing breeches.

As was the case with the service coat, the weight of the woolen cloth in the service breeches proved to be too light for use in the American Expeditionary Forces. And in 1918, when the weight of the coat was increased, that of the breeches was likewise made a 20-ounce melton.²⁹

The breeches fitted tightly about the leg. This close fit was accomplished by lacing or buttoning them below the knee, and necessitated wearing some manner of legging or puttee.

In January, 1918, a board of officers, which had been appointed at General Headquarters, A. E. F., with a view to making recommendations regarding types of clothing for which contracts were to be placed for the winter of 1918-19, recommended that in place of the breeches then in use in the American Expeditionary Forces, long trousers with medium narrow leg similar to the British Army issue be adopted; the trousers to be habitually worn with a spiral woolen puttee.³⁰ This type of leg covering had been found by the British and by the French to be the most satisfactory and efficient for the soldier, and it was recommended by the board that all our foot troops be uniformed in that manner. Trousers obviated the constriction which breeches caused, and on certain occasions permitted the soldier to discard his puttees. Later in the World War the manufacture of breeches was abandoned in favor of trousers.³¹

Breeches were issued in 32 different sizes, which represented varying combinations of waist and inseam measurements. The waist measurements ranged from 30 to 42 inches; the inseam measurements from 26 to 31 inches. Under active service conditions in the American Expeditionary Forces, with breeches supported by belts, experience proved that there was no practical difference, either in comfort or in appearance, whether breeches were an inch too large in the waist or an inch too long in the seam.³⁰ Therefore General Pershing recommended in January, 1918, that 15 of the then 32 breeches sizes be omitted.²⁴

OVERCOAT

The olive-drab overcoat that was a part of the uniform of our Army in the spring of 1917 was made on a pattern that had been adopted by the War Department in 1913.³² It was double-breasted, had a standing, rolling collar, and was made in 10 different sizes, varying in length from 48 to 54 inches, and

in breast measurement from 34 to 44 inches. A slit was made in the back of the skirt, which normally was kept buttoned. At the back of the waist there was a cloth strap on each side which when buttoned together gave the back of the coat a snug fit. There were two outside welted pockets, one on each side, with perpendicular openings. Opposite these openings were slits in the lining of the coat which permitted access to the pockets of the trousers. The outer fabric of the overcoat was a 30-ounce, olive-drab melton; the lining was an olive-drab cotton cloth; the interlining, extending down the back and front from the collar seam to the lower buttons, was canton flannel.



FIG. 24.—Long-skirt pattern overcoat



FIG. 25.—Short-skirt pattern overcoat

In the summer of 1917, a short-length pattern for the olive-drab overcoat was adopted.²³ This coat did not differ materially from the 1913 pattern for the olive-drab overcoat except in the lengths of the different sizes, these lengths now ranging from 38 to 44½ inches, representing a shortening of 10 inches for each size.

In the American Expeditionary Forces the 30-ounce melton of which the overcoat was made proved too light a material for comfort;²⁰ so, in the spring of 1918 a 32-ounce melton was specified for the manufacture of the olive-drab overcoat.²⁹

To protect members of the American Expeditionary Forces in Siberia from the excessive cold of the winters there special overcoats were provided.²⁹ These overcoats had a sheepskin lining, wool attached, and a shell of moleskin cloth or cotton duck, similar to overcoats used by miners and explorers in northern Alaska.³⁴ In addition, parkas were supplied.³⁵ A parka is an Alaskan, hooded overgarment, worn shirt fashion. Parkas supplied our forces in Siberia were of moleskin cloth, lined with sheepskin, and had a fur-lined hood. Sheep-lined, moleskin coats and parkas were also issued the American Expeditionary Forces stationed in the Vosges Mountains.³⁶



FIG. 26.—Clothing worn by our Siberian expeditionary forces

LEATHER JERKIN

In the fall of 1918 a leather jerkin was adopted as an additional article of clothing for issue to our Army.³⁷ The jerkin was a waistcoat of sheepskin or lambskin, lined with woven-woolen melton, kersey, or mackinaw cloth, of a weight varying from 26 to 32 ounces per lineal yard of 54-inch material. It was supplied in 6 sizes, numbered 1 to 6; number 1 being a 36, and number 6, a 46.



FIG. 27.—The leather jerkin

Though the jerkin was a late article of issue it proved a popular garment in the American Expeditionary Forces in the winter of 1918-19, and was frequently worn over the olive-drab coat in lieu of an overcoat.

FOOTGEAR

LEGGINGS AND PUTTEES

In 1917, canvas leggings formed a part of our enlisted men's uniform, for wear when breeches were worn.²¹ The canvas legging was of two kinds, foot and mounted, the differences being that the mounted legging was one-half inch longer than the foot legging and, in addition, its inner surface was leather faced to resist wear. The legging was fashioned so as to fit the leg snugly, and was fastened in front of the leg by means of a stay which passed through eyelets in both sides at the top and bottom; in the middle there were two eyelets on the inner side, whereas on the outer side there was hook, thus facilitating rapid lacing or removal of the legging.

Officers wore russet-leather or pigskin leggings with the service uniform, except that, unless it was otherwise prescribed, mounted officers and other officers when mounted were authorized to wear russet-leather boots instead, and in the field officers were authorized to wear canvas leggings or woolen puttees.²¹

In January, 1918, General Pershing recommended that the dismounted enlisted men of the American Expeditionary Forces wear the woolen puttee to the exclusion of the canvas legging.³⁸

The puttee adopted for wear in the American Expeditionary Forces in the spring of 1918 was a spirally wound legging similar to that which was in use in the British Army.³⁹ (See Fig. 23.) It was $4\frac{1}{4}$ to $4\frac{1}{2}$ inches wide and had a finished length, exclusive of its fastening tape, of 106 inches.⁴⁰

SHOES

Prior to the World War, the shoe issued to the enlisted men of our Army, and intended for use in the field, was known as the russet marching shoe.⁴ This shoe was machine sewed, had an upper of calfskin with the rough side turned in, and was lined with white duck. Though excellent in pattern, it proved short-lived when subjected to severe service in France.⁴¹ Similar complaints had been made in respect to the marching shoe in 1916,⁴² when a large part of our Army was serving on the Mexican border. At that time the Quartermaster General ordered the purchase of several hundred pairs of shoes and their issue to our troops, which conformed in pattern and substance, with minor modifications, to those furnished by American manufacturers to the French and Belgian Armies. The shoes so manufactured had a half middle sole in addition to the outsole, an iron heel plate, hobnails, and the uppers were made of chrome vegetable retanned cowhide, flesh side of the leather out.⁴³

In May, 1917, the modified field shoe was improved upon by the use of a full middle sole in place of a half middle sole, and the outsole was waterproofed.⁴³

The improved shoe, however, failed in one of its purposes in the American Expeditionary Forces; that is to say, because of the manner in which it was

constructed it failed to keep out water. Consequently, in January, 1918, after the Quartermaster General had called upon the chief quartermaster, A. E. F., for a report on clothing, preparatory to letting new contracts for clothing, the chief quartermaster, A. E. F., made the following remarks about the shoe then in use: ²⁴

The field shoe (trench shoe) in the main is satisfactory, but can be improved by having the upper leather changed from a chrome vegetable tannage well stuffed with tallow. Leather in the shape of backs rather than sides should be used in the manufacture, avoiding the danger of getting flanky leather in the uppers. The method of attaching the sole by the Goodyear welt process should be abolished. The present welt construction admits water through the stitch hole. The weight of the insole should be increased to 7 iron; the insole to be of best quality, reinforced with canvas. The middle sole should be of best quality, and the method of attaching the middle sole, upper and insole should be the clinched nail method. The outsole should then be attached to the middle sole by stitching the edge extending beyond the upper, and the work should be reinforced by nailing through the outsole, middle sole, and insole with one row of brass nails clinching on the inside. This will make a leak-proof joint. A toe plate, one-eighth of an inch thick at the toe and tapering to one-sixteenth of an inch at the ends covering the toe of the outsole, should be attached with a type of nail similar in shape to a horseshoe nail. This toe plate should be attached to all shoes on existing contracts. The heel lift next to the top piece should be of at least 8/48 substance and equal in quality to the top piece. The field shoe must be worn in large sizes. The present tariffs on shoes need revision, and a board has been appointed to revise existing tariffs on shoes and clothing.

These suggestions of the chief quartermaster, A. E. F., for an improved field shoe for the American Expeditionary Forces were accepted by a board of officers, appointed to meet at General Headquarters, A. E. F., in January, 1918, with the object of reviewing the chief quartermaster's recommendations and of submitting such additional recommendations as might be desired.³⁰ General Pershing approved the findings and recommendations of the board referred to and cabled the new shoe requirements to the War Department.⁹ When manufactured, this shoe was called the Pershing shoe.⁴⁴ A shoe was now available that would successfully keep out water. Nor did it seem to



FIG. 28.—Infantryman wearing canvas leggings

matter whether bark-tanned leather or chrome retanned leather was used in its manufacture. In an experiment in the American Expeditionary Forces, at the orthopedic training camp, St. Aignan, Loire-et-Cher, in the spring of 1918, a number of pairs of bark-tanned and chrome retanned shoes were issued to a group of men for observation purposes. The left shoe of each pair of shoes was treated with dubbing. During the period of observation, which lasted for a week, when the shoes were worn constantly through mud and water, each shoe worn proved absolutely waterproof, irrespective of the manner of tannage or treatment with dubbing. The thickness of the sole of the new shoe eliminated one objection which formerly obtained as regards the original trench shoe. In the trench shoe, when its sole was studded with hobnails, the metal of the hobnails, because of the relative thinness of the sole, was brought in close proximity to the foot which the shoe encased. Conducting the cold readily, hobnails made the foot feel colder than otherwise would have been the case.⁴⁶ The three-layer sole of the Pershing shoe gave not only a greater degree of insulation but an added waterproof quality as well, and, what was of even greater importance, a much longer life to the shoe. The British had been using a triple-soled shoe for their troops in the British Expeditionary Forces. Their replacement for this shoe was two pairs per man per year.⁴⁵ Compared with this consumption of footwear are the following figures regarding the shoe which the Pershing shoe replaced, reported by the division quartermaster, 1st Division, A. E. F.:⁴⁷

Fourteen thousand six hundred and eight men (Artillery and Infantry) drew an average of 3,849 pairs of shoes each month, not including the shoes brought overseas with the men, during the last half of the year 1917. This made a rough average of one pair of shoes for each man for each period of four months, despite every effort being made to keep the shoes repaired by means of fairly well equipped shoe repair shops in each regiment concerned.

BACKSTAYS

One of the weakest points in the trench shoe was the backstay. Here the shoe would rip after much wear, and likewise where the quarter was butted together at the back. This ripping was attributed generally in the American Expeditionary Forces to the friction wear of the bottom of the canvas legging. In an examination of hundreds of shoes that were considered beyond repair in the reclamation depot at St. Pierre de Corps, Loire-et-Cher, 60 per cent of the shoes examined were ripped apart on the inside where the quarters were butted together, and 40 per cent of the shoes showed a ripped backstay.⁴⁵ This ripping away was concluded to be due not to any wear of the legging but to the action of the heavy leather of the upper. In the Pershing shoe this vulnerable point of the shoe was strengthened by widening the backstay and by making there three rows of stitching where formerly there had been but two rows.⁴⁵

WEIGHT

Some objections were made that the increased thickness of the sole of the Pershing shoe made it too heavy for troops. These objections were not generally applicable, however, in the American Expeditionary Forces, since there was not that preponderance of marching usually associated with foot soldiers on campaign. Then, too, in actual tests of the shoe, made at the orthopedic

camp, St. Aignan, with the weight of the Pershing shoe and its flexibility especially in mind, it was determined that the "weight of the shoe was good for campaigning in France; that its flexibility was good for a shoe of this weight."⁴⁵ However, when the arctic was worn over the newer field shoe there could be no doubt that the combination could not be used for marching purposes. Also, it is appropriate, in this connection, to mention the fact that the usefulness of this shoe was considered applicable only to conditions which our troops met in Europe; and that with the passing of those conditions the use of the three-soled, heavy leather shoe was discontinued.⁴⁵

SHOE SIZE TARIFF

In the summer of 1917, the following shoe size tariff obtained for the guidance of officers concerned with the maintenance of exceptionally large stocks of shoes:²¹

TABLE 18.—*Size tariff per 10,000, russet shoes, during the summer of 1917*

Width	Size														
	5	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12
A.....	6	7	19	18	33	27	29	18	14	8	5	3	1	1	1
B.....	22	25	63	62	107	88	95	59	47	26	18	9	5	2	2
C.....	51	59	148	146	250	207	222	140	110	61	43	22	11	6	4
D.....	90	103	257	256	440	362	390	243	192	106	75	39	20	10	7
E.....	110	126	314	312	535	442	474	297	234	130	92	47	25	13	9
EE.....	68	78	194	193	330	273	293	183	144	80	56	29	15	8	6

This tariff did not supersede or take the place of size records which were kept by organizations;²¹ however, what was not taken into consideration when it was formulated was the fact that the Army could not be considered as one group. On the contrary, from an anthropological standpoint, the divisions which comprised the American Expeditionary Forces were, in a large measure, an aggregation of groups. Each of these groups presented marked differences as to foot measurements; for example, the 77th Division included in greatest number men from New York,⁴⁹ and since these men comprised in great part stock of Semitic origin, their statures being short and underdeveloped, necessarily their feet were materially below the average for the Army as a whole. Again, the 88th Division, comprising men from the Middle West of the United States, of native white and German and Scandinavian stock, possessed a mean stature above the mean stature for the United States,⁵⁰ and, necessarily, the foot measurements of the men of this division were above the average for the Army. The application of the shoe tariff (Special Regulations No. 40) to either of these groups could not result otherwise than in producing an excess of shoes too large for the 77th Division, and the reverse for the 88th Division.

Members of the American Expeditionary Forces, especially men in the field, during the greater part of the year, habitually wore two pairs of woolen socks, which necessitated wearing oversized shoes.⁵¹ In effect, this "stepped up" the sizes in the tariff of Special Regulations No. 40, and made the lowermost sizes and widths unsuitable for use in the American Expeditionary Forces; consequently, in the fall of 1917, General Pershing cabled to the War Depart-

ment to discontinue shipping shoes overseas of sizes 5 and 5½ and width A of all sizes.⁵² It was necessary, however, that larger sizes be provided than had formerly been done. This was recommended by the board of officers which met at General Headquarters in January, 1918, and referred to above. The revised shoe tariff as recommended by this board and as cabled to the War Department by General Pershing was as follows:⁵³

TABLE 19.—Proposed revised tariff for field shoes, January 31, 1918

Width	Sizes														
	6	6½	7	7½	8	8½	9	9½	10	10½	11	11½	12	13	14
B.....	5	5	15	19	29	23	34	20	25	15	13	20	17	1	1
C.....	15	25	85	86	183	120	135	90	77	42	27	22	17	3	2
D.....	56	86	148	225	425	508	501	198	120	55	69	24	13	10	7
E.....	53	83	257	311	614	452	515	300	223	156	94	73	38	20	8
EE.....	42	58	324	368	630	490	445	329	246	103	72	38	21	16	5

The revised shoe tariff does not give an adequate impression of the relationship in numbers of the sizes of shoes required by the American Expeditionary Forces. This is due to the fact that, when the tariff was prepared, there was in stock in the American Expeditionary Forces a surplus of small sizes.⁵⁰ It will be noted that the revised tariff carried no sizes 5 or widths A throughout the sizes, but that sizes 13 and 14 were asked for in small number. In the absence of exact information concerning the small sizes which were in stock in the American Expeditionary Forces in January, 1918, no intelligent comparison may be made of the old and the revised tariffs.

In the United States the Quartermaster General, in an effort to approximate a satisfactory shoe tariff for the American Expeditionary Forces, caused 6,300 men to be measured for shoes at Camp Upton, N. Y., in the early spring of 1918.⁵⁴ These men were properly fitted over two pairs of heavy woolen socks. In addition, other surveys and all available data were considered in preparing a new shoe tariff.⁵⁴

For our expeditionary forces which were sent to North Russia and to Siberia in the late summer of 1918, shoepacks (or lumbermen's boots), were supplied for winter wear.⁵⁵ During the winter 1918-19 in North Russia, this shoepack proved to be serviceable; however, as the snow melted and the ground became soft it was found that this footgear afforded no protection against dampness. Early in the spring of 1919 it was discarded, the field shoe then being worn to good advantage.⁵⁵

SHOE FITTING

In the American Expeditionary Forces the fitting of the soldiers' shoes was far from being satisfactory practically throughout the existence of these forces. Though in the United States a shoe-fitting apparatus was devised and was supplied to the Army in the United States in the latter part of the year 1918,⁵⁶ no such means were available to the American Expeditionary Forces. There the instructions covering shoe fitting were promulgated by the War Department in 1912.⁵⁷ Briefly these instructions of 1912 required that a sol-

dier's shoes should be fitted by a commissioned officer, preferably the company commander, who was to examine the fit of the shoe after it had been laced snugly, the soldier meanwhile having his entire weight, plus that of a 40-pound burden on his back, bearing on the foot being fitted. Several factors, however, served to prevent a satisfactory application of this system to the American Expeditionary Forces. Primarily, its success is dependent upon not only the experience but the interest of the individual supervising the fitting. In the rush of war activities, such as obtained in the American Expeditionary Forces, it is not surprising that one or both of these requirements frequently were missing. Also, occurrences were not infrequent when discrepancies between the shoe marks and actual sizes precluded a proper fitting even after the required sizes had been correctly determined. Then, too, after the salvaging of shoes was practiced size marks were frequently obliterated in the wearing of the shoes prior to their salvage, which left one in ignorance of their size when they were supplied to other than former wearers. To overcome the difficulty incident to size marks being erased by wear, the size of each Pershing shoe was cut part way through the leather of the upper.

During the winter of 1917-18 shoe fitting in the American Expeditionary Forces was at its worst. In the 1st Division it was reported that many of the men of that division during the month of December, 1917, had poorly fitted shoes which caused much foot trouble;⁵⁸ and in the 42d Division 90 per cent of the men of that division were reported as having poorly fitting shoes during the month of December, 1917, nearly all of the misfits being too small.⁵⁹ The cause of the poorly fitted shoes in the 1st Division was attributed to the fact that company commanders made requisitions for shoes that were too small, the fact that the shoes were too small being in part due to the custom of the men wearing more than one pair of socks to keep their feet warm.⁴⁷ In other words, company commanders were using foot measurements made in the United States, making no allowances in later requests for shoes for the wearing of additional socks or for the increase in the size of the foot through development. In the 42d Division, to ameliorate the condition, the division orthopedic surgeons in January, 1918, determined the required sizes of shoes for the men of that division and furnished the sizes to company commanders.⁶⁰ The general application of this means of fitting shoes soon tended to bring about very happy results where the question of shoe fitting was not complicated by shoe schedule considerations. This is demonstrated in subsequent monthly sanitary reports of various divisions of the American Expeditionary Forces. For example, in July, the surgeon, 5th Division, reported that shoe fitting in that division was excellent on the whole, although too many instances existed where shoes had been found to be too small.⁶¹ An inspection of sanitary reports after this period discloses the fact that where shoes of American make were available to the American Expeditionary Forces no difficulties were experienced in properly fitting them. On the other hand, where it was necessary to supply to divisions of the American Expeditionary Forces, shoes from our Allies, as for example, the British, it was next to impossible, because of the pattern of the shoe, to fit them to our men.⁶²

Because of the material shortage, and of the changes in the field shoe with consequent changes in machinery with which to manufacture the shoes, there was not, during the year 1918, an adequate shipment of field shoes to our overseas forces. To meet this shortage, shoes were borrowed from the French and from the British Governments, and in the spring of 1918 an order was placed with the British for several million pairs of shoes for the American Expeditionary Forces.⁶³

British shoes very generally gave little satisfaction to our troops. The British shoe was constructed on a last which differed quite materially from that on which our field shoe was made so that much difficulty was experienced in the American Expeditionary Forces in getting a proper fitting.⁶⁴ In the British shoe, which had a full quarter pattern, it was difficult to obtain a proper fit for our men at the back of the shoe; large wrinkles formed in the shoe above the counter and gave rise to abrasions on the foot, especially over the tendo Achilles. In the march of our Third Army to the Rhine after the armistice many of the men, especially of the 42d Division, had British shoes issued to them. These shoes, it was claimed, contributed to a large number of foot troubles that had to be taken care of at the end of each day's march.⁶⁵

WATERPROOFING SHOES

The shoes first sent to the American Expeditionary Forces were not waterproofed. This fact has been referred to in the discussion of the changes in the quality of the shoes which were later made. To overcome this fault, in so far as the 1st Division was concerned, a board was appointed in the 1st Division in the winter of 1917-18.⁶⁶ As at that time a prepared dubbing was not furnished by the Quartermaster Department, which was the case later, the board made use of a combination of beef tallow and neat's-foot oil, the proportion finally decided upon being one-third tallow and two-thirds neat's-foot oil. The process used in waterproofing the shoes was as follows: Thoroughly dry shoes were set in a pan containing a warm mixture of neat's-foot oil and tallow, 1½ inches deep, in the proportions given, and were allowed to remain therein about 15 minutes. The uppers of the shoes were then thoroughly coated with the warm waterproofing mixture by means of a brush, and the mixture was rubbed in by hand. In most instances one such treatment resulted in a very satisfactory waterproofing, and invariably a second similar treatment completed the waterproofing of the shoes, rendering them so soft and pliable as to materially increase the comfort with which they were worn.

When the field shoe of 1917 was replaced by the metal-fastened shoe of 1918, the specifications for the manufacture of the new shoe required that the leather be dubbined in the process of manufacture.⁶⁶

RUBBER BOOTS

For wear in places where soldiers of the American Expeditionary Forces were required to stand or walk in water, rubber boots were issued. This applied particularly to the trenches. The rubber boot furnished our Army when we entered the World War was of the same construction that had been used previously in civil life for a period of about seven years.⁶⁷ At this time

both the British and French Armies were using the same type of boot, and though it did not prove satisfactory for wear under the usual conditions met in trench warfare, no changes had been made in its construction.

In civilian use the rubber boot ordinarily is worn intermittently. The contrary was the case in trench warfare in Europe where frequently rubber boots were worn for weeks at a time, no opportunity being afforded to permit a drying out of the interior of the boot.⁴³ It was not an unusual thing for the interior of the boot to be as wet as the exterior. This wetting of the interior, as well as the moisture from perspiration, caused a rotting of the inner fabric of the boot lining. With this vital part gone, the boot readily was torn and was no longer serviceable, since this type of defect could not be repaired.

In the early winter of 1917-18 representatives of the Quartermaster Corps, A. E. F., made an examination of rubber boots as they were received in a repair shop of the British Expeditionary Forces, and the defects of the worn boots were studied from the standpoint of manufacture with a view to obtaining an improved boot for the use of the American Expeditionary Forces.⁴³ Not only was the lining defect noted but it was found also that the rubber boot then in use was prone to break between the sole and the upper, and to snag in the instep. Improvements for these conditions were recommended by a board of officers which met at General Headquarters, A. E. F., in January, 1918. In detail the recommendations of this board were as follows:⁴⁰

1. In place of the present fusion lining of the leg and tan net lining of the vamp, substitute duck, impregnated with gum, making the boot waterproof inside as well as outside. This will prevent the rotting of the lining, which is such a marked defect in the present boot.
2. Under the insole, place a form sole of Langley, under side calendered with gum, and extending three-eighths of an inch up over the lining, making with the waterproof lining an interior absolutely waterproof.
3. Reinforce shank and toe with Langley toe strips, preventing the breaking of the upper, just above the sole.
4. Extend front stay and ankle piece to joint of top and leg, just above the present front stay.
5. Change the seam on the hip top from the inside of the leg to the back or outside of the leg, preventing the seam opening up when chafed.
6. Substitute, if possible, a metal ankle-strap loop which would resist abrasion of trench boards and to resist wear.

These changes, with several minor modifications, were adopted in the manufacture of the new rubber boot for the American Expeditionary Forces.⁴³

OVERSHOES

During the winter of 1917-18 an arctic overshoe was issued to the American Expeditionary Forces for wear under exceptional circumstances. This overshoe was rubber soled and had a waterproofed cashmerette upper, the foot of which was closed by means of straps and buckles. For ordinary wear overseas this overshoe proved unsatisfactory.⁴⁰ Its constant use in mud and water stained its outer fabric, and rotted the cloth covering, thus rendering the overshoe useless in a very short time.

The sizes of the arctic overshoes ranged from 6 to 13, inclusive, with no variation in widths for the separate sizes.²¹

As the arctic was worn over the hobnailed shoe in the American Expeditionary Forces, it was essential that the overshoe have considerably more foot room than had formerly obtained; also, and because of the hobnails, it was equally important to have within the overshoe an insole capable of resisting their abrasive action.

The modified overshoe, based on changes recommended by the chief quartermaster, A. E. F., in January, 1918,⁶⁷ was called a four-buckle gaiter. The outer vamp and the quarter of this gaiter were made of duck, frictioned on both sides, replacing the old cashmerette. Within was an insole of chrome leather treated to resist the abrasive action of the hobnails. To permit the new overshoe to be worn over the hobnailed shoe, a new last was developed.⁶⁸

MOCCASINS

Moccasins were furnished the American Expeditionary Forces for wear inside of rubber boots. These moccasins were made of thin, soft leather comprising a sole and an upper, and were fashioned to lace snugly in front.⁶⁹ The leather of the sole was either of soft, chrome-tanned horse butts, split to a thickness of from 2 to 3 mm., or of a dry, chrome-tanned cowhide shoulder, 2 to 2½ mm. in thickness.

Moccasins were furnished in sizes 7 to 15; the upper of each pair having stamped on it in letters one-half inch high: "To be worn inside of corresponding size of rubber boot."

Wearing moccasins inside of rubber boots did not prove practicable, and in May, 1918, the chief quartermaster, A. E. F., recommended that no more be issued.⁷⁰

STOCKINGS

Woolen stockings only were issued to the American Expeditionary Forces, these comprising both light and heavy woolen stockings.⁷¹ The light woolen stocking was supplied in sizes from 9½ to 12, and the heavy woolen stocking from 9½ to 11½.²¹ Heavy woolen stockings were the more popular among the enlisted men of the American Expeditionary Forces, the number shipped overseas during the fiscal year ending June 30, 1919, being 22,789,121, as against 6,954,094 light woolen stockings furnished the American Expeditionary Forces for the same period.⁷¹ In use, the heavy woolen stocking proved suitable. It was found, however, that the schedule of sizes, existent in 1917, did not provide for exceptionally large stockings, in view of the fact that two pairs were constantly worn during the winter. In consequence, General Pershing recommended in January, 1918, that sizes 12, 13, and 14 be added to the tariff of sizes for woolen stockings.³⁸

Because of the cold and the wet experienced by the American Expeditionary Forces, the question of stockings for the men was given primary consideration. Particularly was this true during the winter of 1917-18, when trench warfare obtained, and a consequent liability for the incidence of trench foot among such as were located in the trenches at the front. A general order, issued from General Headquarters, A. E. F., in January, 1918,⁷² prescribed that each man, before marching to a forward area, have supplied to him three pairs of serviceable woolen stockings; and that, to insure each man at the front having at least

one change of stockings each day, arrangements were to be made for the delivery of dry stockings at the front and for the return of wet ones to the drying rooms at the rear.

WATERPROOF OUTER CLOTHING

In 1917, new types of raincoats, both foot and mounted, were produced for our Army to replace the old types of poncho and slicker.⁷³ Efforts to supply the Army with these new raincoats met with much difficulty due to the fact that there was not a sufficient manufacturing capacity in the United States to meet the requirements; consequently, available stocks of commercial raincoats were purchased, on the theory that even a poor quality waterproof outer garment was better than none.⁷⁴

The 1917 raincoats were made of rubberized cotton sheeting. In the American Expeditionary Forces they proved unsatisfactory; that is to say, they would readily shed water for short periods and when they were in good condition, but they did not meet the severe test to which they were put in France where our men had to wear them for hours in hard rains.⁷⁵ When the coats became thoroughly wet they retained the moisture for a long time and could not be dried readily. Besides, an examination of a number of them that had been turned in to the salvage depots in the American Expeditionary Forces showed that they were too easily torn even after having been worn for only a relatively short time.

Oilskin raincoats in the American Expeditionary Forces proved to be short lived, because the waterproofing was quickly worn off the surface of the coats, and they easily became torn. Though it had been claimed these coats would not stick together, such proved to be the case in the American Expeditionary Forces, where many oilskin raincoats were received in the salvage depots so adherent to one another as to be unfit for use when separated. Then, too, it was found that the waterproofing surface frequently was prone to harden and crack, thus rendering the garment unfit for water shedding purposes.⁷⁵



FIG. 29.—Overseas cap

HEADGEAR

Our first troops that went to France were supplied with the service hat, a wide and stiff-brimmed, felt hat, the crown of which was worn peaked.⁷⁶ The service hat proved to be impractical for wear by troops in the field overseas, however, and in January, 1918, General Headquarters, A. E. F., published instructions covering the adoption of the "overseas cap," as a part of the uniform for officers, soldiers, and other uniformed members of the American Expeditionary Forces.⁷⁷

For enlisted men the cap was made of 20-ounce olive-drab cloth, with no show of color on the cap. For officers the cap was made on the same pattern as that for enlisted men, and of a material to match the officer's uniform. Stiffening of the flap, showing in the way of piping around the flap, corresponded in color to the color of the officer's arm of service, except in the case of a general officer. Caps for general officers had a narrow strip of gold braid around the edge of the flap.⁷⁷

In order to make use of the service hats which had been brought to France, General Pershing authorized the wearing of them in the base and intermediate sections of the American Expeditionary Forces, when thought advisable by commanding officers.

From a utilitarian standpoint the overseas cap served its purpose. It was small, adhered closely to the head, and folded compactly when not worn. It did not entirely escape criticism from a sanitary standpoint, however: because it was brimless it afforded no protection against rain driving in the face, it could not prevent water, from the rain, trickling down the wearer's neck at the back, and when the sun shone, the cap did not keep the sun's glare from the wearer's eyes.⁷⁸ The standard cap was made of a 20-ounce melton, with no waterproof qualities, consequently, after being wet it shrank and dried out with difficulty.⁷⁹ In view of these objectionable features about the cloth, and especially because of the lack of adequate wool at the time, a new overseas cap was designed, made of a rabbit fur felt. This improvement in the overseas cap came at the end of the war, however, and it was not used.

The steel helmet, the real reason for our adoption of the overseas cap, was worn by all troops at the front. (See Fig. 20.) When we entered the World War we had no distinctive steel helmet of our own, and because the British type of helmet offered fewer difficulties in the manufacture than any other available type, we purchased several hundred thousand British steel helmets.⁸⁰ Afterwards, this type of helmet was adopted by us for production, but we originated our own lining.⁸¹ The lining was woven of cotton twine in meshes three-eighths of an inch square. This web, fitting tightly upon the wearer's head, evenly distributed the weight of the 2-pound helmet, and in the same way distributed the force of any blow upon the helmet. The netting, together with a small piece of rubber around the edge of the lining, kept the helmet away from the head, so that even a relatively large dent could not reach the wearer's skull.

In the latter part of the summer of 1918, when we sent expeditionary troops to Siberia, fur caps, made of muskrat, with ear flaps, were furnished for members of this expedition for winter wear.⁸²

WINTER CAPS

Prior to the World War a winter cap was issued to our troops for wear by officers and enlisted men in cold weather when not at formations, and when prescribed for wear by commanding officers.⁷⁶ This cap was made of shelter-tent duck, lined with 16-ounce olive-drab felt. It had an extension forming

a cape which when fastened in front afforded protection for the whole of the head, except a space in front for visual and breathing purposes.⁸³ A stock of winter caps was maintained in the American Expeditionary Forces,⁸⁴ for wear by our troops stationed in the Vosges Mountains during the winter months,⁸⁵ where considerably lower temperatures were encountered than elsewhere in France.

WOOLEN TOQUES AND MUFFLERS

In January, 1918, the chief quartermaster, A. E. F., recommended that woolen toques be supplied the American Expeditionary Forces for wear, under the steel helmet, during cold weather.⁸⁶ Knitted woolen toques, stocking caps, then became an article of equipment for our troops overseas, only to be almost immediately discontinued in use as such.⁸⁷

Later when it was decided to provide drivers of automobiles and motor trucks in the American Expeditionary Forces with woolen mufflers, the abandoned toques were sewn together to make mufflers.⁸⁸

MOTORCYCLIST'S CAP

In June, 1918, a winter cap for motorcyclists of our Army was adopted.⁸⁶ This cap was made of specified jerkin leather, and had an eiderdown lining. It had a leather shawl or neckpiece which was 6 inches deep at the front, tapering to $3\frac{1}{4}$ inches at the center of the back; also there was a soft leather visor which could be turned up or down. Earpieces, 3 inches long and $1\frac{1}{2}$ inches wide, were attached to the shawl. Under each ear tab was a hole, three-eighths inch in diameter, for ventilation. The cap was supplied in six sizes, from $6\frac{7}{8}$ to $7\frac{1}{2}$; however, all caps were cut one size oversize.

In December, 1918, the motorcyclist's cap was modified somewhat.⁸⁷ The lining of the shawl was changed to cotton jersey fleece, and goggle straps were placed about 2 inches from each end of the visor. The sizes also were changed to 7 to $7\frac{3}{4}$, all sizes one oversize.

FLANNEL SHIRTS

The olive-drab shirt issued to our troops in 1917 was made of shirting flannel, and had a rolling collar.⁸⁸ It was fitted with two outside breast pockets, about $6\frac{1}{2}$ inches wide and 7 inches deep, intended for carrying small articles when the coat was not worn.

As was the case with other articles of clothing supplied at first to the American Expeditionary Forces, the flannel shirt proved too light for comfort under the weather conditions experienced in France. In January, 1918, General Pershing recommended to the War Department that it be increased 10 to 15 per cent in weight; that it should be closely woven, and contain at least 60 per cent of wool.⁸⁹ Subsequently, in 1918, shirting flannel for the olive-drab shirt was increased from $8\frac{1}{2}$ -ounce to $9\frac{1}{2}$ -ounce material.⁸⁹

The olive-drab shirts were made in six sizes, numbered from 1 to 6; their collar measurements were 15 to 19, including one half-size.⁸⁸

UNDERWEAR

The underwear for the enlisted men of our Army, in the spring of 1917, comprised wool knit undershirts, cotton knit undershirts, and knit, cotton-flannel, or jean drawers, to be worn according to climatic conditions.⁷⁶ These articles of underwear were standard. The supply of them on hand, however, was inadequate for the troops in the Army during the winter of 1917-18, nor had there been time since our declaration of war for manufacturers to knit a sufficient amount of woolen underwear.⁹⁰ Consequently, it was necessary to procure whatever ready-made, heavy underwear the markets of the United States afforded. As a result, our enlisted men during the winter of 1917-18 wore heavy underwear of various kinds and grades of merit. The experience was not without some value, since it gave to officers at the War Department concerned with the procurement of clothing an excellent conception of how woolen underclothing ought to be made. For example, a great deal of fleece-lined underclothing was issued. In a study which was made of the causes of common colds it was found that soldiers wearing fleece-lined underclothing, other things being equal, caught cold more frequently than did men wearing any other sort of underclothing. The fleece of the lining absorbed perspiration, retained it, and stayed damp. Because many soldiers slept in their underwear, they were enveloped in a damp layer of clothing the greater part of the 24 hours.⁹⁰

In December, 1917, the War Department adopted two kinds of underwear, wool and cotton flat-knitted, and wool and cotton ribbed.⁹¹ Each kind was of two grades, one containing 50 per cent wool and cotton, the other 40 per cent wool and 60 per cent cotton. Both undershirt and drawers had rib cuffs about $4\frac{1}{2}$ inches long, sewed to the sleeves or legs, as the case might be, with a seam as elastic as the cloth. The undershirts were furnished in sizes from 34 to 46, each size representing in inches the circumference of the shirt below the arm holes; and the drawers were in eight sizes, from 30 to 44, each size being the waist measurement in inches.

For the American Expeditionary Forces no winter underclothing containing less than 50 per cent wool was wanted.³⁰

GLOVES

Three kinds of gloves were regularly issued to the United States Army at the beginning of the World War in 1917.⁴ These were yellow, horsehide gloves, for each member of machine-gun companies; leather riding gloves, for each mounted man only; olive-drab woolen gloves, for winter use, for dismounted duty only. In the American Expeditionary Forces much manual labor necessarily was performed by the troops, and in the winter of 1917-18 with the woolen glove only available for wear while performing this duty this glove soon proved to be not serviceable. In consequence, a board of officers which met at General Headquarters, A. E. F., in January, 1918, recommended that a serviceable leather mitten, with a separate place for the forefinger, to be worn over the woolen glove, be issued.³⁰ Before this recommendation could be acted upon at the War Department it was determined

that, since there was not available in the United States sufficient machinery to manufacture the seamless, olive-drab woolen glove in the numbers needed,⁸⁹ substitutes would have to be adopted. Therefore, in February, 1918, the woolen glove was discontinued as an article of issue, and a canton-flannel glove⁹² and a canvas gauntlet,⁹³ both having leather-lined palms, were adopted, with a view to furnishing a hand covering that would be warm and at the same time resistant to wear. The glove and the gauntlet were made of brown canton flannel, weighing 9 to 10 ounces to the square yard; they were lined by a cotton jersey cloth of a similar weight, and the palm and thumb of each were faced with split leather. For the glove there was a wristlet of knitted tubing; whereas the gauntlet had a stiff, flaring cuff with a wristlet inside. The hand part of the gauntlet differed from that of the glove in that it was cut on a one-finger-mitten pattern. There was but one size for both the glove and the mitten; the measurements of the hand part being 8 inches from the top of the middle finger to the wrist and $4\frac{3}{4}$ inches across the palm above the thumb.

Since the glove desired by the American Expeditionary Forces was one which, though of similar material, was unlined and was cut on a pattern sufficiently large to permit wearing it over the woolen glove, these styles which have just been described could not answer the purpose; consequently, in April, 1918, new styles were adopted by the War Department. The canton-flannel glove with the palm and thumb leather facing was discarded for a glove of a somewhat similar style, but wider in the palm to permit its being worn over a woolen glove, and having a cuff, cut without flare, and a wrist strap.⁹⁴ The canvas gauntlet with leather palm was likewise discarded for a one-finger, canton-flannel mitten that had a cuff, without flare, and a wrist strap.⁹⁵ Because these newly adopted articles of hand covering were intended for wear over woolen gloves, the jersey lining, which the patterns they superseded had, no longer was used. Reference has been made above to the fact that the olive-drab woolen glove was discontinued as an article of issue in February, 1918. To furnish a separate, nicer glove for the canton-flannel glove and the mitten adopted in April, 1918, a knit fabric glove was adopted for the purpose.⁹⁶ This knit glove was made of cotton jersey cloth, olive drab in color, weighing 9 to 10 ounces per square yard. The wristlets were made of knitted tubing of a good-quality yarn, measuring 11 to 12 yards to the pound. The hand part of the glove was cut on one glove pattern, measuring $7\frac{3}{4}$ inches from the end of the second finger to the wrist.

A seamed woolen glove was adopted in June, 1918, for issue to our troops.⁹⁷ This glove was to be made of a yarn consisting of new-scoured fleece or pulled wool, not lower than one-quarter blood grade, free from all substitutes and impurities, and cotton not exceeding 5 per cent. It was issued in three sizes, as follows: No. 9, 12 inches in length from the tip of the middle finger to the top of the cuff; No. 10, $12\frac{1}{2}$ inches; No. 11, 13 inches. In November, 1918, a change of the quality of the wool of this glove was made.⁹⁸ It now consisted of a two-ply woolen yarn composed of 50 per cent one-half blood wool, the remainder being noils, garnetted worsted thread waste, and not over 10 per cent by product (card and thread waste).

In December, 1918, a wool-lined leather gauntlet was adopted for wear by chauffeurs and motorcyclists of our Army.⁹⁹ This glove was made sufficiently large to be worn over the knit wool glove.

BLANKETS

The woolen, olive-drab blanket issued to the Army in 1917 was made of 75 per cent wool and 25 per cent cotton. The admixture of noils, shoddy, waste, reworked wools, or other impurities in the manufacture of the yarn was prohibited.¹⁰⁰ In size, the blanket measured 7 feet by 5 feet 6 inches, and its weight was 3 pounds. Two blankets were issued to each soldier, one for use during active campaign and worn on the person, and an additional one for use during lulls in campaign or when in mobilization or maneuver camps.⁴

Experience in the American Expeditionary Forces proved that this blanket was satisfactory as to quality and size; but, because of the scarcity of fuel in France during the World War and the frequent occasions when only one blanket could be used, such as when blankets had to be carried on the person, it was imperative that the blanket be heavier.³⁰ Not only was the olive-drab blanket increased in weight from 3 to 4 pounds,¹⁰¹ but in addition, in January, 1918, the number of them issued to individual soldiers in the American Expeditionary Forces was increased from 2 to 3.¹⁰²

In increasing the weight of the olive-drab blanket in the spring of 1918 no cotton was used in its fabrication; but since there was a possibility of exhausting the available wool supply it was permissible in manufacturing the blanket to use 35 per cent reworked wool or noils, the remainder being 55 per cent wool, grade 44's or finer, and 10 per cent wool, grade 60's or finer.¹⁰¹

HOSPITAL CLOTHING

When we entered the World War hospital clothing for base and evacuation hospitals comprised pajama suits and slippers.¹⁰³ The allowance of woolen blankets was approximately three per patient.¹⁰³ It was recognized that the needs of such hospitals varied greatly under different conditions of service, consequently their equipment tables were guides only in their organization.¹⁰⁴

Experience in the American Expeditionary Forces soon proved that the hospital clothing being furnished was inadequate for the comfort of the patients, more especially those not confined to bed. On November 23, 1917, the chief surgeon, A. E. F., advised the Surgeon General of the necessity for adopting and having manufactured on a large scale a uniform convalescent suit, sufficiently heavy for patients to wear either within or without the hospital buildings.¹⁰⁵ The idea was borrowed from the British Expeditionary Forces, where the use of such hospital clothing not only gave adequate comfort but in addition obviated the necessity of supplying patients with regular uniforms when it was necessary for them to go outdoors, and made them readily recognizable as hospital patients.

As a part of this suit a nightshirt was recommended for adoption, one that might have been worn with the suit in the daytime as a day shirt. Nightshirts subsequently were added to the equipment of hospitals in the American Expeditionary Forces,¹⁰⁶ but pajamas were not replaced by convalescent suits. The number of blankets per patient was increased from 3 to 4 in the spring of 1918.¹⁰⁶

Mention has been made above of the necessity for hospitals having adequate clothing in stock with which to equip soldiers discharged to duty.

HOSPITAL GARMENTS FURNISHED BY THE AMERICAN RED CROSS

The American Red Cross furnished the Medical Department, through an agreement whereby the Medical Department was to supply materials and the Red Cross the means for fabrication, bed shirts, pajamas, and convalescent robes. These articles were sent to France in Red Cross chapter boxes, and were distributed to hospitals in the American Expeditionary Forces by arrangements between the Medical Department, A. E. F., and the American Red Cross in France.¹⁰⁷

CLOTHING FOR HOSPITAL ATTENDANTS

ENLISTED PERSONNEL

The clothing of the enlisted personnel, Medical Department, on duty in hospitals conformed to the uniform of the American Expeditionary Forces as a whole; however, because of the objection to wearing hobnailed, trench shoes in hospitals, enlisted men on duty therein were authorized to wear plain-soled, garrison shoes.¹⁰⁸

CLOTHING FOR THE ARMY NURSE CORPS

When we entered the World War there was no prescribed outdoor uniform for the Army Nurse Corps. The indoor uniform consisted of a waist, a skirt, a belt, and a collar, all of plain white, washable material, and a badge of the corps.¹⁰⁹ In May, 1917, because of the contemplated transfer of members of the Army Nurse Corps to Europe during the following months, the Surgeon General recommended to The Adjutant General the adoption of an outdoor uniform to consist of an olive-drab (woolen) skirt, coat, and overcoat, a hat, a white or olive-drab shirt waist, and tan shoes.¹¹⁰ It soon proved, however, that difficulty would be experienced in trying to obtain the material needed in an olive-drab color; accordingly, on May 23, 1917, the Surgeon General decided to adopt a blue serge outdoor uniform for the Army Nurse Corps.¹¹¹

The first of our nurses who went overseas with the base hospital units which were sent abroad in the early summer of 1917 for service with the British Expeditionary Forces immediately encountered great difficulty in keeping their white uniforms clean and in having them laundered.¹¹² For these reasons a uniform made of medium gray material, with which a white apron was to be worn, was adopted in August, 1917, to replace the white uniform overseas.¹¹³

Until the latter part of 1918 the American Red Cross furnished uniforms and equipment to all members of the Army Nurse Corps ordered overseas.¹¹⁴ This was done at the request of the Surgeon General, who, in a letter to the Director General of Military Relief, American Red Cross, in September, 1917, expressed the opinion that the expense connected with the purchase of the equipment was too heavy to be borne by members of the Army Nurse Corps.¹¹⁵ The articles composing this gratuitous issue were added to from time to time. It has been seen that the standardized outdoor uniform comprised the blue

serge Norfolk suit, blue overcoat, hat, and tan shoes; and the indoor uniform consisted of a waist, a skirt, a belt, a collar, cuffs, an apron, with or without bib, a cap, and a badge of the corps.¹¹⁶ Following the Surgeon General's request that the American Red Cross furnish without cost to members of the Army Nurse Corps the articles of uniform and equipment needed by them, the Red Cross War Council authorized a list ultimately consisting of a hat, an outdoor uniform, a coat or heavy ulster, a cape, gloves, 2 white shirtwaists, 2 flannel shirtwaists, 4 gray wash uniforms, 6 or 8 aprons, 6 sets of collars and cuffs, several caps, 2 pairs of black woolen "tights," 1 steamer blanket, 1 sleeping bag, 1 gray sweater, 1 poncho, 1 blanket roll, 1 raincoat, 1 rain hat, 1 pair rubber boots, 1 pair of moccasins, shoes, stockings, heavy underwear, and pajamas.¹¹⁷

Though the Surgeon General had as early as August 29, 1917, proposed legislation covering a clothing allowance for the Army Nurse Corps,¹¹⁸ such an allowance was not actually made until December, 1918.¹¹⁹ In lieu of an allowance, however, the pay of all nurses had been increased \$10 per month by an act of Congress July 9, 1918. In this month General Pershing cabled the War Department a recommendation that all nurses whose pay did not exceed \$75 a month be equipped on embarking for service overseas on the same basis that clothing was gratuitously issued to our troops and that clothing be sold at cost price to other nurses.¹²⁰ Previous to this time it had been considered that congressional action would be necessary before clothing could be furnished to nurses without cost to them. The Judge Advocate General decided in September, 1918, that, since nurses were by statute a part of the Army of the United States, for which the President had authority to prescribe the quantity and kind of clothing which was to be issued annually, it was legal to include nurses in such authorization.¹²¹ In consequence of this decision the War Department authorized the issue of a single initial outfit to members of the Army Nurse Corps, upon their first entry into the service, as follows:¹²² One navy-blue Norfolk suit, 1 navy-blue overcoat, 1 navy-blue flannel waist, 1 navy-blue velour hat for winter, 1 navy-blue straw hat for summer, 4 sets of insignia. When ordered to duty with the American Expeditionary Forces the following additional articles were issued: 6 gray cotton uniforms, 1 gray woolen sweater, 1 gray woolen muffler, 1 raincoat, 1 blanket for use on transport, 1 sleeping bag, 1 steamer trunk. In January, 1919, the blue cape, maroon-lined, was added to the initial issue list of articles.¹²³

WASHING OF CLOTHING

Adequate plans were made in the American Expeditionary Forces for keeping reasonably clean the clothing of our soldiers. In so far as troops of the Services of Supply were concerned there was a measureable degree of success, as will be shown later; however, in the zone of the advance it was not possible to fully realize the plans. That this was true was due partly to the fact that there was insufficient time to acquire the needed facilities prior to the cessation of hostilities and partly to the impracticability of changing the clothing of troops actually engaged in combat.

On June 28, 1917, the chief quartermaster, A. E. F., and the chief surgeon, A. E. F., in a joint memorandum to the chief of staff, A. E. F.,¹²⁴ stated that there was an immediate demand for laundries for our troops in the training camps and that laundries should be established by us at once near our training camps to serve the camps and our hospitals. On August 19, 1917, the chief surgeon, A. E. F., again urged the immediate establishment of laundries in the American Expeditionary Forces as follows:¹²⁵

I think it of the greatest importance that laundries should be established at the earliest practicable date.

Delousing stations and arrangements for the sterilization of clothing are so closely associated with the work of laundries at the front that I think the establishment of these two stations should be considered when the construction of laundries is taken up.



FIG. 30.—American soldiers washing clothing in the River Orne, France

I am decidedly of the opinion that all soldiers at the front should have their laundry done free of charge. This is particularly necessary for the soldiers who, returning from the trenches, must go to a delousing station where they must give up all their own clothes and receive a clean outfit throughout.

Under present arrangements all clothing is Government property and simply loaned to soldiers to wear. For this reason it is thought to be fair that the clothing of all soldiers should be laundered at Government expense. But if this is not considered feasible a flat rate should be made for laundry for all soldiers on lines of communication.

Until January, 1918, the washing of our soldiers' clothing in the American Expeditionary Forces, except patients in hospital, was their responsibility.

When troops were located in or near villages or cities where local laundries or the personal services of washerwomen could be utilized, no insuperable difficulties normally were encountered. However, when it was necessary for the soldier to wash his clothing, or for him to have the washing done by washerwomen whose almost invariable custom it was, especially in rural districts, to wash the clothing in cold water, often muddy streams or stagnant pools, the practice had the defect of incomplete cleansing, and practically no destructive effect on infested clothing.

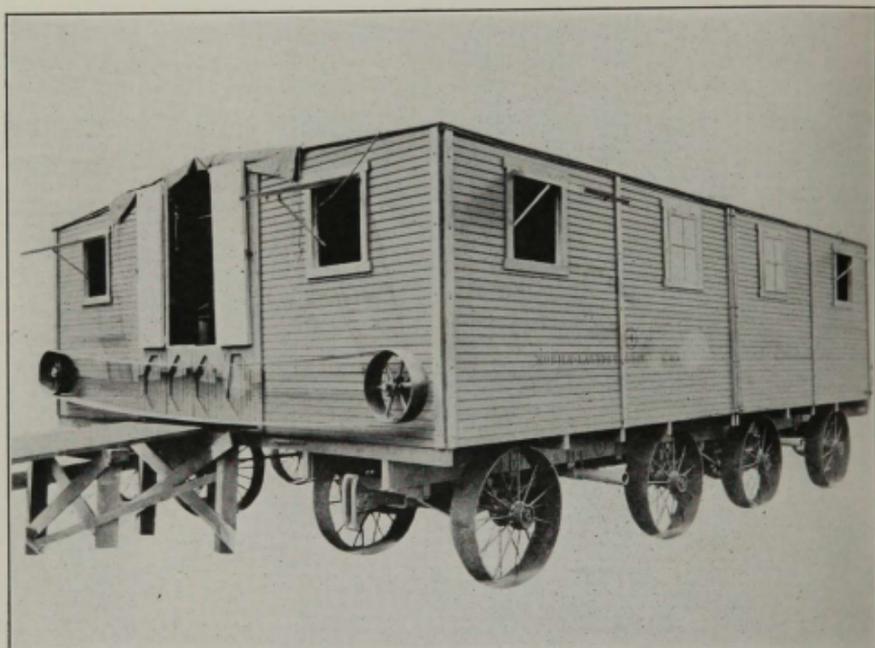


FIG. 31.—Mobile laundry manufactured in the United States for the American Expeditionary Forces. Exterior view showing the four units comprising the laundry assembled and ready for operation

In the winter of 1917-18, when our troops were beginning to occupy front-line trenches in progressively greater numbers, it was manifest that the men, while occupying the trenches, could have no facilities for washing their clothing, if left to their own resources; furthermore, it was equally manifest they would experience difficulty in making personal arrangements to have the work done. Because of the inevitability of louse infestation under such conditions, with its attendant dangers, a general order was issued from General Headquarters, A. E. F., on January 20, 1918,¹²⁶ which imposed upon the Quartermaster Corps the provision and operation of laundries to do such laundry work as was found to be necessary for troops in the zone of the advance, as well as for patients in hospitals, irrespective of location in the American Expeditionary Forces. No charge was to be made for the laundry work done. All garments laundered were to be sterilized, washed, repaired, and re-issued, without any attempt being made to return to the soldier the identical garments he turned in for cleaning.

Since changes of clothing could not be made for men serving in the trenches, it was provided that clean clothing would be issued to front-line troops after they had left the trenches, and had used whatever bathing facilities had been made available.¹²⁶

PROCUREMENT OF MOBILE LAUNDRIES

To meet the requirements thus imposed upon it necessitated the Quartermaster Corps, A. E. F., having at its disposition mobile laundries and personnel to operate them. To this end, steps were taken by the chief quartermaster, A. E. F., the latter part of February, 1918, to secure from the United States

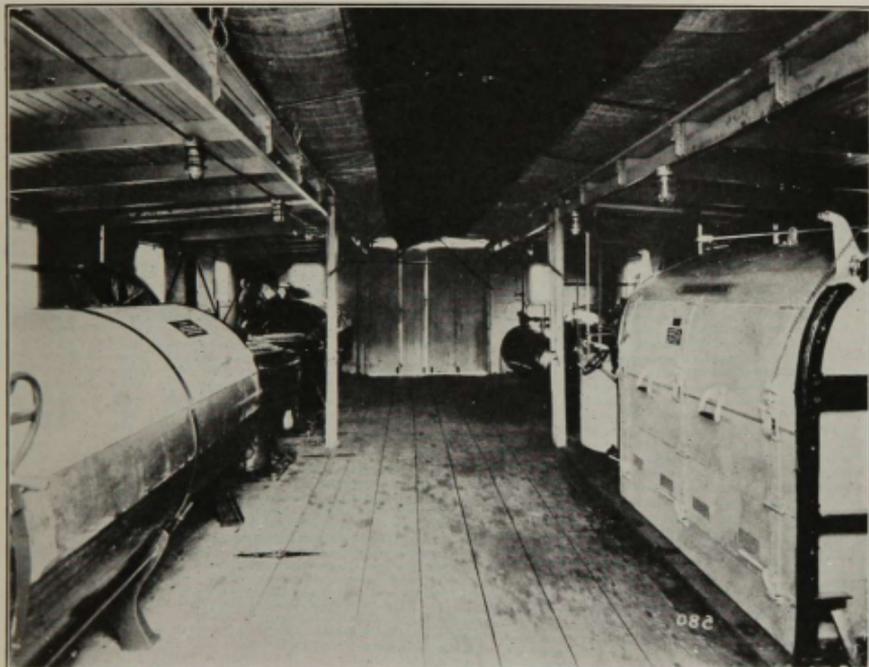


FIG. 32.—Mobile laundry. Same as in Figure 31, showing the interior of the plant

portable laundries and units of personnel with which to operate them, at the rate of one laundry for each division.¹²⁷ Unfortunately, however, there did not exist in the United States at this time a mobile laundry of proven value; consequently, it was necessary for the Quartermaster General to direct experimental work looking to the perfection of mobile laundries prior to placing contracts for their manufacture.¹²⁸ In consequence of this unavoidable delay, it was not until June 5, 1918, that the first mobile laundry unit was shipped overseas.¹²⁹ There was a further delay until the following August 21, when three additional mobile laundries were sent to the American Expeditionary Forces;¹³⁰ and until after the middle of the following October these four mobile laundries were all that could be secured from the United States because

of difficulties incident to their manufacture.¹³¹ By November 11, 1918, however, 24 mobile laundries had been shipped overseas, or were at the ports and ready for such shipment; and, thereafter, from 4 to 6 were being delivered from contractors weekly.¹³²

PERSONNEL TO OPERATE MOBILE LAUNDRIES

To operate the mobile laundries for divisions the following personnel was authorized in April, 1918:¹³³

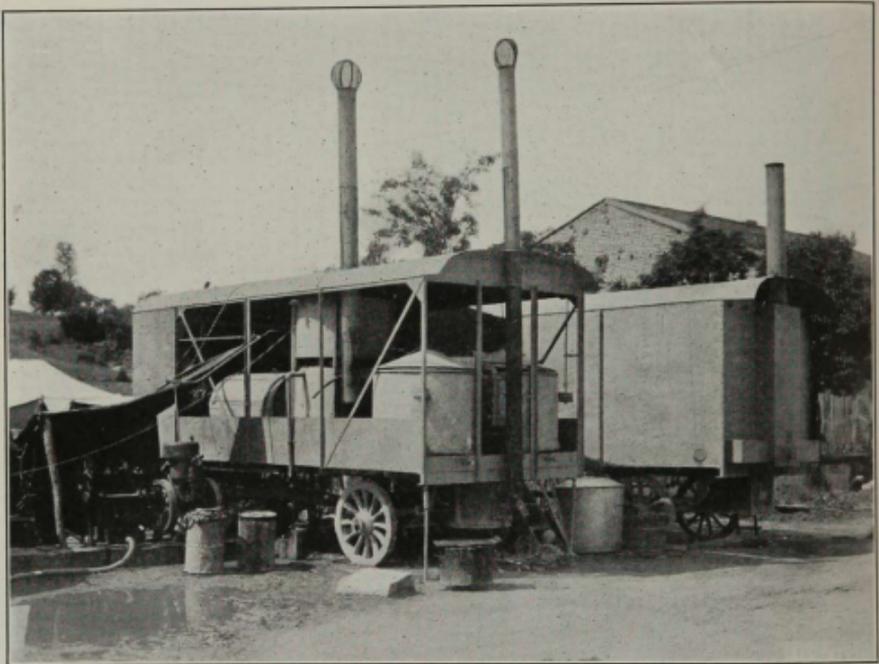


FIG. 33.—Type of portable laundry procured in France

Personnel of a laundry company, Quartermaster Corps

[Maximum and minimum strength, April 8, 1918]

Units	Number	Remarks
Sergeants, first class	2	Foremen.
Sergeants	6	1 acting first sergeant; 2 tractor operators, 22-horse-power steam tractor; 2 machinists or mechanics; 1 clerk.
Corporals	6	2 clerks (1 for unit administrative clerical work); 2 chauffeurs; 2 machine operators.
Cook	1	
Privates, first class	18	2 water-pump operators; 4 extractor operators, 2 firemen, 2 drying machine operators, 6 markers and sorters, 2 chauffeurs.
Privates	4	Laborers.
Total enlisted	37	NOTE.—Personnel to operate 2 shifts of 8 hours per day.

It was necessary that these men undergo training before they could be sent overseas. Consequently, one of the first equipments for a mobile laundry unit that was manufactured was sent in June, 1918, to a camp in the United States where the training of successive laundry companies could be effected.¹²⁹

MOBILE LAUNDRIES PROCURED ABROAD

Pending the establishment of laundries in the American Expeditionary Forces by the Quartermaster Department, in which it was planned that the laundry of our base hospitals would be done,¹³⁴ the Medical Department, A. E. F., in the fall of 1917, endeavored to secure portable laundries for the purpose. The following letter explains the plan then in view:

HEADQUARTERS LINES OF COMMUNICATION,
AMERICAN EXPEDITIONARY FORCES,
OFFICE OF THE CHIEF SURGEON,
France, October 27, 1917.

From: The Chief Surgeon, L. of C.
To: The Chief Quartermaster, L. of C.
Subject: Laundry Facilities for Base Hospitals.

1. As it is my understanding that the Quartermaster Corps will furnish laundry facilities for the Medical Department in France, and as there are at present 12 hospitals that need laundries or an increase in their present plants, I request that you have the purchasing board of the Quartermaster Corps obtain laundries for each of these hospitals.

2. If this does not meet with your approval, can you not have laundries established at points convenient to base hospitals, so that their soiled linen may be sent to these laundries either by rail or by motor truck?

3. An attempt has been made to obtain portable laundries from the Service de Santé. The Medical Department representative on the purchasing board has obtained the promise of four portable laundries. So far he has been unable to obtain a shipment of these laundries. Doubtless in the course of time some of them will be shipped. The Red Cross also has been requested to obtain these portable laundries, but information at the present moment indicates that they have not been successful.

4. As the number of patients is constantly increasing and as the present facilities are barely adequate for the present needs, it will be necessary to take steps to obtain these laundries in the United States if you are unable to supply laundry facilities here in France. Please indicate to me at your earliest convenience your action in this matter.

5. I am attaching herewith copies of letters from the commanding officers of several base hospitals, showing the needs of increased laundry facilities.

Portable laundries were being procured by the Medical Department, A. E. F., not only for emergency use in base hospitals, as is indicated in the letter quoted above, but for mobile hospital units assigned to combat organizations. The need for portable laundries with camp hospitals and evacuation hospitals is shown in the following communication:

[2nd ind.]

OFFICE CHIEF SURGEON, G. H. Q., A. E. F.,
France, January 24, 1918.

To: C. in C., A. S., G. S.

1. In connection with the subject of laundries, attention is invited to paragraph 4 of a memorandum from this office dated January 16, 1918, addressed to the C. in C., A. S., G. S.

2. It is estimated that one portable laundry will be required to do the work needed at each camp hospital and that three portable laundries will be required at each evacuation hospital. The latter will be able to handle not only the work of the evacuation hospital but that of the field hospitals with which it is in connection as well.

3. The above calculation is based upon the output of the French type of portable laundry known as the "Groupe de Buanderie et Sechoir" of the Service de Santé. Each of these groups will wash and dry 600 to 700 pieces daily, using a minimum amount of fuel.

4. The urgent need of laundry facilities may be illustrated by the conditions existing to-day in the 26th Division. In the camp hospital of this division there are approximately 600 patients, a large proportion of which are contagious cases, including cerebrospinal meningitis, scarlet fever, measles, mumps, and diphtheria. To further complicate the situation, a considerable number of the patients admitted are lousy at the time of admission. It will be readily apparent that without adequate means of laundering and sterilizing infected clothing conditions exist which will inevitably cause further spread of contagious disease. The latter is now prevalent in the A. E. F. No adequate means of laundering clothing exists, and the condition regarding contagious disease outlined above is much the same in practically every American hospital in France.

5. Therefore it is recommended that the Qm. Dept. be instructed to purchase the required number of the type of laundry indicated above, or a similar type, in France or England. As this apparatus is not usually carried in large quantities, it will probably be necessary to have them manufactured. To obtain relief from the existing situation, there should be no delay in placing the necessary orders.

When a new mobile hospital unit, the mobile surgical hospital, was adopted as a unit of the Medical Department, A. E. F., early in 1918, mobile laundries formed a part of the equipment of such units.¹³⁵

The Medical Department, A. E. F., during the winter of 1917-18, was having manufactured by the French as many portable laundries as possible for the Medical Department mobile units mentioned above.¹³⁵ In the spring of 1918, because of the imperative need for mobile laundries by divisions at the front, the chief surgeon, A. E. F., sanctioned the diversion of these laundries to the divisions, as follows:

OFFICE OF THE CHIEF SURGEON,
AMERICAN EXPEDITIONARY FORCES,
HEADQUARTERS, S. O. S.,
France, 13 April, 1918.

From: The Chief Surgeon.

To: Lieut. Col. C. C. Whitecomb, purchasing officer, Medical Department, Hotel Méditerranée, Paris.

Subject: Laundries from the Service de Santé.

1. I have just had a consultation with the chief quartermaster, S. O. S., and it has been agreed that in view of the fact that there is such wide infestation of lice in divisions at the front that the diversion of such laundries as are promised on the Service de Santé contract with the Medical Department to divisional uses as well as Medical Department uses is appropriate.

2. It is the understanding in this office that there are some 18 laundries still due on the contract. Will you please get in touch with Lieut. Col. H. E. Wilkins, of the Quartermaster Department in Paris, and try to carry out with him the following arrangement:

2 laundries to be shipped to the 2d Division, via regulating officer, Is-sur-Tille.

1 laundry to be shipped to the 42d Division, via regulating officer, Is-sur-Tille.

2 laundries to be shipped to the 32d Division, Prauthoy (Hte. Marne).

2 laundries to be shipped to the 26th Division, via regulating officer, Is-sur-Tille.

In the order named.

3. It seems to me that in order that there may be no conflict with the Service de Santé as to the destiny of these laundries, they should be shipped to the division surgeon in each case, with a quotation from this letter made to the division surgeon that the laundries are sent to his area for the use of troops in the trenches as well as for the use of the Medical Department, and that under A. E. F. order the Quartermaster's Department is charged with

the operation of the plants. This will preserve a Medical Department destiny for these laundries as they leave Paris, and it will probably avoid explanations which may be called for by the service which furnishes the laundries.

4. Please notify this office as the laundries are shipped, and be sure to let the division surgeons know the conditions under which they are sent. The chief quartermaster, S. O. S., will be informed on your notification, and he will send instructions to the quartermaster of the division covering the situation along the lines laid down in this letter.

Following this the Salvage Service of the Quartermaster Department, A. E. F., which had been charged with laundering the clothing of our troops in the zone of the advance, gradually acquired control of practically all the mobile laundries which were operating at hospitals in the Services of Supply, and by the latter part of October, 1918, had them, in addition to a few diverted as explained above, distributed as follows:¹³⁶ Two with the 1st Division; 2 with the 2d Division; 1 with the 33d Division; 1 with the 35th Division; 2 with the 77th Division; 1 at the naval base hospital at Brest; 2 at the hospital center, Allerey, (1 ordered to Evacuation Hospital No. 2, Baccarat, and 1 to the hospital at Nevers, for temporary duty); 1 to Coetquidon; 5 to the regulating officer, Le Gourget. The four mobile laundries which had been received from the United States had been sent to the First Army,¹³⁷ for operation in connection with evacuation hospitals of that army.¹³⁷

LOCATION OF MOBILE LAUNDRIES IN THE ZONE OF ADVANCE

Aside from the mobile laundries, attached to such mobile organizations of the Medical Department as the evacuation hospital and the mobile surgical hospital, which were intended primarily for the laundering of the linen used in connection with the operation of such hospitals, it was a matter of some moment for a period as to where, within an army, it would be best to locate the mobile laundries that were intended for laundering the clothing of combat troops. It has been seen that it was the purpose to have one of these laundries for each division in the zone of the advance;¹²⁷ and it was considered that the logical place for the establishment of the divisional laundry was in connection with the bathing facilities afforded a division, in order that transportation of both clean and soiled clothing could thus be dispensed with. Control of all these facilities varied somewhat. In October, 1918, in the First Corps, A. E. F., mobile laundries were made a part of the area facilities for divisions of that corps under the premise that, during periods of activity, the corps could look after them more readily than could constantly changing divisions.¹³⁸ The corps commander felt at the time, however, that all plants such as laundries, bathing and delousing places, should be made army establishments.¹³⁸ In the First Army the opinion was held that these plants should be located at each divisional railhead to insure each division being in touch with such facilities, as it either withdrew from the front line for a rest, or changed its base, it being manifestly impossible for such impediments to be used by divisions when engaged in a warfare of movement.¹³⁹

LAUNDERING IN SERVICES OF SUPPLY

Because of the inadequacy of mobile laundries with our troops in the zone of the advance, it was necessary to utilize other means for having the greater

part of the laundry work done. Following the establishment of the Salvage Service of the Quartermaster Department, A. E. F., early in 1918,¹⁴⁰ repair shops were constructed by that service, variously located in the Services of Supply. Ultimately there were repair shops at Angers, Bazoilles, Brest, Chaumont, Gievres, Le Mans, Marseille, Nancy, Paris, Rochefort, Savenay, St. Aignan, Tours, Vittel, in France; at Winchester, England; and at Coblenz, Germany.¹⁴¹ The primary purpose of these shops was the renovation of discarded material so that it might be reissued to troops. Clothing made up a large part of such salvaged material, and came to the repair shops in one or the other of the following manners: When troops at the front were issued clean



FIG. 34.—Laundry at Base Hospital No. 52, Rimacourt, France

clothing, and there were no means at hand for the laundering of the soiled clothing, this was sent back to one of the above mentioned salvage shops, where it was subjected to the routine that will be described shortly. On the other hand, clothing was frequently discarded by the troops individually; that is to say, it was thrown away when it had become soiled,¹⁴² subsequently to be automatically collected by the Salvage Service and shipped to the rear for renovation in compliance with existing orders.¹⁴⁰ Occasionally, however, especially during the summer of 1918, the clothing of divisions was sent to one of our laundries in the Service of Supply. Thus when the 3d Division was on the Marne, in the summer of 1918, soiled underwear, flannel shirts, and socks were sent to the American Expeditionary Forces' laundry at Paris, and were

reissued, when received back, to the troops of the division at the division bathhouse.⁴³ This distribution was always in addition to the regular issue of clothing, which was supplied on requisition made by organization supply officers.⁴³

Clothing that was laundered by the Salvage Service, A. E. F., was first sterilized.⁴⁴ Thus olive-drab blouses were subjected to a steam pressure of 40 pounds for 30 minutes. Then they were passed through the washing machines, thence to the drying rooms. After the clothing had been cleaned it was repaired, if necessary, and sorted, inspected, sized, pressed or ironed, and packed into bundles of 10 for shipment.

Clothing that had required only slight repairing, or none, was reissued to combat troops; whereas clothing that had necessitated repairs because of rips and tears was sent to troops in labor battalions or in the various depots. Garments, particularly outer clothing, that did not come out of the renovating process in a good condition because of the low grade of material of which they had been made, and many articles of clothing that had required extensive repairing, were dyed green and were used to clothe the prisoners of war held by the American Expeditionary Forces.⁴⁴

LAUNDRY ESTABLISHMENTS AND LAUNDRY AT STATIONARY HOSPITALS

Mention has been made (p. 647) of the fact that one of the functions of the Quartermaster Corps, A. E. F., was to establish and operate laundries for our base hospitals overseas.⁴⁵ Since it was necessary to obtain from the United States machinery for these laundries, it was likewise essential to determine in advance the approximate amount of laundry machinery that would be needed for the purpose. The following communications between the Medical Department, A. E. F., and the Quartermaster Corps, A. E. F., show what steps were taken by the departments mentioned, also the modifications which were effected in the general plan of accomplishing laundry work for hospitals:

From: Chief Q. M. L. of C.
To: Chief Surgeon L. of C.
Subject: Laundry machinery.

DECEMBER 13, 1917.

1. To enable this office to make timely requisition for laundry machinery, it is requested that the following information be furnished.

2. For the first 500,000 men what number and size base hospitals are contemplated.

3. For the same number of men, what number of evacuation hospitals are contemplated. Will laundry units designed to handle the wash of 1,000 beds be the proper size for evacuation hospitals. What weight in clothes, bedding, and towels should be estimated to be washed each week for each patient. What weight clothes to be washed each week for nurses, attendants, and enlisted personnel.

[1st ind.]

OFFICE OF THE CHIEF SURGEON, L. OF C.,
France, December 22, 1917.

To the CHIEF QUARTERMASTER, L. OF C.:

1. Returned. The hospitalization necessary for the first 500,000 men will be as follows: Base hospitals, 40, capacity 1,000 beds each, 40,000; evacuation hospitals, 20, capacity, 1,000 beds each, 20,000; total, 60,000.

2. Weight of laundry, estimated, per week: For base hospitals, 15 pounds per bed (40,000), 600,000; nurses, 4,000, 15 pounds each, 60,000; medical officers, 1,400, 20 pounds each, 28,000; enlisted men, 8,000, 15 pounds each, 120,000; total, 808,000. For evacuation hospitals, 15 pounds per bed (2,000), 300,000; medical officers, 320, 20 pounds each, 6,400 enlisted men, 3,600, 15 pounds each, 54,000; total, 360,400. Total pounds per week, 1,168,400. Where the regular hospital bed is used at the evacuation hospital the laundry average will be maintained by the large amount of linen from the operating rooms.

3. In the scheme of hospitalization, it is contemplated to establish a large number of beds in certain areas, as follows: Bordeaux, 15,000; Allerey (near Dijon), 10,000; Beaune (near Dijon), 10,000; Mesves (near Nevers), 10,000; Mars (near Nevers), 10,000; Bazoilles, 7,000; Savenay and St. Nazaire, 5,000; Nantes, 4,000; Limoges (tentative), 3,000; Angers (tentative), 3,000. In other words, to establish hospital centers of such grouping as will facilitate the question of supplies and transportation, and when it comes to the establishment of laundries the same will apply and should be taken into consideration.

4. The above figures are based on the minimum of normal hospitalization; and the maximum, estimated for combat hospitalization, would be double.

DECEMBER 24, 1917.

Memorandum to the Chief Quartermaster, L. of C.:

Amending the first indorsement hereon, reference to laundry facilities for the Line of Communications, upon reconsideration of the matter with Major McDiarmid, I am of the opinion that the original estimate was excessive in allowance for men and officers.

It is recommended that 10 pounds per officer and 8 pounds per man be estimated for, the estimate being then as follows: Base hospitals, 15 pounds per bed (40,000), 600,000; nurses, 4,000, 15 pounds each, 60,000; medical officers, 1,400, 10 pounds each, 14,000; enlisted men, 8,000, 8 pounds each, 64,000; total, 738,000. Evacuation hospitals, 15 pounds per bed (20,000), 300,000; medical officers, 320 (10 pounds each), 3,200; enlisted men, 3,600, 8 pounds each, 28,800; total, 332,000; total per week, 1,070,000.

PARIS, January 7, 1918.

From: Officer in charge of Laundries and Salvage Division.

To: Chief Quartermaster, Line of Communications.

Subject: Base hospital laundries.

1. It is requested that laundries of capacities mentioned below be established at the following central points: Nantes, 230,625 pounds per week; Nevers, 369,000 pounds per week; Dijon, 387,450 pounds per week; Vittel, 239,850 pounds per week; Langres, 77,490 pounds per week; Limoges, 55,360 pounds per week; Bordeaux, 369,000 pounds per week; Chateauroux, 27,675 pounds per week; Brest, 18,450 pounds per week.

2. You will find attached Schedule No. 1, on which is shown the names of the cities in which it is proposed to locate the central laundries, also the names of the cities in which are located the base hospitals which are to be served from these various central laundries, together with their individual number of beds and personnel. This personnel has been obtained by figuring 4,000 nurses, 1,400 medical officers, and 8,000 enlisted men to each 40,000 beds.

3. You will also find attached Schedule No. 2, which gives a detailed statement of the number of pounds per week that will be required of each central laundry. These figures have been obtained by taking the number of beds submitted by the Medical Department, Line of Communications, and allowing 15 pounds per bed, 10 pounds per medical officer, 15 pounds per nurse, and 8 pounds per enlisted man.

4. It is requested that the cities mentioned herein as the central points at which to establish laundries be approved.

5. It is further requested that authority be given to procure buildings of sufficient size at the various central points mentioned above and to install therein the machinery necessary to provide the laundries of sufficient capacity to handle the number of pounds per week, as shown on Schedule No. 2.

SCHEDULE No. 1.—*Schedule of suggested sites for base hospital laundries, showing number of beds and personnel*

Laundry sites	Hospital sites	Beds	Medical officers	Nurses	Enlisted men
Nantes.....	St. Nazaire.....	1,500	52.5	150	300
	Savenay.....	4,000	140	400	800
	Angers.....	3,000	105	300	600
	Nantes.....	4,000	140	400	800
	Total.....	12,500	437.5	1,250	2,500
Nevers.....	Mesves.....	10,000	350	1,000	2,000
	Mars.....	10,000	350	1,000	2,000
	Total.....	20,000	700	2,000	4,000
Dijon.....	Allerey.....	10,000	350	1,000	2,000
	Beaune.....	10,000	350	1,000	2,000
	Dijon.....	1,000	35	100	200
	Total.....	21,000	735	2,100	4,200
Vittel.....	Bazouilles.....	7,000	245	700	1,400
	Vittel.....	3,500	122.5	350	700
	Contrexeville.....	2,500	87.5	250	500
	Total.....	13,000	455	1,300	2,600
Langres.....	Langres.....	3,000	105	300	600
	Chaumont.....	1,200	42	120	240
	Total.....	4,200	147	420	840
Limoges.....	Limoges.....	3,000	105	300	600
	Bordeaux.....	20,000	700	2,000	4,000
	Chateauroux.....	1,500	52.5	150	300
	Brest.....	1,000	35	100	200
Grand total.....		96,200	3,367	9,620	19,240

SCHEDULE No. 2.—*Detailed schedule of number of pounds per week that will be required of laundries established at central points*

Sites	Beds	Medical officers	Nurses	Enlisted men	Total
Nantes.....	187,500	4,375	18,750	20,000	230,625
Nevers.....	300,000	7,000	30,000	32,000	369,000
Dijon.....	315,000	7,350	31,500	33,000	387,450
Vittel.....	195,000	4,550	19,500	20,800	239,850
Langres.....	63,000	1,470	6,300	6,720	77,490
Limoges.....	45,000	1,050	4,500	4,800	55,350
Bordeaux.....	300,000	7,000	20,000	32,000	369,000
Chateauroux.....	22,500	525	2,250	2,400	27,675
Brest.....	15,000	350	1,500	1,600	18,450
	1,443,000	33,670	144,300	153,920	1,774,890

JANUARY 15, 1918.

Memorandum for chief surgeon:

1. With reference to the attached papers, subject, "Base hospital laundries," it is requested that you furnish a statement of the amount of laundry work that will be required for each base hospital, keeping in mind the necessity of restricting this work to the absolute minimum, and also keeping in mind the fact that on account of the tonnage and material situation it is preferable to have a scarcity of such facilities at times of maximum stress rather than to expend large amounts of tonnage and materials in securing fully ample facilities at all times.

JANUARY 16, 1918.

Memorandum for the commander in chief, A. S., G. S.

1. The estimates of the officer in charge of laundries as contained in paragraph 3 herein is correct for 96,200 base hospital beds; i. e., 18,450 pounds of laundry per week for 1,000 beds.

2. This does not take into consideration camp hospitals, of which it is estimated there will be 40 of 300 beds each, nor evacuation hospitals, of which there will probably be 60 of 500 beds each, that will require laundry facilities. Laundry from field hospitals can be sent to the nearest evacuation hospital centers.

3. The locations of only a limited number of camp hospitals can be given at present as the training areas of only 12 divisions are known. The location of none of the evacuation hospitals is known at present, but they will probably be located close enough together so that one laundry can serve three or four hospitals.

The location of the base hospitals is permanent, and for them permanent laundries should be established; but as the location of camp and evacuation hospitals is subject to change, the laundries supplying these should be mobile, and for these it is recommended that portable laundries manufactured in France be used. As it is probable that their manufacture will be slow, it is suggested that orders for construction be given early.

[34 ind.]

HEADQUARTERS, A. E. F., C. S. G. S.,

France, February 2, 1918.

To C. G., L. of C.

1. The figures given in Schedule 1, inclosed, do not check as to number of beds with the authorizations to date as shown in data furnished by the Engineer Department.

2. A revised tabulation follows:

Proposed laundries	Projected hospitals	Authorized beds to be completed			Laundry, pounds week	
		Beds	By July 1, 1918	After July 1, 1918	Before July 1	Total
Nantes.....	St. Lazaire.....	1,300	1,300			
	Savenay.....	1,000	1,000			
	Angers.....	1,000	1,000			
	Nantes.....	1,000	1,000			
	Total.....	4,300	4,300		79,335	79,335
Nevers.....	Mesnes.....	10,000	5,000	5,000		
	Mars.....	10,000	5,000	5,000		
	Total.....	20,000	10,000	10,000	184,500	369,000
Dijon.....	Allerey.....	10,000	5,000	5,000		
	Beaune.....	10,000	5,000	5,000		
	Dijon.....	1,000	1,000			
	Total.....	21,000	11,000	10,000	202,950	387,450
Vittel.....	Bazoilles.....	7,000	4,800	2,200		
	Vittel.....	4,000	4,000			
	Contrexeville.....	3,500	3,500			
Total.....	13,500	11,300	2,200	208,485	249,075	
Langres.....	Rimacourt.....	5,000	5,000			
	Langres.....	3,000	3,000			
	Chaumont.....	1,500	1,500			
Total.....	9,500	9,500		175,275	175,275	
Limoges.....	Limoges.....	3,000	3,000		55,350	55,350
Bordeaux.....	Bordeaux.....	1,860	1,860			
	Beaudesert.....	5,000	5,000			
	Vauclaire.....	1,000	1,000			
	Total.....	7,860	7,860		145,017	145,017
Chateauroux.....	Chateauroux.....	1,500	1,500		27,675	27,675
Brest.....	Brest.....	400	400		7,380	7,380
Total.....		81,060	58,860	22,200	1,085,967	1,493,557

3. The laundry requirements in the above table are based on 18,450 pounds per week for 1,000 beds, which is the estimate of the chief surgeon, A. E. F.

4. The sites for laundries given in the first column of the tabulation are hereby approved. Their capacity will be that required for the amounts shown in the last column. If it is known that more beds will be required in the future, in certain districts the laundries will be so designed that their capacity can be increased when this becomes necessary.

FEBRUARY 9, 1918.

From: C. Q. M., L. O. C.,
To: Chief Surgeon, L. O. C.,
Subject: Base hospital laundries.

In view of the fact that a plan of central laundries to handle the base hospital requirements has been provided, it is requested that you notify all base hospitals to discontinue the installation of individual laundries, as this machinery will be needed for the central plants.

The washing of hospital linen of the immobilized hospitals of the American Expeditionary Forces was accomplished in one of three ways. For some of the larger hospitals, laundries were constructed.¹⁴² However, because it was considered inadvisable to establish a great number of small laundries, especially in one section, use was made of existing salvage depot laundries when they were conveniently located. Again, in the absence of hospital laundries and conveniently located salvage depot laundries, the laundry work of hospitals was done by contract.¹⁴³

Though the Salvage Service, A. E. F., laundered the clothing of patients in hospital,¹²⁶ the laundering of hospital linen was chargeable to Medical Department funds.¹⁴⁴ This "linen" comprised linen, clothing, and bedding, the property of the Medical Department; the washable clothing of patients admitted to hospitals, which required cleansing before it could be put away; the white, hospital clothing of the enlisted attendants; the uniforms of the Nurse Corps soiled while on public duty.¹⁴⁵

Because of difficulties and unsatisfactory results encountered by the personnel of a number of hospitals in having their laundry done by private arrangements, efforts were made by the commanding officers of some of the hospitals in question to obtain authority to have this personal clothing laundered at plants operating at the hospitals.¹⁴⁶ These requests were invariably disapproved by the chief of the Salvage Service, A. E. F., however, because of the inadequacy of the plants to do special work.¹⁴⁷

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- (2) Final Report of General John J. Pershing, September 1, 1919.
- (3) Report of assistant chief of staff, G-1, Hq. S. O. S. Appendix "I" of proceedings of a board of officers convened by par. 174, S. O. No. 96, G. H. Q., A. E. F., April 8, 1919, to consider "Lessons to be gained from the experiences of the present war in so far as they affect the tactics and organization of Infantry." On file with records of General Headquarters, A. E. F., War Department, Washington.
- (4) G. O. No. 39, W. D., June 24, 1915.
- (5) G. O. No. 17, W. D., May 1, 1916.

- (6) Cablegram No. 145-S, Chaumont, September 7, 1917, from General Pershing to The Adjutant General.
- (7) Memorandum from the officer in charge, supplies division, chief quartermaster's office, A. E. F., December 12, 1918, to Capt. C. F. Burkhardt, Q. M. C. On file, Office of the Quartermaster General, W. D. File No. 400.43-7.
- (8) America's Munitions, 1917-18. Report of Benedict Crowell, Assistant Secretary of War, Director of Munitions, Washington, Government Printing Office, 1919, 474.
- (9) Final Report of General John J. Pershing, September 1, 1918, 73.
- (10) Bimonthly report of European purchases, from Col. Harry E. Wilkins, Q. M. C., April 13, 1918, to the chief quartermaster, A. E. F. Copy on file, Historical Division, S. G. O.
- (11) Statement based on comments in Monthly Sanitary Reports, made by surgeons of organizations in American Expeditionary Forces, to The Adjutant General. On file, A. G. O., World War Division, Medical records section.
- (12) Ayres, Leonard P., Col., General Staff, U. S. Army: The War with Germany, A Statistical Summary. Washington, Government Printing Office, 1919, 61.
- (13) Letter from the chief quartermaster, A. E. F., April 22, 1919, to Maj. E. K. Coulter, Q. M. C., historical officer, A. P. O. 702, A. E. F. Subject: History of clothing branch. On file, Office of the Quartermaster General, W. D., Washington. File No. 400.43-7.
- (14) Ayres: Op. cit., 61.
- (15) Strength report, A. E. F., for November, 1918, from General Pershing to The Adjutant General.
- (16) G. O. No. 89, W. D., July 11, 1917.
- (17) G. O. No. 44, G. H. Q., A. E. F., March 23, 1918.
- (18) G. O. No. 38, H. A. E. F., September 17, 1917.
- (19) Telegram from the chief quartermaster, A. E. F., May 25, 1918, to General Pershing. Copy on file, Office of the Quartermaster General, U. S. Army. File No. 400.43-7.
- (20) G. O. No. 25, G. H. Q., A. E. F., February 9, 1918.
- (21) Special Regulations No. 40, W. D., 1917.
- (22) Annual Report of the Quartermaster General, U. S. Army, 1919, 769.
- (23) G. O. No. 144, W. D., November 16, 1917.
- (24) Memorandum from the chief quartermaster, A. E. F., January 12, 1918, to the chief of staff, G. H. Q., A. E. F. Subject: Clothing. Copy on file, Historical Division, S. G. O.
- (25) America's Munitions, 1917-18, 456.
- (26) Ibid, 459.
- (27) Ibid., 460.
- (28) G. O. No. 144, W. D., November 16, 1917.
- (29) Annual Report of the Quartermaster General, U. S. Army, 1919, 759.
- (30) Report of a board of officers convened at General Headquarters, A. E. F., pursuant to S. O. No. 17, G. H. Q., A. E. F., January 17, 1918. Copy on file, Historical Division, S. G. O.
- (31) America's Munitions, 1917-18, 457.
- (32) Specifications No. 1176, for olive drab overcoats. Adopted April 10, 1913, W. D., Office of the Quartermaster General, U. S. Army.
- (33) Specifications No. 1267, for olive drab overcoats. Adopted August 27, 1917, W. D., Office of the Quartermaster General, U. S. Army.
- (34) Annual Report of the Quartermaster General, U. S. Army, 1919, 762.
- (35) America's Munitions, 1917-18, 462.
- (36) Letter from chief quartermaster, A. E. F., November 11, 1918, to the purchasing officer, Q. M. C., A. P. O. 703, A. E. F. Subject: Special Clothing. Copy on file, Historical Division, S. G. O.
- (37) Specifications No. 1391 for jerkins. Adopted November 4, 1918, W. D., Office of the Quartermaster General, U. S. Army.

- (38) Memorandum from Col. W. D. Connor, General Staff, A. C. of S., G. H. Q., A. E. F., January 31, 1918, to the chief quartermaster, A. E. F. Subject: Proceedings of a board of officers convened in accordance with S. O. No. 17, G. H. Q., A. E. F., January 17, 1918. Copy on file, Historical Division, S. G. O.
- (39) America's Munitions, 1917-18, 465.
- (40) Specifications for knitted spiral woolen puttees. Adopted June 18, 1918, W. D., Office of the Quartermaster General, U. S. Army.
- (41) America's Munitions, 1917-18, 473, 474.
- (42) Annual Report of the Quartermaster General, U. S. Army, 1916, 351.
- (43) Historical Report of the chief quartermaster, A. E. F., 1918, to the Secretary, General Staff, Hdqrs., S. O. S., A. E. F. On file, Historical Section, Army War College. File No. 74-46.1.
- (44) America's Munitions, 1917-18, 473.
- (45) Memorandum from Wendell Endicott, May 21, 1918, to the chief quartermaster, A. E. F. Subject: Shoes, rubber boots, etc. On file, European Claims Branch, Washington Intermediate Depot. File No. 420.
- (46) Letter from the division commander, 26th Division, A. E. F., January 5, 1918, to the Commander in Chief, A. E. F. Subject: Adequacy of clothing and shoes. On file, European Claims Branch, Washington General Intermediate Depot. File No. 420.
- (47) Letter from the division quartermaster, 1st Division, A. E. F., December 27, 1917, to the chief quartermaster, A. E. F. Subject: Issue of shoes. On file, European Claims Branch, Washington General Intermediate Depot. File No. 420.
- (48) Specifications for shoes. Office of the Quartermaster General, U. S. Army.
- (49) Annual Report of the Surgeon General, U. S. Army, 1919, Vol. I, 578.
- (50) Data from examination of 100,000 soldiers, U. S. Army, made in compliance with letter of instructions, The Adjutant General, June 25, 1919, to the Surgeon General, U. S. Army. Data on file, Statistical Division, S. G. O.
- (51) Letter from the Acting Quartermaster General, U. S. Army, February 20, 1918, to the Adjutant General. Subject: Shoes for men ordered overseas. Copy on file, Record Room, S. G. O. File No. 421-11, Shoes, Boots (General).
- (52) First indorsement from the Quartermaster General, U. S. Army, December 28, 1917, to The Adjutant General. Subject: Tariff of shoes. Copy on file, Record Room, S. G. O., 421-11, Shoes, Boots (General).
- (53) Memorandum from the chief of staff, G. H. Q., A. E. F., January 31, 1918, to the chief quartermaster, A. E. F. Subject: Cable re clothing. On file, European Claims Branch, Washington General Intermediate Depot. File No. 420.
- (54) Memorandum from Wendell Endicott, May 21, 1918, to Maj. Crusan, office of the chief quartermaster, A. E. F. Subject: Tariff and inventory of sizes of field shoes. On file, European Claims Branch, Washington General Intermediate Depot. File No. 420.
- (55) Report from the chief surgeon, American Expeditionary Forces, North Russia, to the Commanding General, A. E. F., North Russia, June 20, 1919. Subject: Report of medical service, A. E. F., North Russia. On file, Historical Division, S. G. O.
- (56) Special Regulations No. 28, Changes No. 3, W. D., September 20, 1918.
- (57) G. O. No. 26, W. D., 1912.
- (58) Monthly Sanitary Report, 1st Division, A. E. F., for December, 1917, from Lieut. Col. J. T. Mabie, M. C., Sanitary Inspector, 1st Division, to The Adjutant General. On file, A. G. O., World War Division.
- (59) Monthly Sanitary Report, 42d Division, A. E. F., for December, 1917, from Lieut. Col. David S. Fairchild, Jr., Sanitary Inspector, 42d Division, to The Adjutant General. On file, A. G. O., World War Division.
- (60) First indorsement Monthly Sanitary Report, 42d Division, A. E. F., for December, 1917, from the division surgeon, January 7, 1918, to the division commander, 42d Division. On file, A. G. O., World War Division.
- (61) Monthly Sanitary Report, 5th Division, A. E. F., for June, 1918, from Maj. R. H. Davies, M. C., sanitary inspector, 5th Division, to The Adjutant General. Also: 1st Ind. thereto. On file, A. G. O., World War Division.

- (62) Monthly Sanitary Report, 42d Division, A. E. F., for June, 1918, from Capt. R. H. Boaking, M. C., sanitary inspector, 42d Division, to The Adjutant General. *Also:* Monthly Sanitary Report, 5th Division, A. E. F., for December, 1918, from Lieut. Col. J. J. O'Reilly, M. C., division surgeon, 5th Division, to The Adjutant General. On file, A. G. O., World War Division.
- (63) Monthly report of European purchases, from Col. H. E. Wilkins, Q. M. C., April 13, 1918, to assistant chief quartermaster, A. E. F., 1918. Copy on file, Historical Division, S. G. O.
- (64) Memorandum from Wendell Endicott, May 17, 1918, to chief quartermaster, A. E. F. Subject: Fit and size distribution of shoes. On file, European Claims Branch, Washington General Intermediate Depot. File No. 420.
- (65) Report of Medical Department activities, 42d Division, undated, from Col. D. S. Fairchild, jr., M. C., division surgeon, 42d Division. On file, Historical Division, S. G. O.
- (66) Memorandum from Wendell Endicott, May 21, 1918, to the chief quartermaster, A. E. F. Subject: Field shoes. On file, European Claims Branch, Washington General Intermediate Depot. File No. 420.
- (67) Memorandum from Wendell Endicott, May 8, 1918, to the chief quartermaster, A. E. F. Subject: Four-buckle gaiter. On file, European Claims Branch, Washington General Intermediate Supply Depot. File No. 420.
- (68) Annual Report of the Quartermaster General, U. S. Army, 1918.
- (69) Specifications No. 1333 for moccasins. Adopted May 23, 1918. W. D., Office of the Quartermaster General, U. S. Army.
- (70) Letter from the chief quartermaster, A. E. F., May 22, 1918, to the Quartermaster General, U. S. Army. Subject: Moccasins. Copy on file, Historical Division, S. G. O.
- (71) Annual Report of the Quartermaster General, U. S. Army, 1919, 767.
- (72) G. O. No. 11, G. H. Q., A. E. F., January 17, 1918.
- (73) Annual Report of the Quartermaster General, U. S. Army, 1918, 291.
- (74) America's Munitions, 1917-18, 471.
- (75) Memorandum from Wendell Endicott, May 21, 1918, to the chief quartermaster, A. E. F. Subject: Raincoats. On file, European Claims Branch, Washington General Intermediate Depot. File No. 420.
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- (77) G. O. No. 7, G. H. Q., A. E. F., January 9, 1918.
- (78) Statement based on Monthly Sanitary Reports, A. E. F., to The Adjutant General. On file, A. G. O., World War Division.
- (79) America's Munitions, 1917-18, 474.
- (80) *Ibid.*, 223.
- (81) *Ibid.*, 224.
- (82) Annual Report of the Quartermaster General, U. S. Army, 1919, 762.
- (83) Specifications for winter caps. Adopted October 12, 1917, June 17, 1918, and June 25, 1919. W. D., Office of the Quartermaster General, U. S. Army.
- (84) Courier cable from General Pershing, April 21, 1918, to The Adjutant General. On file, European Claims Branch, Washington General Intermediate Depot. File No. 420 (General); 8.
- (85) Memorandum from the chief quartermaster, A. E. F., January 12, 1918, to the chief of staff, G. H. Q., A. E. F. Subject: Clothing. Copy on file, Historical Division, S. G. O.
- (86) Specification No. 1340, for winter caps for motor-cycle drivers. Adopted June 18, 1918. W. D., Office of the Quartermaster General, U. S. Army.
- (87) Specifications No. 1403, for leather caps for motorcyclists. Adopted December 16, 1918. W. D., Office of the Director of Purchase and Storage, U. S. Army.
- (88) Specifications No. 1287, for olive drab flannel shirts. Adopted December 21, 1917. W. D., Office of the Quartermaster General, U. S. Army.
- (89) America's Munitions, 1917-18, 458.

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- (91) Specifications No. 1288, for winter underwear. Adopted December 20, 1917. W. D., Office of the Quartermaster General, U. S. Army.
- (92) Specifications No. 1304, for canton flannel gloves. Adopted February 21, 1918. W. D., Office of the Quartermaster General, U. S. Army.
- (93) Specifications No. 1306, for canvas gauntlets. Adopted February 21, 1918. W. D., Office of the Quartermaster General, U. S. Army.
- (94) Specifications No. 1325, for canton flannel gloves. Adopted April 15, 1918. W. D., Office of the Quartermaster General, U. S. Army.
- (95) Specifications No. 1327, for one-finger canton flannel mittens. Adopted April 15, 1918. W. D., Office of the Quartermaster General, U. S. Army.
- (96) Specifications No. 1326, for jersey knit gloves. Adopted April 15, 1918. W. D., Office of the Quartermaster General, U. S. Army.
- (97) Specifications No. 1342, for seamed olive drab woolen gloves. Adopted June 26, 1918. W. D., Office of the Quartermaster General, U. S. Army.
- (98) Specifications No. 1389, for seamed olive drab woolen gloves. Adopted November 1, 1918. W. D., Office of the Quartermaster General, U. S. Army.
- (99) Specifications No. 1401, for gauntlets. Adopted December 14, 1918. W. D., Office of the Director of Purchase and Storage.
- (100) Specifications No. 1244, for blankets. Adopted August 21, 1916. W. D., Office of the Quartermaster General, U. S. Army.
- (101) Specifications No. 1312, for the olive drab blanket. Adopted March 30, 1918. W. D., Office of the Quartermaster General, U. S. Army.
- (102) Letter from the Commander in Chief, A. E. F., January 4, 1918, to the commanding generals of divisions, A. E. F. Subject: Equitable distribution of clothing. Copy on file, Historical Division, S. G. O.
- (103) Manual for the Medical Department, 1916, par. 891.
- (104) *Ibid.*, par. 859.
- (105) Letter from the chief surgeon, A. E. F., November 23, 1917, to the Surgeon General, U. S. Army. Subject: Evacuation hospitals. On file, Historical Division, S. G. O.
- (106) List of medical supplies for the initial equipment of evacuation hospitals (1,000-bed). Revised June 24, 1918, S. G. O. Copy on file, Historical Division, S. G. O.
- (107) Letter from the chief surgeon, Line of Communications, A. E. F., February 11, 1918, to the chief surgeon, A. E. F. Subject: Red Cross Production. Copy on file, Historical Division, S. G. O.
- (108) Circular No. 19, par. 3, Chief Surgeon, A. E. F., April 4, 1918. On file, Historical Division, S. G. O.
- (109) Letter from the Surgeon General, March 3, 1915, to commanding officers of U. S. Army general hospitals. Subject: Uniform, Army Nurse Corps. On file, Record Room, S. G. O. File No. 79494-16.
- (110) Letter from the Surgeon General, May 17, 1917, to The Adjutant General. Subject: Army Nurse Corps, outdoor uniform. On file, Record Room, S. G. O. File No. 79494-26.
- (111) Letter from the Surgeon General, May 23, 1917, to The Adjutant General. Subject: Army Nurse Corps, outdoor uniform. On file, Record Room, S. G. O. File No. 79494-20-C.
- (112) Letter from the chief nurse, American Base Hospital Unit No. 12 (General Hospital No. 18, B. E. F.), July 8, 1917, to the commanding officer. Subject: Nurses' uniforms. On file, Record Room, S. G. O. File No. 79494-22.
- (113) Letter from the Surgeon General, August 9, 1917, to the Director General, Military Relief, American Red Cross, Washington, D. C. Subject: Gray uniform, Army Nurse Corps. On file, Record Room, S. G. O. File No. 79494-26.
- (114) Letter from the Acting Surgeon General, September 16, 1918, to the chief clerk, Office of the Assistant Secretary of War. Subject: Uniform for nurses. On file, Record Room, S. G. O. 421 (Nurses' uniforms).

- (115) Letter from the Acting Surgeon General, to the Director General of Military Relief, National Headquarters, American Red Cross. September 26, 1917. Subject: Clothing allowance of nurses ordered to Europe. On file, Record Room, S. G. O. File No. 421 (Nurses' uniforms).
- (116) Changes, M. M. D., No. 3, September, 1917.
- (117) Dock, Lavinia L., Pickett, Sarah E., Noyes, Clara D., Clement, Fannie F., Fox, Elizabeth G., Van Meter, Anna R.: History of American Red Cross Nursing, The MacMillan Company, New York, 1922, 370.
- (118) Memorandum from the superintendent, Army Nurse Corps, November 7, 1918, to the Surgeon General. On file, Record Room, S. G. O. File No. 421 (Nurses' uniforms).
- (119) Circular No. 63, Office of the chief surgeon, A. E. F., December 30, 1918.
- (120) Cablegram No. 1523, par. 2, from General Pershing, July 27, 1918.
- (121) Second indorsement, W. D., J. A. G. O., September 20, 1918, to The Adjutant General. Subject: Uniforms for nurses. On file, Record Room, S. G. O. File No. 421 (Uniforms for nurses).
- (122) G. O. No. 134, W. D., December 17, 1918.
- (123) G. O. No. 19, W. D., January, 1919.
- (124) Memorandum from the chief quartermaster, A. E. F., and the chief surgeon, A. E. F., June 28, 1917, to the chief of staff, A. E. F. Subject: Laundries. On file, A. G. O., World War Division, Medical Records Section. File No. 331.5.
- (125) First indorsement, A. E. F., C. S. O., France, August 19, 1917, to the Commander in Chief, A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 331.5.
- (126) G. O. No. 13, G. H. Q., A. E. F., January 20, 1918.
- (127) Cable No. 638-S, par. 1, February 23, 1918, from General Pershing.
- (128) Cable No. 878-R, March 7, 1918, from the Chief of Staff, W. D., to General Pershing.
- (129) Cable No. 1574-R, June 28, 1918, from the Chief of Staff, W. D., to General Pershing.
- (130) Cable No. x-11, August 21, 1918, from the Chief of Staff, W. D., to General Pershing.
- (131) Seventh indorsement, Hq. S. O. S., O. C. Q. M., A. E. F., October 30, 1918, to the chief surgeon, A. E. F. On file, Historical Division, S. G. O.
- (132) Memorandum from the officer in charge, Salvage Division, Quartermaster General's Office, December 12, 1918, to the Quartermaster General. Subject: Salvage operations. On file, Historical Division, Quartermaster General's Office.
- (133) Tables of Organization, 328, W. D., April 8, 1918.
- (134) Seventh indorsement, A. E. F., C. S. O., France, September 12, 1917, to the Surgeon General, U. S. Army. Subject: Laundries for base hospitals. On file, Historical Division, S. G. O.
- (135) Order No. 2526, Purchasing Officer, Medical Department, A. E. F., August 26, 1918. On file, A. G. O., World War Division, Medical Records Section. File No. 322.3281, Misc.
- (136) Seventh indorsement, Hq., S. O. S., O. C. Q. M., A. E. F., October 30, 1918, to the chief surgeon, A. E. F. On file, Historical Division, S. G. O.
- (137) Telegram from the chief surgeon, A. E. F., August 26, 1918, to the chief surgeon, First Army. On file, A. G. O., World War Division, Medical Records Section. File No. 414.42.
- (138) Fourth indorsement, Hdqrs., First Army Corps, A. E. F., October 10, 1918, to the Adjutant General, First Army. On file, with Sanitary Report, 77th Division, for September, 1918, Historical Division, S. G. O.
- (139) Fifth indorsement, from the commanding general, First Army, A. E. F., October 14, 1918, to the Commander in Chief, A. E. F. On file, with Sanitary Report, 77th Division, for September, 1918, Historical Division, S. G. O.
- (140) G. O. No. 10, G. H. Q., A. E. F., January 16, 1918.
- (141) Historical report of the chief quartermaster, A. E. F., 1917-19. On file, Historical Division, Office of the Quartermaster General.

- (142) Third indorsement, Hdqrs., First Army Corps, C. S. O., A. E. F., October 10, 1918, to the commanding general, First Army Corps, A. E. F. On file, with Sanitary Report, 77th Division, for September, 1918, A. G. O., World War Division.
- (143) Memorandum for the chief surgeon, A. E. F., September 1, 1918, from the chief quartermaster, A. E. F. On file, A. G. O., World War Division, Medical Records Section, 486.3. (2) G. O. No. 13, G. H. Q., A. E. F., January 21, 1918.
- (144) Telegram from the chief quartermaster, A. E. F., January 23, 1919, to the chief quartermaster, Advance Section, A. E. F. Copy on file, A. G. O., World War Division, Medical Records Section, 486.3.
- (145) Manual for the Medical Department, U. S. Army, 1916, par. 267.
- (146) Letter from the commanding officer, Hospital Center, Rimaucourt, October 28, 1918, to the chief surgeon, A. E. F. Subject: Laundry. Also: Letter from the quartermaster, Hospital Center, Beaune, October 21, 1918, to the chief quartermaster, A. E. F. Subject: Laundry for personnel. Also: Letter from the commanding officer, Hospital Center, Bazoilles, November 2, 1918, to the chief surgeon, A. E. F. Subject: Laundering for hospital personnel. On file, A. G. O., World War Division, Medical Records Section. File No. 486.3.
- (147) Second indorsement, Hdqrs., S. O. S., O. C. Q. M., November 7, 1918, to the chief surgeon, A. E. F. On file, A. G. O., World War Division, Medical Records Section, 486.3.

CHAPTER VI
FOOD AND NUTRITION
CALORIC VALUE OF ARMY RATIONS
GARRISON RATION

The ration of the American Expeditionary Forces was based upon the garrison ration, as prescribed in Army Regulations, 1205, 1913, and so modified as to meet the needs of our troops under varying conditions of activity in France and England. In these modifications the food and nutrition section, office of the chief surgeon, A. E. F., acted in both an advisory and an initiatory capacity.¹ When studying the following tables, showing the changes and food values of the various combinations evolved, certain principles which guided the work of the section should be borne in mind. The fact that cooks and mess sergeants lacked full experience with the possibilities of the garrison rations made it inevitable that in many instances the full food value of the ration failed to reach the stomach of the soldier. Hence, particular attention was given to the psychological factor, and the allowances always exceeded those of the allied armies because of the necessity of providing variety in order to assure happiness and to maintain morale. When any army is composed of men recently drawn from every walk of life, and endowed by custom with varying food habits, the psychological factor plays a part that can not be overestimated. Although the efforts directed by the Medical Department toward prevention of waste, and the improvement of cooking, attained appreciable results in this direction, nevertheless, it was necessary to provide in the ration itself a factor of safety that was higher than was absolutely demanded by nutritional needs, but which was justified by the type of troops to be fed and by the conditions under which they were living.

In Table 20 are shown the component articles and substitutes of the garrison ration which obtained when we entered the World War.²

TABLE 20.—*The garrison ration as prescribed by A. R., 1905, 1913, with estimated composition and caloric value*²

Component articles and substitutes	Weight		Protein, grams	Fat, grams	Carbo- hydrate, grams	Calories
	Ounces	Grams				
Beef, fresh.....	20	570	86.6	86.6	0	1,160
Or mutton, fresh.....	20	570	74.4	135.5	0	1,564
Bacon.....	12	340	32.3	202	0	2,014
Canned roast beef.....	16	454	117.5	67.2	0	1,105
Canned corned beef.....	16	454	119.5	85	0	1,280
Corned-beef hash.....	16	454	27.3	8.6	42.6	365
Fish, dried.....	14	397	63.2	15.8	0	275
Fish, pickled.....	18	511	83.29	88.9	0	1,266
Fish, canned.....	16	454	88.6	34	0	680
Flour.....	18	511	58.3	5.11	383.5	1,856
Or soft bread.....	18	511	47	6.64	271.5	1,367
Hard bread.....	16	454	49.9	30.4	322.5	1,800
Corn meal.....	20	570	52.4	10.8	430	2,069
Baking powder.....	.08	2.24				
Bennis.....	2.4	68	15.3	1.22	40.5	240
Or rice.....	1.6	45	3.6	.13	35.5	163
Hominy.....	1.6	45	3.7	.27	35.5	165
Potatoes.....	20	570	10.2	.6	83.8	388
Or onions.....	20	570	7.9	1.7	50.7	256
Tomatoes, canned.....	20	570	6.8	1.1	22.8	131
Fresh vegetables, carrots, turnips, and cabbage,—average.....	20	570	6.2	1.1	37.6	189
Prunes.....	1.28	36	.65	0	22.4	95
Or apples.....	1.28	36	.57	.79	23.8	108
Peaches.....	1.28	36	1.69	.25	22.5	102
Jam.....	1.28	36	.14	0	19.1	77
Coffee, roasted and ground.....	1.12	32				
Or coffee, green.....	1.4	39				
Tea, black or green.....	.32	9				
Sugar.....	3.2	91	0	0	91	371
Milk.....	.5	14	.9	1.14	1.41	20
Vinegar.....	1.16					
Or pickles.....	1.16	5	.02	.01	.13	1
Salt.....	.64	18				
Pepper.....	.04					
Spices (cinnamon).....	.014					
Lard.....	.64	18		18		168
Or lard substitute.....	.64	18		18		168
Butter.....	.5	14	.14	11.9		112
Or oleo.....	.5	14	.16	11.6		110
Sirup.....	1.32	45			33.8	139
Flavoring extract.....	.014					

¹ Gill.

Table 21 shows the component articles of the ration which was substituted in the American Expeditionary Forces on October 11, 1918, for the ration in Table 20:³

TABLE 21.—Garrison ration, as used in the American Expeditionary Forces with estimated composition and caloric value

Component articles and substitutes	Weight		Protein, grams	Fat, grams	Carbo- hydrate, grams	Calories
	Ounces	Grams				
Beef.....	20	570	86.6	86.6	0	1,160
Or mutton, fresh.....	20	570	74.4	135.5	0	1,564
Beef, fresh and boneless.....	16	454	85.4	85.4	0	1,132
Bacon.....	12	340	32.3	202	0	2,014
Pork, fresh.....	16	454	54.5	135	0	1,480
Sausage, pork.....	16	454	65.8	98	0	1,183
Sausage, Vienna.....	16	454	67.6	45	0	695
Canned roast beef.....	16	454	117.5	67.2	0	1,103
Canned corned beef.....	16	454	119.5	85	0	1,280
Corned-beef hash.....	16	454	27.3	8.6	42.6	365
Fish, dried.....	14	397	63.2	15.8	0	275
Fish, canned.....	16	454	88.6	34	0	680
Cheese.....	10	283	81.6	101.5	.8	1,280
Bread.....	16	454	41.8	5.9	241.2	1,215
Or flour.....	16	454	51.8	4.5	341.2	1,630
Corn meal.....	16	454	41.8	8.6	342	1,635
Oatmeal.....	16	454	73.1	32.7	306	1,836
Macaroni.....	16	454	60.8	4.1	336	1,665
Baking powder.....	.08	2.3				
Beans, dry.....	4	113	25.4		67.4	400
Or beans, baked.....	8	227	15.6	5.7	44.5	300
Rice.....	2	57	4.6	.2	45	204
Or hominy.....	2	57	4.7	.4	45	206
Potatoes, fresh.....	20	570	10.2	.6	83.8	388
Or onions.....	20	570	7.9	1.7	50.7	236
Tomatoes, canned.....	20	570	6.8	1.1	22.8	131
Potatoes, canned.....	15	426	8.1	1.7	176.2	759
Fresh vegetables, carrots, turnips, and cabbage, average.....	20	570	6.2	1.1	37.6	189
Dehydrated vegetables.....	4	113	9.6	.4	91.4	420
Corn, canned.....	12	340	9.5	4.1	64.6	341
Peas, canned.....	20	570	20.5	1.1	55.8	320
Jam.....	3	85	.3	0	45.2	180
Or prunes.....	3	85	1.5	0	52.8	222
Apples, dried.....	3	85	1.3	1.8	56.2	232
Peaches, dried.....	3	85	4	.6	53.2	240
Apricots, dried.....	3	85	4	.8	53.1	240
Figs.....	3	85	3.6	.3	63	276
Dates.....	3	85	1.6	2.1	60	270
Raisins.....	3	85	1.9	2.5	58.3	270
Sirup (0.64 gill).....	3.2	91	0	0	68.2	279
Coffee.....	1.12	32	0			
Tea.....	.32	9				
Sugar.....	3.2	91			91	371
Milk, evaporated.....	1	28	1.9	2.28	2.8	41
Vinegar.....	1.16					
Or pickles.....	1.16					
Salt.....		5	.02	.01	.13	1
Pepper.....	.64	18				
Spices.....	.02					
Butter.....	.014					
Or oleo.....	.5	14	.14	11.9	0	112
Lard.....	.5	14	.16	11.6	0	110
Flavoring extract.....	.5	14		14		131
Candy.....	.014					
Tobacco:	.8	23			21.6	88
Smoking.....	.4	11				
Chewing.....	.4	11				
Cigarettes.....	4					

By comparing Tables 20 and 21 it will be seen how the American Expeditionary Forces garrison ration was enriched in order to provide variety and to insure a better preparation of food. Cheese was added to the meat component at the same time that macaroni was made a part of the bread component. The importation of canned sausage made possible a further variation. With the use of roller kitchens and under the conditions of warfare it seemed undesirable to attempt to supply flour to troops in the field, consequently, bakeries were established at safe points for supplying this article. Therefore, in the

revision of the ration, bread was made the component and flour a substitute. The problem of providing satisfactory breakfasts demonstrated the desirability of breakfast-food material, and to this end oatmeal in conjunction with cornmeal, made possible the production of porridges. Macaroni was placed in this substitute group because of its nutritional relationship to the other cereals; combined with cheese or with tomatoes it provided a further variety of diet. Rice and hominy ceased to be substitutes for beans; rice was an independent component, with hominy its substitute, their separation and the requirements as to issue insuring the right quantities making it certain that both rice and beans would be supplied to troops. With rice a substitute for beans, the issuing officer could confine his troops to beans alone and fail to issue any rice at all; the change remedied this defect. The vegetable component was a field in which many attempts were made to secure variety. This was important from a nutritional viewpoint because of the high protein content of the ration and the relatively small amount of basic salts. The difficulties which developed in this adjustment are noted elsewhere. In the home garrison ration (A. R. 1205, 1913) prunes constituted the fruit component; jam was issuable only up to 50 per cent of 1.28 ounces. To remedy this condition in the American Expeditionary Forces jam was made the component; its issue was increased to 3 ounces per ration. During the World War jam proved an important fruit article for the production of a variety of desserts; apples were a close second in this particular. How this factor worked in other directions may be illustrated as follows: Often the issue of bread was reported as being inadequate. On investigation this frequently was found to be in connection with the cook's failure to provide desserts. Increasing the amount of jam or apples permitted the preparation of more desserts, which in turn reduced the craving for bread and incidentally gave greater satisfaction to the men. It will be noted that, after more than doubling the amount of fruit articles issued, the value of that portion of the ration was not increased to an equal extent because sirup ceased to be a component, becoming a fruit substitute. This measure conserved material, at the same time meeting the practical needs of the situation.

One of the early difficulties met with, in so far as the garrison ration of Table 20 was concerned, was the inadequacy of the milk component, for if milk was used in the coffee none was left for puddings or other uses. An increased allowance of milk was therefore one of the first changes made. In the group of spices the addition of sage, thyme, etc., was designed to relieve the monotony of canned meat. By the use of these spices many cooks became expert in disguising canned roast beef as sausage or other dishes. The discontinuance of lard as a component and its placement as a substitute for butter was the result of numerous observations as to the use of fat. At the front, where pastry making was limited, lard necessarily accumulated. Since the firewood used was usually green, company cooks frequently started their kitchen fires with the fat not needed for cooking purposes. To prevent such possible waste, the change was made. Also, omitting lard as a component of the ration made it necessary for the cooks to render meats in order to get sufficient cooking fat, which in turn made for food conservation. The addition of candy to the ration was intended primarily to provide confectionery for our troops at the

front, because sales commissaries were not easily maintained in advanced positions where the demands upon transportation limited shipments almost entirely to rations and ammunition. When candy was placed in the ration its presence was assured at points where otherwise it often would have been lacking. No observer of troops in the American Expeditionary Forces questioned the value of candy as a means of satisfying the men's appetites. Tobacco was added for similar psychological reasons.¹

The following paragraph is from the letter accompanying the proposed general order, which subsequently appeared as General Orders, No. 176, G. H. Q., A. E. F., 1918, of the food and nutrition section of the Medical Department, American Expeditionary Forces, at that time: ⁴

The main changes proposed for the garrison ration are: (1) Increase of beans and its substitutes, the present issue being insufficient on the daily issue; (2) an increase of dried fruit and the use of sirup as a substitute rather than as a regular component. This will meet all needs while making the distribution easier; (3) the milk allowance is doubled, the amount used in the home camps is over 2 ounces; (4) pepper is reduced 50 per cent; (5) lard is withdrawn as a component but added as a substitute for butter or oleomargarine. Lard is now generally wasted and quite enough fat can be obtained from beef and bacon. The quality of oleomargarine now issued in France is bad and it should be packed in tins. So far as possible butter only should be issued to troops at the front; (6) the addition of candy. There is a universal demand of men living in the open for sweets, which demand can not be supplied or is not, by the sales commissary. It is believed that in addition to being a good and concentrated food, candy will tend to decrease the consumption of wine, much of which is objectionable from its alcohol content.

One of the first important observations made in studying the administration of the garrison ration was the necessity for a control of the manner of its issue. The nutritional value of the ration is determined not by what is prescribed but by the proportion of articles and substitutes that are actually supplied to the soldier. Shortly after General Orders No. 176, American Expeditionary Forces, 1918, had been promulgated the Quartermaster Department, A. E. F., printed a circular, ⁵ proposed by the Medical Department, in which was specified the proportion of components and substitutes that experience had shown to be best adapted to the needs of the troops.¹

The caloric value of the rations can be determined only by studying the food actually furnished; the following tables give the approximate nutritional value of the old ration as issued, the ration established by General Orders No. 176, American Expeditionary Forces, as described by Circular No. 57, O. C. Q. M., 1918, and finally the latter as modified by subsequent experience. For computing the cost of the garrison ration, Army Regulations 1221, 1913, prescribed the percentages of each component as a basis (Table 22), and the figures therein shown are those usually taken for estimating the caloric value of this ration.

For several reasons the caloric value, as thus computed, is considerably higher than that of the actual food consumed. In the first place, the flour component is calculated as flour, while in actual use it is largely issued as bread, which nets a lesser caloric value. As a matter of fact the percentages of the different components, as shown in Table 22, never were intended to prescribe the method of issue, but merely to secure a uniform method of calculating the cost of the ration.¹

TABLE 22.—Caloric value of garrison ration as provided in A. R., 1221, 1913

Component	Per cent of issue	Weight		Protein, grams	Fat, grams	Carbo-hydrate, grams	Calories
		Ounces	Grams				
Beef, fresh.....	70	14	397	60.6	60.6	0	812
Bacon.....	30	3.6	102	9.7	60.6	0	604
Flour.....	100	18	511	58.3	5.11	383.5	1,836
Baking powder.....	100	.08					
Beans.....	50	1.2	34	7.6	.61	20.25	120
Rice.....	50	.8	23	1.8	.06	17.7	81
Potatoes.....	70	14	397	7.14	.42	58.66	272
Onions.....	20	4	114	1.58	.34	10.16	51
Tomatoes, canned.....	10	2	57	.68	.11	2.28	13
Prunes.....	30	.38	11	.19		6.72	28
Jam.....	50	.64	18	.07	0	9.55	39
Apples, dried.....	10	.128	3.6	.057	.079	2.38	11
Peaches.....	10	.128	3.6	.169	.025	2.25	10
Coffee, roasted and ground.....	100	1.12	32				
Sugar.....	100	3.2	91	0	0	91	371
Milk, evaporated, unsweetened.....	100	.5	14	.9	1.4	1.4	20
Vinegar.....	50	.8					
Pickles.....	50	.8	2.5	.01	.005	.065	.5
Salt.....	100	.64	18				
Pepper.....	100	.04	1				
Cinnamon.....	100	.014					
Lard.....	50	.32	9	0	9	0	84
Lard substitute.....	50	.32	9	0	9	0	84
Butter.....	50	.25	7	.07	5.95	0	56
Oleo.....	50	.25	7	.08	5.8	0	55
Sirup.....	100	.32	45	0	0	33.8	139
Extracts, lemon.....	100	.014					
Total.....				148.94	159.10	639.71	4,706.5

Table 23 gives a much more accurate idea of the food value of the ration as actually issued in the American Expeditionary Forces. This shows the food actually issued, and included the change in flour and bread issue to 16 ounces, which was made by General Orders No. 78, Headquarters, American Expeditionary Forces, December 18, 1917.

In Table 24, column A, the percentage issue of the Army ration, as provided in General Orders, No. 176, G. H. Q., A. E. F., 1918, and Circular No. 57, O. C. Q. M., A. E. F., is shown. In column B appear the changes that were made until April 30, 1919, as a result of experience and a return to rest conditions.

TABLE 23.—Sample issue, garrison ration in the American Expeditionary Forces, previous to appearance of General Orders No. 176, G. H. Q., A. E. F., 1918

Component and substitutes	Per cent of issue	Weight		Protein, grams	Fat, grams	Carbo-hydrate, grams	Calories
		Ounces	Grams				
Beef.....	70	14	397	60.6	60.6	0	812
Bacon.....	30	3.6	102	9.7	60.6	0	604
Bread.....	90	14.4	409	37.62	5.31	217	1,094
Flour.....	10	1.6	45	5.18	.45	34.12	165
Beans.....	50	1.2	34	7.6	.61	20.25	120
Rice.....	50	.8	25	1.8	.06	17.7	81
Potatoes.....	70	14	397	7.14	.42	58.66	272
Onions.....	20	4	114	1.58	.34	10.16	51
Tomatoes.....	10	2	57	.68	.11	2.28	13
Prunes.....	50	.64	18	.375	0	11.2	48
Jam.....	50	.64	18	.07	0	9.55	39
Coffee.....	100						
Sugar.....	100	3.2	91			91	371
Milk.....	100	.5	14	.9	1.4	1.4	20
Vinegar.....	50	1.16					
Pickles.....	50	1.16	2.5	.01	.005	.065	0.5
Salt.....	100						
Pepper.....	100						
Cinnamon.....	100						
Lard.....	100	.64	18		18		168
Butter.....	100	.5	14	.14	11.9		112
Sirup.....	100	1.32	45			34.1	139
Flavoring extract.....	100	.014					
Total.....				133.395	159.54	507.49	4,109.5
Per cent.....				16	20	64	

¹ Gills.

TABLE 24.—Garrison ration as prescribed by General Orders No. 176, G. H. Q., A. E. F., and as issued in accordance with Circular No. 57, O. C. Q. M., A. E. F., November 1, 1918, and with subsequent changes of April 30, 1919

Articles	A					B				
	Schedule of Nov. 1, 1918					Schedule of Apr. 30, 1919				
	Per cent of issue	Protein, grams	Fat, grams	Carbohydrate, grams	Calories	Per cent of issue	Protein, grams	Fat, grams	Carbohydrate, grams	Calories
Beef.....	60	51.9	51.9	0	696	60	51.9	51.9	0	696
Bacon.....	20	6.46	40.4	0	402	20	6.46	40.4	0	402
Sausage, Vienna.....						4	2.7	1.8	0	28
Fish, dried, fish, canned.....	20	17.7	6.8	0	136	4	3.5	1.3	0	27
Cheese.....						4	3.2	4.06	.032	51
Canned, roast beef.....						8	9.4	5.37	0	88
Bread.....	85	35.5	5	205	1,032	66	27.6	3.89	159	802
Flour.....	6	3.1	.2	20.5	99	25	12.9	1.1	85.2	412
Cornmeal.....	4.5	1.8	.3	15.4	64	4.5	1.8	.3	15.4	74
Oatmeal.....	3	2.1	.9	9.2	55	3	2.1	.9	9.2	55
Macaroni.....	1.5	.9	.6	5	25	1.5	.9	.06	5	25
Baking powder (1 ounce to 20 ounces flour).....	100									
Beans, dried.....	100	25.4	2	67.4	400					
Beans, baked.....						100	15.6	5.7	44.5	309
Rice.....	50	2.3	.1	22.5	102	50	2.3	.1	22.5	102
Hominy.....	50	2.3	.2	22.5	103	50	2.3	.2	22.5	103
Potatoes.....	70	7.1	.4	58.6	271	70	7.1	.4	58.6	271
Onions.....	20	1.5	.3	10.1	51	20	1.5	.3	10.1	51
Tomatoes.....	10	.6	.11	2.2	13	10	.6	.11	2.2	13
Jam.....	30	.09	0	13.6	54	30	.09	0	13.6	54
Prunes.....	20	.3	0	10.5	44	20	.3	0	10.5	44
Apples, or peaches.....	10	.1	.18	5.6	25	10	.1	.18	5.6	25
Dates, figs, or raisins.....	10	.16	.21	6	27	10	.16	.21	6	27
Sirup.....	30	0	0	20.4	83	30	0	0	20.4	83
Coffee.....	100					100				
Sugar.....	100	0	0	91	371	100	0	0	91	371
Milk.....	100	1.9	2.28	2.8	41	100	1.9	2.28	2.8	41
Vinegar.....	50					30				
Pickles.....	50	.01	0	.06	.5	70	.01	0	.09	.7
Salt, pepper, and spices.....	100					100				
Butter.....	50	.07	5.9	0	56	50	.07	5.9	0	56
Oleo or lard.....	50	.08	5.8	0	55	50	.08	5.8	0	55
Extract.....	100	0	0			100	0	0		
Candy.....	100	0	0	21.6	88	100	0	0	21.6	88
Tobacco.....	50					50				
Cigarettes.....	50					50				
Totals.....		161.37	123.06	609.96	4,303.5		154.57	132.26	605.82	4,344.7
Per cent.....		18	14	68			17	14	69	

When providing rations for troops in the zone of the advance, experience soon proved that the ordinary method of issue for 10-day periods was impracticable. On the other hand, the attempt to furnish every day each component of the ration according to the prescribed percentages caused much difficulty in the matter of dividing packages and in handling the smaller portions. The ideal sought was to issue daily such quantities as with fair certainty could be used in the day's menu. This difficulty was appreciated early in the American Expeditionary Forces, and an attempt to remedy it was made by governing the issue of rations from the regulating station. In planning General Orders, No. 176, G. H. Q., A. E. F., 1918, the same idea was considered, and in Q. M. C. Circular No. 57, O. C. Q. M., 1918, a method of daily issue was planned, which, in general, involved a distribution of allowances over a 10-day period, issuing on each day a sufficient quantity of certain components to provide for a good menu and yet insure consumption of the entire amount within 24 hours.¹ Table 25 shows the percentage issue on the original ration which prevailed for May 21, 1918, to November 1, 1918, the daily percentage issue under provisions of Circular No. 57, and the daily issue as practiced throughout our Army of Occupation on April 30, 1919. The caloric values of each day's issue are given.¹

TABLE 25.—Percentage issue on the original ration
ISSUE A. DAILY AUTOMATIC ISSUE PLAN WHICH PREVAILED MAY 21, 1918

Component articles	Distribution of allowances over a 10-day period																			
	First day		Second day		Third day		Fourth day		Fifth day		Sixth day		Seventh day		Eighth day		Ninth day		Tenth day	
	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries
Beef, mutton, or pork.....	100	1,160	100	1,160	100	1,160	100	1,160	100	1,160	100	1,160	100	1,160	100	1,160	100	1,160	100	1,160
Bacon.....	90	1,063	90	1,063	90	1,063	90	1,063	90	1,063	90	1,063	90	1,063	90	1,063	90	1,063	90	1,063
Bread.....	10	165	10	165	10	165	10	165	10	165	10	165	10	165	10	165	10	165	10	165
Flour.....	100	240	100	240	100	240	100	240	100	240	100	240	100	240	100	240	100	240	100	240
Baking powder.....	80	310	80	310	80	310	80	310	80	310	80	310	80	310	80	310	80	310	80	310
Rice.....	20	51	20	51	20	51	20	51	20	51	20	51	20	51	20	51	20	51	20	51
Potatoes.....	100	163	100	163	100	163	100	163	100	163	100	163	100	163	100	163	100	163	100	163
Tomatoes.....	100	310	100	310	100	310	100	310	100	310	100	310	100	310	100	310	100	310	100	310
Onions.....	100	371	100	371	100	371	100	371	100	371	100	371	100	371	100	371	100	371	100	371
Peas.....	100	77	100	77	100	77	100	77	100	77	100	77	100	77	100	77	100	77	100	77
Peaches, apricots, or apples.....	100	108	100	108	100	108	100	108	100	108	100	108	100	108	100	108	100	108	100	108
Dates, figs, or raisins.....	100	115	100	115	100	115	100	115	100	115	100	115	100	115	100	115	100	115	100	115
Syrup.....	100	139	100	139	100	139	100	139	100	139	100	139	100	139	100	139	100	139	100	139
Pickles.....	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Vinegar.....	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Cinnamon or nutmeg.....	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Butter.....	100	112	100	112	100	112	100	112	100	112	100	112	100	112	100	112	100	112	100	112
Oil.....	100	110	100	110	100	110	100	110	100	110	100	110	100	110	100	110	100	110	100	110
Lard or lard substitute.....	100	108	100	108	100	108	100	108	100	108	100	108	100	108	100	108	100	108	100	108
Peppermint.....	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Pepper.....	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Salt.....	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Coffee.....	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Milk.....	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20
Sugar.....	100	371	100	371	100	371	100	371	100	371	100	371	100	371	100	371	100	371	100	371
Total calories.....		3,937		3,937		3,904		3,904		3,907		4,733		3,944		3,845		4,773		3,827

Average calories per day, 4,143.

TABLE 25.—Percentage issue on the original ration—Continued
 ISSUE B. DAILY AUTOMATIC ISSUE PLAN WHICH PREVAILED NOVEMBER 1, 1948

Component articles	Distribution of allowances over a 10-day period																				
	First day		Second day		Third day		Fourth day		Fifth day		Sixth day		Seventh day		Eighth day		Ninth day		Tenth day		
	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	Per cent	Calo-ries	
Beef, mutton or pork	60	696	60	696	60	696	60	696	60	696	60	696	60	696	60	696	60	696	60	696	
Bacon	40	805	40	805	40	805	40	805	40	805	40	805	40	805	40	805	40	805	40	805	
Sausages																					
Spiced, corned, or roast beef																					
Spiced, corned, or roast beef																					
Spiced, corned, or roast beef																					
Bread	85	1,033	85	1,033	85	1,033	85	1,033	85	1,033	85	1,033	85	1,033	85	1,033	85	1,033	85	1,033	
Flour	15	278	15	248	15	248	15	278	15	248	15	248	15	248	15	278	15	248	15	278	
Oat meal																					
Corn meal																					
Macaroni																					
Baking powder																					
Beans	100	400	100	400	100	400	100	400	100	400	100	400	100	400	100	400	100	400	100	400	
Rice																					
Hominy	70	258	70	258	70	258	70	258	70	258	70	258	70	258	70	258	70	258	70	258	
Potatoes																					
Tomatoes																					
Onions	33½	85	33½	85	25	32	33½	85	25	32	33½	85	25	32	33½	85	25	32	33½	85	
Jam																					
Prunes																					
Peaches, apricots, or apples																					
Dates, figs or raisins																					
Strap	100	270	100	279	100	279	100	279	100	279	100	279	100	279	100	279	100	279	100	279	
Pickles	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Vinegar																					
Chinamen, or nutmeg																					
Cloves, or ginger																					
Savory, or allspice																					
Butter	100	112	100	110	100	112	100	112	100	112	100	112	100	112	100	112	100	112	100	112	
Ohio																					
Lemon	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Vanilla	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Pepper	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Salt	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Coffee	100	41	100	41	100	41	100	41	100	41	100	41	100	41	100	41	100	41	100	41	
Milk	100	371	100	371	100	371	100	371	100	371	100	371	100	371	100	371	100	371	100	371	
Sugar	100	88	100	88	100	88	100	88	100	88	100	88	100	88	100	88	100	88	100	88	
Candy																					
Tobacco	45	5	45	5	45	5	45	5	45	5	45	5	45	5	45	5	45	5	45	5	
Smoking	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
Chewing	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	
Cigarettes																					
Total calories	4,437		3,691		4,306		3,838		4,963		3,586		4,112		3,925		4,347		3,849		3,849

Average calories per day, 4,047

INCREASES IN GARRISON RATION FOR SPECIAL TROOPS

Previous to the organization of the food and nutrition section of the Medical Department, American Expeditionary Forces, certain increases for special types of troops had been authorized; e. g., 50 per cent increase in coffee, 33 $\frac{1}{3}$ per cent increase in sugar, and 25 per cent increase in meat for troops in the front lines from November to March,⁶ and a 25 per cent increase in meat, sugar, and coffee for men engaged in hard labor over eight hours per day between the months of November and March.⁷ Looking toward a revision of these schedules, the officers of the Medical Department concerned with food and nutrition made investigations and, through the chief surgeon, American Expeditionary Forces, recommended changes to the Quartermaster Corps.¹ The classes of increases and their effect on the garrison ration are summarized in Table 26.

TABLE 26.—*Special increases in the garrison ration, as prescribed in General Orders No. 176, G. H. Q., A. E. F., October 11, 1918*

	Protein, grams	Fat, grams	Carbohy- drate, grams	Calories
A				
Front-line troops entire year—10 per cent increase in the bread component; 25 per cent sugar, and 33 $\frac{1}{3}$ per cent coffee. As issued this represents the following value:				
Bread.....	4.18	0.6	24.1	121.5
Sugar.....	0	0	23.0	92.0
Total.....	4.18	.6	47.1	213.5
B				
From Nov. 1 to Mar. 31 there was for front-line troops a 25 per cent increase in the meat component. As issued this represents:				
Meat.....	19.01	25.3	0	308
With these increases the garrison ration (using issue A, Table 24, as a base) for front-line troops contained the following:				
Front-line troops, Apr. 1 to Nov. 1.....	165.55	123.6	657.06	4,517
Front-line troops, Nov. 1 to Mar. 31.....	184.56	148.96	657.06	4,825
C				
For troops performing hard labor in excess of 8 hours per day, the following scale of increases was provided. Before this increase was issued an organization performing hard labor was investigated by the officers of the food section, and the increase was either approved or disapproved.				
For messes consisting of 75 men or less:				
15 per cent increase in bread component.				
10 per cent increase in vegetable component.				
25 per cent increase in coffee component.				
50 per cent increase in butter component.				
For messes of more than 75 men:				
7 $\frac{1}{2}$ per cent increase in bread component.				
5 per cent increase in vegetable component.				
12 $\frac{1}{2}$ per cent increase in coffee component.				
25 per cent increase in butter component.				
This represents the following increase as issued:				
15 per cent bread.....	6.51	.9	38.2	204
10 per cent vegetable.....	.9	.08	7.09	33
50 per cent butter.....	.07	5.9	0.	56
Total.....	7.48	6.88	45.29	293
Which added to the rations yields.....	168.85	129.94	655.25	4,596
For messes of more than 75 men the amount was half the other, or.....	165.11	126.50	632.6	4,450

THE FIELD RATION

A. R. 1205, 1913, states in part: "The field ration is the ration prescribed in orders by the commander of the field forces. It consists of the reserve ration in whole or in part, supplemented by articles of food requisitioned or purchased locally, or shipped from the rear, provided such supplements or substitutes correspond generally with the component articles or substitutive equivalents of the garrison ration."

Paragraph II, General Orders, No. 18, H. A. E. F., July 28, 1917, prescribed the following field ration:

TABLE 27.—The field ration, American Expeditionary Forces, prescribed July 28, 1917

Articles	Weight		Protein, grams	Fat, grams	Carbo-hydrate, grams	Calories
	Ounces	Grams				
Bacon.....	12	340	32.3	202.0	0	2,014
Or canned meat (figures for corned beef).....	16	454	(119.5)	(85.0)	(0)	(1,280)
Hard bread.....	16	454	49.4	30.0	322.5	1,800
Beans.....	4	113	25.4	2.0	67.4	400
Potatoes.....	8	227	4.0	.2	33.4	155
Dried fruit.....	1.28	47	.8	.7	25.9	109
Or jam.....	1.28	47	(.1)	(0)	(17.3)	(80)
Coffee.....	1.12	.....	.....	.....	.....	.....
Sugar.....	3.2	91	0	0	91.0	372
Milk.....	.5	14	.98	1.4	1.43	21
Salt.....	.64	.....	.....	.....	.....	.....
Pepper.....	.04	.....	.....	.....	.....	.....
Total grams on the basis of bacon and dried fruit issues.....	.....	.....	112.88	236.43	541.63	4,871

Various articles of the garrison ration were added to this from time to time as substitutes, and in General Orders, No. 176, G. H. Q., A. E. F., 1918, the field ration was set forth as follows:

TABLE 28.—The field ration, American Expeditionary Forces, prescribed October 11, 1918

Component articles	Quantity, ounces	Substitute articles	Quantity, ounces
Canned meats.....	16	Beef, corned.....	16
		Corned beef hash.....	16
		Roast beef.....	16
		Canned fish.....	16
		Sardines.....	16
		Bacon.....	12
Potatoes, dehydrated.....	4	Potatoes, fresh.....	8
		Vegetables, dehydrated.....	4
Soup cubes.....	1.76		
Hard bread.....	16	Soft bread.....	16
Beans, dry.....	4	Peas, dry.....	4
Jam.....	3	Dried fruits.....	3
Coffee, soluble.....	.75	Coffee, roasted and ground.....	1.12
Sugar.....	3.2		
Salt.....	.16		
Milk.....	1.0		
Chocolate, sweet.....	1.0	Candy.....	1.0
Tobacco.....	.4		

The field ration as used differed from that proposed by the food and nutrition section in only two particulars, the presence of dry beans and fresh potatoes. In lieu of these it was proposed that there be canned baked beans, but no

potatoes, this recommendation being based upon the opinions of the officers most concerned in many of the combat divisions, whose unanimous feeling was that the field ration must not contain perishable components and that it should consist of articles ready for immediate use.⁸ On this account it was felt that fresh potatoes and dry beans were not suitable. The statement accompanying the recommendation on the subject was as follows:⁸

Whenever in battle it is impracticable to serve hot meals regularly to troops from company kitchens or when other conditions may require it, the issue of the garrison ration to organizations concerned will be temporarily discontinued upon the orders of the C. O., and the field ration issued instead. As soon as conditions again permit its use the issue of the garrison ration will be resumed. The regulating officer will be notified in advance when replacements of field rations are needed, or when it is desired that organizations shall be supplied daily with the field instead of the garrison ration or when the issue of the garrison ration is to be resumed.

In this connection the following comment was received from the Quartermaster Department upon the subject:⁹

In my opinion, potatoes, fresh, should be the component article of the field ration and potatoes, dehydrated, the substitutive article. Fresh beef and fresh onions should also be added to the field ration, as fresh food is essential to the health of troops, and all nations make every effort to provide fresh beef and fresh vegetables for their troops in the field. Sugar should also be made a substitutive article for issue in lieu of candy when the latter is not available.

Reply to this comment was as follows:¹⁰

I do not agree with the point of view in regard to the field ration. It is understood that so far as it is possible all troops of the American Expeditionary Forces will be subsisted on the garrison ration, and that the field ration will be used only in forward positions where but little cooking is possible and where food can be carried to men occupying exposed positions only once or twice a day. For that reason it was our judgment that the field ration should be almost wholly ready to eat and nonperishable. Four days' supply of the field ration are carried in divisional and regimental trains as reserve, and it is obvious that fresh beef or fresh potatoes have no place in such a ration.

My criticism of the field ration, as approved by G. H. Q., would rather be that dehydrated potatoes or other vegetables and dried beans and dried fruit, all of which require considerable time for preparation, should not be included. These articles were added at G. H. Q., and canned tomatoes, canned baked beans, contained in the ration as recommended by the chief quartermaster, were excluded. Additional sugar, in lieu of candy, would, it seems to me, be virtually useless in the field ration. Sweet chocolate should be the candy issued.

The letter which was sent to the chief quartermaster, A. E. F., when the field ration was proposed contained the following paragraph, which was concurred in by his office:¹¹

In open warfare and in some instances in trench warfare, where positions or approaches are particularly exposed, it is clear that the garrison ration, with its quarters of beef, potatoes, and other materials requiring the use of kitchens close to the positions, is not practicable. The efforts to use the marmite cans for carrying food forward prove in many, or even in most instances, to be unsuccessful; the marmites are too large and heavy and in practice food sours quickly in them. The use of the present marmite should be abandoned, and for trench use a squad can be substituted.

Under such conditions all careful observers we have consulted agree that a ration made up chiefly of cooked and canned food, ready to be eaten without cooking when necessary, and nonperishable, must be used. This opinion is reached after consulting with many officers of the 1st, 2d, 4th, 26th, 32d, and 42d Divisions, after their service in the recent activity

north of Chateau Thierry and after personal observation of the conditions there. The most satisfactory provision for the conditions of the sort referred to is to modify the field ration now carried in field and supply trains by the removal of potatoes, dried fruit, dried beans, and bacon and addition of material which does not require preparation. Such food, with solidified alcohol where needed, will make possible the feeding of the men satisfactory, while that is not possible under present arrangements. When a division is in active combat in open warfare, the whole division should be subsisted on the field ration, four day's supply of which is on the trains, these being replaced from the railhead, and the shipment of rations from depots being changed on telegraphic orders to field rations. As soon as the division is withdrawn it should change at once to the garrison ration.

In railroad journeys by our troops in France the Red Cross canteens added variety to the travel ration by providing hot foods at the stops.¹² Also in the latter part of the period during which troops were being transferred home a system of ration trains was developed by the Quartermaster Department, American Expeditionary Forces.¹³ These carried roller kitchens mounted on flat cars; meals were cooked en route and served to the men at stopping points. This plan worked so well that it was adopted generally for the troops transferred from Germany to the coast and for those troops sent from Le Mans to the base ports.¹⁴

THE RESERVE RATION

The following tables show the changes made in the field ration from time to time during the World War:

TABLE 29.—*The reserve ration, and as modified in the American Expeditionary Forces*

A. Army Regulations, 1913:

Component articles	Quantity, ounces
Bacon.....	12
Or canned meat (corned beef).....	16
Hard bread.....	16
Coffee, roasted and ground.....	1.12
Sugar.....	2.4
Salt.....	.16

B. In General Orders, No. 18, H. A. E. F., July 28, 1917, this reserve ration was changed by increasing the sugar component to 3.2 ounces.

C. In General Orders, No. 176, G. H. Q., A. E. F., 1918:

Component articles	Quantity, ounces	Substitute articles	Quantity, ounces
Canned meats.....	16		
Corned beef.....	16	Roast beef.....	16
		Corned-beef hash.....	16
		Sardines.....	16
		Canned fish.....	16
Hard bread.....	16		
Coffee soluble.....	.75		
Salt.....	.16		
Sugar.....	3.2		
Soup cube (1).....	1.76		
Solid alcohol.....	2		

D. Trench reserve ration (kept in a metal box; 25 rations packed together):

½-pound cans hard bread.....	50	¼-pound cans sardines.....	4
1-pound cans corned beef.....	10	3.3-ounce rations sugar.....	25
1-pound cans roast beef.....	5	0.75-ounce soluble coffee.....	25
1-pound cans corned beef hash.....	5	0.60-ounce salt.....	25
1-pound cans salmon.....	4	2-ounce solidified alcohol.....	25

In practice the use of the reserve ration presented many difficulties. The loss of hard bread due to exposure, to weather, and to destruction by rats, the tendency of the men to throw away the ration for lack of a suitable container

and the absence of unit size cans, all were factors.⁸ In the ration prescribed by General Orders No. 176, G. H. Q., A. E. F., 1918, bacon was eliminated in favor of canned meats because of the tendency to deterioration of the former, and the difficulty of cooking it under field conditions.¹

THE TRAVEL RATION

Table 30 shows the travel ration which obtained when we entered the World War, and its modification in October, 1918:

TABLE 30.—*The travel ration, and as modified in the American Expeditionary Forces*

A. As laid down in Army Regulations:

Component articles	Quantity, ounces	Substitute articles	Quantity, ounces
Soft bread	18	Hard bread	16
Corned beef	16	Corned beef hash	12
Tomatoes, canned	8		
Jam	1.4		
Coffee, roasted and ground	1.12		
Sugar	2.4		
Milk	.5		

B. As modified in General Orders, No. 176, G. H. Q., A. E. F., 1918:

Component articles	Quantity, ounces	Substitute articles	Quantity, ounces
Canned roast beef	12	Canned corned beef	12
		Sardines	12
		Canned fish	12
		Hard bread	16
Soft bread	16		
Beans, baked	4		
Tomatoes, canned	8		
Jam	2		
Coffee, roasted and ground	1.12	Coffee, soluble	.5
Sugar	2.4		
Milk	1		
Tobacco	.4		

SUMMARY OF CALORIC VALUE OF VARIOUS RATIONS ISSUED TO THE AMERICAN EXPEDITIONARY FORCES

Table 31 summarizes the caloric value of the various rations issued to the American Expeditionary Forces.

TABLE 31.—*Summary of caloric value of the various rations, American Expeditionary Forces*

	Protein, grams	Fat, grams	Carbohydrate, grams	Calories
A. The garrison ration as issued:				
1. According to A. R. 1221, 1913	148.94	159.10	639.71	4,706
2. Sample issue in A. E. F. prior to G. O. 176	133.39	159.54	507.49	4,169
3. G. O. 176 according to Cir. 57, O. C. Q. M., A. E. F., November, 1918	161.37	123.06	609.96	4,303
4. G. O. 176 as issued to Army of Occupation, May 1, 1919	154.57	132.26	605.82	4,345
5. The average issue under the daily automatic issue plan, May 21, 1918				4,143
6. The average issue under the daily automatic issue plan, November, 1918				4,047
7. The average issue under the daily automatic issue plan, April 30, 1919				3,882
8. Front-line troops, April 1 to October 31	165.55	123.6	657.06	4,517
9. Front-line troops, November 1 to March 31	184.56	148.96	657.06	4,825
10. For troops at hard labor in excess of 8 hours (75 men or less)	168.85	129.94	655.25	4,396
11. For troops at hard labor in excess of 8 hours (75 men or more)	163.11	126.50	632.60	4,450
B. The field ration:				
1. G. O. No. 18, G. H. Q., A. E. F., July 28, 1917	112.88	236.44	541.63	4,869
2. G. O. No. 176, G. H. Q., November, 1918	167.75	111.80	615.3	4,258
C. The reserve ration:				
1. A. R. 1221	192.2	232.4	389.5	4,090
2. G. O. No. 18, G. H. Q., A. E. F., July, 1917	192.2	232.4	393.5	4,147
3. G. O. No. 176, G. H. Q., A. E. F., November, 1918	141.2	87.2	421.8	3,125
D. The travel ration:				
1. Army regulations	141.34	72.0	376.07	2,802
2. G. O. No. 176, G. H. Q., A. E. F., 1918	149.00	84.40	459.80	3,247

CALORIC VALUE OF THE RATION AS AFFECTED BY METHODS OF MESSING

In considering the ration of any army it is almost impossible to draw conclusions as to its adequacy, both as to quality and quantity, from a mere comparison of tables and calories. The method of issue, the efficiency of the cooks, and the watchful care of the company commanders had much greater effect upon the number of food units that reached the stomach of the soldier than the ration articles themselves considered solely as calories. Practically no opportunity was given to the food and nutrition section for making detailed studies in France of the actual food consumption of any body of troops over a period of time, as was done in the United States. From a practical viewpoint, knowing the garrison ration values and concentrating efforts on a small garbage pail and appetizing cooking, it was possible to estimate very well whether the men were or were not getting sufficient nourishment. In one case, however, the commanding officer of a large camp in the Services of Supply, after the armistice, requested a special study of his mess with a view to determining its adequacy and to reducing possible waste. The figures from this investigation are given to illustrate how the method of messing affects the caloric value of a ration rather than as an example of what the troops as a whole did with the ration.¹

TABLE 32.—*Study of a single mess and its food consumption*

[Average number of men fed, 4,167]

	Protein	Calories	Fat, calories	Carbohydrate, calories
Food supplied per man per day.....	549		1,303	2,003
Percentage composition of food.....	14.3		33.9	51.2
Calories per man per day.....		3,855		
Food wasted per man per day, in calories.....		410		
Supplied.....		3,855		
Food consumed per man per day.....		3,445		

STUDY OF WASTES

	Pounds	Five-day period, calories	Per cent
Edible waste:			
Dining hall.....	10,179	7,219,679	9.1
Kitchen.....	3,606	2,536,644	3.0
Total.....	13,784	9,756,323	12.1
Inedible waste:			
Bones.....	1,338		
Onion peels.....	655		
Bacon rinds.....	255		
Prune pits.....	222		
Potato peels.....	4,093		

The loss from careless potato peeling alone presented a case for action. In one instance 4,578 pounds of potatoes were peeled, with 2,099 pounds of waste. On a subsequent day 4,547 pounds of potatoes were prepared under the special direction of a sergeant, with the result that there were only 1,409 pounds of peelings, or a saving of some 700 pounds of edible potato. This experience illustrates the danger of drawing conclusions as to what actually reaches the individual by studying tabulated ration values alone.

Rations of several foreign armies during the World War are presented for comparison in the following tables. These tables should be considered while holding in mind the points mentioned in the preceding paragraph.

TABLE 33.—*The French Army rations (French figures)* ¹

	BEGINNING OF WAR									
	The strong ration ^a					The normal ration ^b				
	Grams	Protein, grams	Fat, grams	Carbohydrate, grams	Calories	Grams	Protein, grams	Fat, grams	Carbohydrate, grams	Calories
Hard bread.....	700	45	1	365	1,705	700	45	1	365	1,705
Fresh meat.....	500	72	72	0	1,000	400	57	58	0	800
Dried vegetables or substitutes.....	100	14	1	64	339	60	8	1	39	203
Salt.....	20	0	0	0	0	20	0	0	0	0
Sugar.....	32	0	0	31	127	21	0	0	20	83
Coffee.....	24	1	1	3	25	16	0	1	2	17
Bacon.....	30	4	14	0	146	30	4	14	0	146
Total.....		136	89	463	3,342		114	75	426	2,954
ON FEBRUARY 3, 1916										
Hard bread.....	700	45	1	365	1,705	700	45	1	365	1,705
Fresh meat.....	450	65	65	0	900	400	57	58	0	800
Dried vegetables or substitutes.....	100	14	1	64	339	60	8	1	39	203
Salt.....	20	0	0	0	0	20	0	0	0	0
Sugar.....	32	0	0	31	127	21	0	0	20	83
Coffee.....	24	1	1	3	25	16	0	1	2	17
Bacon.....	30	4	14	0	146	30	4	14	0	146
Wine.....	∞375				320	∞250				212
Total.....		129	82	463	3,562		114	75	426	3,166
IN 1918 ^c										
Hard bread.....	700	45	1	365	1,705	700	45	1	365	1,705
Fresh meat.....	450	65	65	0	900	400	57	58	0	800
Dried vegetables or substitutes.....	100	14	1	64	339	60	8	1	39	203
Salt.....	20	0	0	0	0	20	0	0	0	0
Sugar.....	48	0	0	47	191	32	0	0	31	127
Coffee.....	36	1	2	4	37	24	1	1	3	25
Bacon.....	30	4	14	0	146	30	4	14	0	146
Wine.....	∞375				320	∞250				212
Brandy (in bivouac).....	∞62				187	∞62				187
Total.....		129	83	490	3,825		115	75	438	3,405

^a The strong ration is that of the zone of advance. The normal ration is that of the troops of the rear and line of communication.

^b By order of the commander in chief of the armies the normal ration can be increased as follows: 25-50 grams fresh meat; 8-16 grams sugar; 6-12 grams coffee; 20-40 grams vegetables or rice. This is in the zone of the armies.

^c Cubic centimeter.

^d In addition to the ration, each man received 0.35 francs per day to purchase supplementary food.

^e In practice only 600 grams bread and 400 grams meat actually were issued in the strong ration and 600 grams bread and 300 grams meat in the normal ration. The difference represented 20 centimes, which was used for local purchase of food.

In considering the British ration tables it must be borne in mind that during a large part of the war of 1914-1918, Great Britain was faced with an ever-increasing scarcity of food. In her home ration there was a steady reduction in quantity issued, while increasing measures were taken to conserve the food actually supplied. Rewards for food salvage, a supervision of menus from the headquarters of the Quartermaster General, and other economy measures made for an extremely efficient system of food saving in the home camps. So efficient was it, in fact, that our own troops, who were used to much greater variety of food and who had not felt the necessity for conservation to any marked

extent. experienced great difficulty at first in the English camps. Abroad, England provided a much more liberal allowance, though even there it was less than the American ration. Also, as may be seen from the tables, the English worked out a much more careful system of increases for labor organizations than was in force for a time in our Army.¹

TABLE 34.—*The British Army rations (British figures)*¹

A. FIELD RATION

Component articles	Weight		Protein, grams	Fat, grams	Carbo- hydrate, grams	Calories
	Ounces	Grams				
Frozen meat.....	8	227	34	34	0	519
Preserved meat.....	3	85	21.7	19.1	0	267
Meat and vegetable ration.....	1½/7	20	.93	.87	1.11	163
Pork and beans.....	2½/7	65	4.49	1.63	12.75	86
Bread.....	12	340	27.2	4.08	178.5	881
Biscuits.....	2.66	75.4	7.54	.75	63.6	299
Rice.....	1	28	2.24	.84	22.1	103
Oatmeal.....	1	28	4.51	2.02	18.9	114
Bacon.....	3	65	8.07	.51	0	307
Butter.....	1	28	.28	23.8	0	221
Cheese.....	2	57	14.25	17.1	1.43	218
Fresh vegetables.....	8	227	1.76	.22	11.89	195
Or dried vegetables.....	2	57	13.6	1.85	34	203
Jam.....	2	57	.34	.05	28.5	120
Tea.....	.5	14				
Sugar.....	2.5	71			69.6	284
Or sugar, when sweetened condensed milk is served.....	2	57			55.8	228
Condensed milk, unsweetened.....	1	28	2.68	2.6	3.14	47
Salt.....	.25	7				
Pepper.....	.01	.3				
Mustard.....	.01	.3				
Pickles.....	.42	12				
Tobacco or cigarettes.....	.28	8				
Matches, 2 boxes.....						
Lime juice.....	.01	.2				
Rum.....	.01	.3				
Total.....			117.35	165.49	433.63	4,032

B. THE LINE OF COMMUNICATIONS RATION

Frozen meat.....	7	198	29.75	29.75	0	455
Preserved meat.....	1.5	43	10.08	9.56	0	133
Meat and vegetable ration.....	1½/7	20	.93	.87	1.11	163
Pork and beans.....	2½/7	65	4.49	1.63	12.75	86
Bread.....	10.5	298	23.8	3.58	156.5	772
Biscuits.....	2.33	66	6.61	.66	56.2	263
Rice.....	2	57	4.56	1.71	45	205
Oatmeal.....	1	28	4.51	2.02	18.9	114
Bacon.....	3	85	8.07	.51	0	307
Oleomargarine.....	1	28	.33	23.5	0	220
Cheese.....	1	28	7.1	8.5	.7	109
Fresh vegetables, or.....	8	227	1.76	.22	11.89	195
Jam.....	2	57	.34	.05	28.5	120
Tea.....	¾	11				
Sugar.....	1	28			27.9	114
Or sugar, when sweetened condensed milk is served.....	.5	14			13.9	57
Condensed milk, unsweetened.....	1	28	2.68	2.6	3.14	47
Salt.....	.25	7				
Pepper.....	.01	.3				
Mustard.....	.01	.3				
Pickles.....	.42	12				
Tobacco or cigarettes.....	.28	8				
Matches, 1 box.....						
Lime juice.....	1/28	.1				
Total.....			105.01	136.60	362.59	3,503

C. THE IRON RATION

Preserved meat.....	12	340	86.8	76.5	0	1,067
Biscuits.....	16	454	45.4	4.54	386	1,810
Tea.....	.5	14				
Sugar.....	2	57			55.8	228
Total.....			132.2	81.04	441.8	3,105

TABLE 34.—The British Army rations (British figures)—Continued

D. THE TRAVEL RATION

Component articles	Weight		Protein, grams	Fat, grams	Carbo-hydrate, grams	Calories
	Ounces	Grams				
Preserved meat.....	9	255	65	57.4	289	860
Biscuits.....	12	340	34	3.40	289	1,356
Sugar.....	2	57			55.8	228
Or sugar, when sweetened condensed milk is served ..	1.5	42			41.9	
Cheese.....	2	57	14.25	17.1	1.43	218
Jam.....	3	85	.51	.07	42.8	180
Tea.....	.5	14				
Condensed milk.....	1	28	2.68	2.6	3.14	47
Total.....			116.44	80.57	392.17	2,829

E. SCALE OF INCREASES

Group members	Component articles and substitutes	Weight		Protein, grams	Fat, grams	Carbo-hydrate, grams	Calories
		Ounces	Grams				
I	Fresh, or frozen meat.....	4	114	17.0	20.4		260
	Or preserved meat.....	3	85	21.7	19.15		267
	Bread.....	4	114	9.0	1.36	59.5	293
	Or biscuit.....	2.5	71	7.1	.71	60.4	283
	Oatmeal.....	1	28	4.51	2.02	18.9	114
II	Bacon.....	2	57	5.42	34.2		340
	Pork and beans (3½ tin).....						
III	Bread.....	4	114	9.0	1.36	59.5	293
	Cheese.....	6	170	13.5	2.04	89.2	439
	Or biscuit.....	1	28	7.1	8.5	.7	109
IV	Bread.....	4	114	9.0	1.36	59.5	293
	Cocoa.....	¾	7	1.05	1.82	2.10	30
V	Or Oxo cubes (1 cube).....			1.08	.21	2.28	16
	Tea.....	¾					
	Sugar.....	¾	21			20.8	84
VI	Pea soup.....	2	57	2.16	.42	4.56	32
	Or Oxo cubes (2 cubes).....			2.16	.42	4.56	32
	Or chocolate.....	¾	7	1.05	1.82	2.10	30
VII	Or cocoa and condensed milk.....	1¾		.53	.52	.63	9
	Or cocoa and milk (3½ tin).....						
VIII	Bread.....	2	57	4.5	.68	29.74	146
	Oxo cube (1 cube).....			1.08	.21	2.28	16

UNITS ENTITLED TO INCREASE

- a. Heavy artillery draw VI twice weekly during special operation winter months or daily during severe weather.
b. All men of the line of communications may draw bread and meat on field ration scale when on hard labor.
c. Railroad or ammunition dumps draw IV when employed four hours or over between 9 p. m. and 6 a. m.
d. Men waiting for trains draw V and VI.
e. Men in the trenches may draw V daily. Scale VI may be drawn twice weekly during winter months or daily during severe weather on authority army commanders.
f. Line of communications men on night duty may draw IV when working four hours or over between 9 p. m. and 6 a. m.
g. Men of field butcheries and bakeries draw line of communications ration with bread and meat on the field ration scale.
h. Railway troops when working over eight hours draw I. When working at night for four hours and over between 9 p. m. and 6 a. m. draw IV. When both V and VI are drawn no bread is allowed in IV.
i. Road construction companies draw field ration with IV for night work.
j. Quarry companies draw field ration with IV for night work.
k. G. H. Q. intelligence wireless draw IV for night work.
l. Canadian forestry companies on line of communications draw special ration. In army areas, forestry companies draw ration plus II when working over eight hours. British forestry parties on line of communications draw line of communications ration plus bread and meat—field ration plus II for over eight hours. British forestry outfits in army areas draw field ration plus II for over eight hours.
m. Women of Q. M. A. A. C. on night duty between 9 p. m. and 6 a. m., draw VII.

TABLE 34.—The British Army rations (British figures)—Continued

F. EQUIVALENTS

Component article	Ounces	Substitute article	Ounces
Frozen meat.....	16	Preserved meat.....	9
		Or meat and vegetable ration (1 tin).	
		Or pork and beans (2½ tins).	
Bread.....	16	Biscuits or flour or rice or oatmeal.....	10
Bacon.....			
Field ration.....	4		
Or line of communications ration.....	3	Meat and vegetable (¾ tin).	
Bacon.....	1	Butter or margarine.....	1
Jam.....	1	Dried fruit or sirup.....	1
		Or honey.....	½
Fresh vegetables.....	8	Dried vegetables.....	2
		Or dried fruit.....	2

G. SUBSTITUTES *

Component article	Ounces	Substitute article	Ounces
Frozen meat.....	16	Rabbit.....	8
Preserved meat.....	1	Sardines.....	1
		Or tinned herring.....	2
Bacon.....	4	Or veal loaf.....	1
		Cambridge sausage.....	4
Condensed milk, unsweetened.....		Or roast sausage.....	6
Cheese.....	1	Dried milk.....	½
		Veal loaf.....	1
Tea.....	½	Or mince meat.....	½
Potatoes.....	2	Coffee.....	1
		Chestnuts.....	1
Fresh vegetables.....	1½	Or dried chestnuts.....	½
Pickles.....	1	Orange (1).....	½
		Sauce.....	1
Frozen meat.....	6	Or chutney.....	1
		British-made frozen sausage (when available).....	6

* In the British Army, substitutes are always forced issue.

H. CHANGES IN THE BRITISH FIELD RATION SCALE

Component articles	Original scale	October, 1915	April, 1916	January, 1917	July, 1917	January, 1918	Total reduction
Meat, fresh, or frozen.....	20	16	16	16	16	16	4
Meal, preserved.....	16	12	12	12	9	9	5
Bread.....	20	20	20	16	16	16	4
Or biscuits.....	12	12	12	12	10	10	2
Bacon.....	4	4	4	4	4	4	0
Cheese.....	3	3	3	2	2	2	1
Fresh vegetables.....	8	8	8	8	8	8	0
Or dried vegetables.....	2	2	2	2	2	2	0
Tea.....	½	¾	¾	¾	¾	¾	½
Jam.....	4	4	3	3	3	3	1
Butter.....	(*)	(*)	(*)	(*)	(*)	(*)	(*)
Sugar ¹	3	3	3	3	3	2	0
Oatmeal.....	(*)	(*)	(*)	(*)	2	2	0
Rice.....					1	1	0
Salt.....	½	¾	¾	¾	¾	¾	¼
Mustard.....	½	½	½	½	½	½	0
Pepper.....	¾	¾	¾	¾	¾	¾	0
Milk, evaporated.....	1 ¼	1 ¼	1 ¼	* 1	* 1	* 1	0
Pickles, weekly.....	1	1	1	1	1	1	0

¹ An extra until Jan. 7, 1917.

* 2 ounces three times weekly.

² When sweetened condensed milk is served, the sugar is 2½ ounces only.

³ Three times weekly.

⁴ Tin.

⁵ Ounce.

TABLE 34.—*The British Army rations (British figures)*—Continued
I. CHANGES IN THE BRITISH LINE OF COMMUNICATIONS RATION SCALE

Component articles	April, 1917	July, 1917	Total reduction	Component articles	April, 1917	July, 1917	Total reduction
Meat, fresh or frozen.....	12	12	0	Jam.....	3	3	0
Meat, preserved.....		6 $\frac{3}{4}$	0	Margarine.....	1	1	0
Bread.....	14	14	0	Sugar.....	2	2	0
Or biscuits.....	0	8 $\frac{3}{4}$	0	Rice.....	2	2	0
Bacon.....	3	3	0	Salt.....	$\frac{1}{4}$	$\frac{1}{4}$	0
Cheese.....	2	2	0	Mustard.....	$\frac{1}{8}$	$\frac{1}{8}$	0
Fresh vegetables.....	8	8	0	Pepper.....	$\frac{1}{16}$	$\frac{1}{16}$	0
Or dried vegetables.....	2	2	0	Milk, evaporated.....	1	1 $\frac{1}{2}$	0
Tea.....	$\frac{1}{2}$	$\frac{1}{2}$	0	Pickles, weekly.....	1	1	0

J. CHANGES IN THE BRITISH HOME RATION SCALE

Component articles	Original scale	Aug. 22, 1914	Sept. 21, 1914	May 22, 1915	Dec. 4, 1915	Feb. 13, 1916	Nov. 4, 1916	Mar. 1, 1917	Jan. 28, 1918	Feb. 4, 1918	Total reduction
Bread.....	20	20	20	16	16	16	16	^a 14	14	^b 14	6
Meat.....	20	16	16	16	16	12	12	12	8	10	10
Tea.....	$\frac{5}{8}$	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$
Sugar.....	3	3	2	2	2	2	2	2	1	1 $\frac{1}{2}$	1 $\frac{1}{2}$
Salt.....	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
Pepper.....	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	0	0	0	0	0	0	$\frac{1}{8}$
Mustard.....	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{16}$	0	0	0	0	0	0	$\frac{1}{16}$
Jam.....	4	4	1	0	0	0	0	0	0	0	4
Bacon.....	4	4	2	2	2	2	2	2	1	2	2
Cheese.....	3	3	1	0	0	0	0	0	0	0	3
Fresh vegetables.....	8	8	0	0	0	0	0	0	0	0	8

^a Boys under 19 continued receiving the 1916 ration.
^b Boys under 10 continued receiving extra 2 ounces of bread.

TABLE 35.—*The German Army rations (French figures)* ¹

A. NORMAL WAR RATION

Articles	Grams	Protein, grams	Fat, grams	Carbo-hydrate, grams	Calories
Bread.....	750	50	3	397	1,886
Or biscuits.....	500	46	22	360	1,890
Or biscuits, with eggs.....	400	36	32	279	1,000
Meat, fresh or frozen.....	375	54	54	0	750
Or meat, smoked.....	200	27	83	0	891
Or meat, preserved.....	200	53	16	0	285
Or rice.....	125	9	2	91	432
Or dried vegetables.....	250	14	1	42	247
Or vegetables, canned.....	150	11	2	106	499
Or potatoes.....	1,500	20	1	230	1,040
Noodles.....	200	22	1	137	670
Fresh cabbage.....	1,200	14	2	53	301
Or fresh cucumbers.....	1,200	7	1	25	142
Or sauer kraut.....	1,200	7	3	36	208
Or dried fruits.....	450	5	2	22	134
Or dried vegetables.....	150	2	1	10	415
Roasted vegetables.....	60	12	1	35	261
Coffee, roasted.....	25	1	1	3	26
Salt.....	25				
Average.....		101	72	419	2,850

¹ Troops at 1,000 m. altitude receive up to 1,000 grams bread.

TABLE 35.—The German Army rations (French figures)—Continued

B. WAR RATIONS OCTOBER, 1917

Articles	Grams	Protein, grams	Fat, grams	Carbo-hydrate, grams	Calories
Bread.....	* 750	50	3	397	1,886
Or biscuits with eggs.....	400	36	32	279	1,600
Meat, fresh, or frozen.....	250	36	36	0	500
Meat, smoked.....	150	20	62	0	668
Or meat, preserved.....	150	40	12	0	280
Or fish, fresh-water.....	600	60	80	0	343
Or fish, fresh sea.....	500	50	9	0	310
Fish, salted.....	300	57	3	0	278
Or fish, smoked.....	200	26	15	0	258
Herring, pickled.....	250	32	19	0	322
Rice.....	150	11	3	109	519
Or barley.....	150	14	3	112	553
Or Le Molina.....	150	14	1	112	529
Or barley flakes.....	150	14	3	112	552
Or dried vegetables.....	250	14	1	42	247
Or potatoes.....	1,500	20	1	230	1,040
Potatoes, dehydrated.....	300				
Or potato flakes.....	250	22	1	137	670
Or noodles.....	200	2	1	10	415
Dried fruits.....	150	2	1	30	167
Or roasted vegetables.....	50	10	1	0	489
Butter.....	65	0	52	0	549
Or lard.....	65	1	58	0	254
Or pork.....	65	10	22	0	618
Or sausage, canned.....	125	19	56	0	332
Or marmalade fruits.....	125	1	0	80	327
Or cheese.....	100	21	24	2	26
Coffee, roasted.....	25	1	1	3	5
Or tea.....	5	0	0	1	118
Or cocoa.....	25	4	6	9	299
Eau de Vie.....	¹ / ₁₇			1	284
Or sirup of fruits.....	¹ / ₁₇			71	64
Sugar.....	17	0	0	16	94
Or sugar with cocoa.....	25			23	
Salt.....	25				1
Pepper.....	⁴ / ₁				11
Onions.....	25			2	
Average.....		107	76	510	3,490

* Troops at 1,000 m. altitude receive up to 1,000 grams bread.

C. IRON RATION

Bread.....	* 750	50	3	397	1,886
Biscuits with eggs.....	400	36	32	279	1,600
Meat, fresh, or frozen.....	200	29	29		400
Meat, smoked.....	200	27	83		891
Noodles.....	200	22	1	137	670
Pickles.....					
Or sauer kraut.....	125	2	1	80	346
Butter.....	50	0	40	0	376
Or lard.....	50	1	44	0	422
Or pork.....	50	7	17	0	195
Marmalade.....	^b 125	^c 1	0	^c 80	^c 332
Or cheese.....	^b 100	^c 21	^c 24	^c 2	^c 327
Coffee, roasted.....	25	1	1	3	26
Or tea.....	^d 3	0	0	^c 1	^c 3
Or cocoa.....	^d 25	^c 4	^c 6	^c 9	^c 118
Eau de Vie.....	¹ / ₁₇			1	299
Sugar.....	17			16	64
Or sugar with cocoa.....	25			23	94
Salt.....	25				1
Pepper.....	⁴ / ₁				
Average.....		153	196	674	5,581

* Troops at 1,000 m. altitude receive up to 1,000 grams bread.

^b Supplementary.

^c Calculated according to our standards.

^d In lieu of 25 grams roasted coffee.

TABLE 35.—*The German Army rations (French figures)*—Continued
D. RATION EFFECTIVE OCTOBER, 1917

Articles	Grams	Protein, grams	Fat, grams	Carbo-hydrate, grams	Calories
Bread.....	600	40	3	319	1,569
Meat, fresh or frozen.....	250	36	36	0	500
Meat, smoked.....	150	20	67	0	668
Or meat, preserved.....	150	40	12	0	289
Or fish, fresh-water.....	600	60	8	0	343
Or fish, fresh sea.....	400	50	9	0	310
Or fish, salted.....	300	57	3	0	278
Or fish, smoked.....	250	32	19	0	322
Herring, pickled.....	250	32	19	0	322
Or codfish, salted.....	200	71	2	0	333
Rice.....	125	9	2	91	432
Or barley.....	125	12	3	94	460
Or Le Molina.....	125	11	1	93	441
Or barley flakes.....	125	12	3	94	460
Or dried vegetables.....	250	14	1	42	247
Or vegetables, canned.....	150	11	2	106	499
Or potatoes.....	300	4	0	46	208
Or potatoes, dehydrated.....	60	.....	.....	.....	.....
Or potato flakes.....	50	.....	.....	.....	.....
Or noodles.....	200	22	1	137	670
Or beet root.....	1,200	13	1	87	418
Fresh cabbage.....	1,200	14	2	53	301
Or fresh cucumbers.....	1,200	7	1	25	142
Or pickles.....	1,200	3	3	36	208
Or sauer kraut.....	450	5	2	22	134
Or dried fruits.....	125	2	1	80	346
Or salted spinach, cabbage, cauliflower or red cabbage, carrots.....	400	.....	.....	.....	.....
Or beans, potted.....	250	.....	.....	.....	.....
Or canned vegetables.....	600	.....	.....	.....	.....
Roasted vegetables.....	60	* 12	* 1	* 35	* 201
Butter.....	55	0	44	0	414
Or lard.....	55	1	49	0	464
Or pork.....	55	8	19	0	215
Or sausage, canned.....	125	19	56	0	618
Or marmalade fruits.....	125	1	0	80	332
Or cheese.....	7	1	2	0	22
Coffee, roasted.....	10	0	0	1	2
Or tea.....	2	0	0	0	2
Or cocoa.....	15	3	4	6	71
Sirup of fruits.....	6	0	0	0	13
Sugar.....	17	0	0	16	64
Or sugar with cocoa.....	25	.....	.....	23	94
Salt.....	25	.....	.....	.....	.....
Pepper.....	.4	.....	.....	.....	1
Onions.....	25	.....	.....	2	11
Oil, edible.....	367	.....	45	.....	423
Flour.....	20	2	0	15	390
Average.....	.....	98	78	439	2,985

* Calculated according to our standards.
† Sixty-five grams on the Eastern Front.

TABLE 36.—*Summary and comparison of rations of armies*¹

A. CALORIC VALUES

Nationality	At beginning of war			1918		
	Field ration	Line of communications	Reserve	Field ration	Line of communications	Reserve
United States (American figures).....	4, 871	4, 109	4, 090	4, 258	4, 303	3, 125
France (French figures).....	3, 345	2, 954	.....	3, 793	3, 481	.....
England (English figures).....	4, 193	3, 623	3, 105	4, 032	3, 503	3, 105
Germany (British figures).....	3, 490	.....	.....	2, 985	.....	.....
Italy (French figures).....	4, 439	4, 439	.....	3, 443	3, 809	.....
Belgium (French figures).....	3, 131	3, 131	.....	3, 563	2, 723	.....
Portugal (French figures).....	.....	.....	.....	3, 362	2, 733	.....
.....	.....	.....	.....	3, 779	3, 225	.....

TABLE 36.—Summary and comparison of rations of armies—Continued

B. AMOUNT OF PROTEIN, FAT, AND CARBOHYDRATES IN THE FIELD RATIONS, 1918

	United States	France	England	Germany	Italy	Belgium	Portugal
Protein, grams.....	167.75	129	117.35	98	145	120	173
Fat, grams.....	111.8	109	165.49	78	48	102	90
Carbohydrates, grams.....	615.3	491	433.63	439	588	438	444
Calories (from tables).....	4,258	3,793	4,032	2,985	3,563	3,362	3,779

C. AMOUNT OF PROTEIN, FAT, AND CARBOHYDRATES IN THE LINE OF COMMUNICATIONS RATIONS, 1918

	United States	France	England	Germany	Italy	Belgium	Portugal
Protein, grams.....	161.37	115	105.01	(?)	88	106	143
Fat, grams.....	123.06	101	136.60	(?)	34	69	79
Carbohydrates, grams.....	629.96	449	362.59	(?)	484	391	379
Calories (from tables).....	4,303	3,481	3,503	(?)	2,723	2,733	3,225

BASE AND ACID CONTENT OF THE GARRISON RATION

In view of the relatively high protein character of our Army ration, considerable thought was given by the food and nutrition section to the question of the fruit and vegetable content of the ration. The following table gives the calculated base and acid content of the ration as prescribed in General Orders, No. 176, G. H. Q., A. E. F., 1918, and calculated from Sherman tables.¹

TABLE 37.—Acid and base content, garrison ration, General Orders, No. 176, G. H. Q., A. E. F., 1918

	Per cent	Amount		Excess acids	Excess base
		Ounces	Grams		
Beef.....	60	12	340	22.5	.....
Bacon.....	20	2.4	68	2.8	.....
Canned fish.....	20	3.2	91	8.2	.....
Bread.....	85	13.6	386	27.2	.....
Flour.....	6	.96	27	2.6	.....
Cornmeal.....	4.5	.72	20	1.0	.....
Oatmeal.....	3	.48	13	1.5	.....
Macaroni.....	1.5	.24	7	.7	.....
Baking powder.....	100	.08	2	0	0
Beans.....	100	4	113	.....	22.4
Rice.....	50	1	28	2.6	.....
Hominy.....	50	1	28	1.4	.....
Potatoes.....	70	14	397	.....	22.7
Onions.....	20	4	113	.....	7.5
Tomatoes.....	10	2	57	.....	3.1
Jam.....	30	.9	25	.....	.9
Prunes.....	20	.6	17	.....	3.5
Apples.....	10	.3	8	.....	1.4
Raisins.....	10	.3	8	.....	1.6
Sirup.....	30	.96	27	0	0
Coffee.....	100	1.12	31	0	0
Sugar.....	100	3.2	91	0	0
Milk.....	100	1	28	.....	1.2
Vinegar.....	50	.08	.....	0	0
Pickles.....	100	.08	.....	0	0
Salt.....	100	.64	18	0	0
Pepper.....	100	.02	.....	0	0
Spices.....	100	.014	.....	0	0
Butter.....	50	.5	14	0	0
Oleo.....	50	.5	14	0	0
Extract, lemon.....	100	.014	.....	0	0
Candy.....	100	.8	23	0	0
Acid balance.....				70.5	64.3
				6.2	

* Gills.

This table shows that if the ration is actually eaten as planned it seems safely within the range outlined by Sherman as neutralizable by the ammonia. "If an excess of acid-forming elements be permitted it would seem that the excess should not exceed 25 units (the equivalent of 25 c. c. normal acid) per man per day." It is at the same time obvious that any failure to maintain the bean, vegetable, or fruit ration would result in a very marked change in balance. The issue, for example, of sirup in place of fruits represents a physiological danger.

FOOD CONDITIONS ON TRANSPORTS

It was inevitable that during the movement overseas of large bodies of our troops in every type of vessel some difficulties were experienced with regard to feeding the men en route. Many of these difficulties were due to the construction of the ships used, few of which were built with the view to messing such great numbers of third-class passengers. Other troubles resulted from limited knowledge on the part of many concerned regarding Army affairs in general and life on transports in particular. Experience has shown that many of the embarrassments were such as could be remedied by requiring more detailed contracts with the owners of chartered transports and by furnishing to commanding officers of troops and to mess officers more explicit information regarding the contracts and the methods of procedure if the food proved unsatisfactory. Little or no complaint was made regarding the feeding of the officers and men on transports operated by the United States Navy, and very little regarding the messing of officers on commercial transports. Practically all the complaints related to enlisted men on commercial transports.¹⁵

Investigations were made by officers of the food and nutrition section of the Medical Department, American Expeditionary Forces, relative to mess conditions on transports at Liverpool, Le Havre, and Brest, during September and October, 1918. The information gained thereby was brought to the attention of the chief of the Army Transport Service of the American Expeditionary Forces. The principal items noted in these investigations were as follows:¹⁶

There appeared to be no definite ration prescribed in the contracts under which the United States Army chartered or used the vessels, or, if there were any defined allowances, the commanding officers of troops were not informed regarding them. There was, therefore, no specific basis upon which the commanding officer of troops could demand a definite quantity of food. Enlisted men went as third-class passengers and their meals were based largely on menus in vogue for emigrant passengers in time of peace, possibly reduced somewhat by the world food shortage. In accordance with the so-called "budget system," which was in effect on some vessels, certain money allowance was provided by the steamship company for buying food during a voyage. Such saving as could be effected was used, wholly or in part, as a bonus, being prorated among the mess stewards and galley forces. This system encouraged close feeding. The meals were often unsatisfactory and led to serious complaint, much of which was very well founded. In some instances there was insufficient food, poorly cooked, not well seasoned, and carelessly served. The galleys and

messing spaces were often unsanitary. In addition it became a practice on some vessels for the crew to sell food and sometimes wine at very exorbitant prices to the men. The messing force was often inadequate and inexperienced, as a result of the circumstance that most of the regular personnel had gone into one or another of the allied armies, leaving only young boys and less able-bodied men available.¹⁶

Several general recommendations were submitted by officers who made these investigations, the main features of which were as follows:¹⁶ It was recommended that contracts governing the use of chartered vessels specify a definite ration with given daily quantities of the various food components per man and that the commanding officers of troops be furnished copies of this schedule and directed to see that the articles were actually supplied; also that the messing of troops on the vessels which rendered unsatisfactory service be taken over by the United States Government and operated on a ration basis by either Army or Navy personnel. It was further recommended that the mess officer for troops be an individual of as high grade as was available, that he be given ample commissioned personnel to assist him, and that, upon the completion of the voyage, he be required to submit a detailed report of all particulars relating to messing, one copy of which report would remain with the vessel available for the mess officer on the next succeeding voyage, the other copy being sent to the general superintendent of Army Transport Service at the port of embarkation. The reason for the latter recommendations lay in the fact that the importance of the mess officers' duties were usually underrated, and an officer of junior rank, without proper assistants, was commonly selected; the reports rendered were usually perfunctory and gave little information that would be of use to mess officers on succeeding voyages.

The armistice followed so closely upon the submission of these recommendations that there was scarcely time for any of them to be put into force while commands were being sent aboard. The investigations, however, and the complaints that had been made by troops, had a very noticeable effect in bringing about a definite improvement, so that by the time the armistice was signed practically no further complaints were being received relative to selling food and wine, or to unsanitary conditions in the galleys; however, some complaint relative to food shortage, to poor cooking, and poor serving persisted.¹⁷

As soon as troops stopped arriving overseas, and the movement back to the United States began, the matter was again taken up by the Medical Department to insure the proper feeding of our troops on their homeward voyage. A food and nutrition officer, on duty with the American Expeditionary Forces in England, was directed by the commanding general, Base Section No. 3, A. E. F., to make arrangements with British steamship companies relative to the feeding of our troops during their transportation to America.¹⁸

In the course of these arrangements, conferences were had with representatives of the British steamship companies concerned; and, later with the victualing superintendents.¹⁹ The establishment of an ample ration on British boats resulted, the scale of rations as agreed upon for United States troops en route from Liverpool to the United States being as follows:¹⁹

CUNARD STEAMSHIP CO.

Article	Ounces	Article	Ounces
Meats.....	16	Peas.....	1½
Bacon.....	4	Rice.....	1½
Bread.....	17	Jam.....	2½
Oatmeal.....	1½	Margarine.....	1
Potatoes.....	19	Milk.....	2½
Sugar.....	2½	Vegetables.....	½
Dried fruits.....	1½	Coffee.....	1½
Pickles.....	2		

ALFRED HOLT & CO.

Article	Ounces	Article	Ounces
Meats.....	16	Peas and beans.....	1½
Bacon.....	4	Rice.....	1½
Bread.....	17	Jam.....	2½
Oatmeal.....	1½	Margarine.....	1
Potatoes.....	19	Milk.....	2½
Sugar.....	2½	Vegetables.....	½
Dried fruits.....	1½	Coffee.....	1½
Pickles.....	2		

WHITE STAR LINE

Article	Ounces	Article	Ounces
Butter.....	2	Dried fruit.....	3
Beef.....	16	Milk.....	2
Fish (three days per week).....	6	Eggs.....	2
Pork products.....	4½	Sugar.....	3
Coffee.....	2	Bread.....	16
Potatoes.....	16	Oatmeal.....	4
Fresh vegetables.....	8		

PACIFIC STEAMSHIP CO.

[Steamship *Orea* carrying United States troops, leaving Liverpool, November 23, 1919]

TROOPS' MENU

SUNDAY

1½ ounces cereal with milk.	Macaroni soup.	6 ounces cold meats.
4 ounces bacon and eggs.	½ pound roast beef.	2 ounces cheese.
Bread, 1 ounce butter.	½ pound vegetables and 1 pound potatoes.	2 ounces pickles.
Coffee, sugar, etc.	½ pound plum pudding and sauce.	½ pound fruit cake.
		Coffee, sugar.

Bread, 1 pound; milk, 2 ounces; coffee, ¼ ounce; sugar, including cooking, 3 ounces.

MONDAY

1½ ounces cereal with sirup.	Barley broth.	6 ounces sausage.
8 ounces liver and onions.	½ pound corned pork.	Stewed fruit (3 ounces).
½ pound potatoes.	3 ounces beans.	Bread, 1 ounce butter.
Bread, 1 ounce butter.	1 pound potatoes.	Sugar, etc.
2 ounces jam.	2 ounces rice pudding and sauce.	
Coffee, etc.		

Bread, 1 pound; milk, 2 ounces; coffee, ¼ ounce; sugar, including cooking, 3 ounces.

TUESDAY

1½ ounces cereal with milk.	Vegetable soup.	2 boiled eggs.
6 ounces steak and onions.	½ pound roast mutton and sauce.	Molasses cake, ¼ pound.
Bread, 1 ounce butter.	½ pound vegetables.	Bread, 1 ounce butter.
Coffee, etc.	1 pound potatoes.	2 ounces jam.
	2 ounces rice pudding and sauce.	

Bread, 1 pound; milk, 2 ounces; coffee, ¼ ounce; sugar, including cooking, 3 ounces.

PACIFIC STEAMSHIP CO.—Continued

TROOPS' MENU—Continued

WEDNESDAY

1½ ounces cereal with milk.	Macaroni soup.	6 ounces cold meat.
4 ounces liver and 2 ounces bacon.	½ pound boiled beef.	2 ounces pickles.
½ pound potatoes.	½ pound vegetables.	3 ounces stewed fruit.
Bread, 1 ounce butter.	1 pound potatoes.	Bread, 1 ounce butter.
2 ounces jam.	¾ pound fruit pie.	Coffee, etc.
Coffee, etc.		

Bread, 1 pound; milk, 2 ounces; coffee, ¾ ounce; sugar, including cooking, 3 ounces.

THURSDAY

1½ ounce cereal with milk.	Scotch broth.	Irish stew (6 ounces meat).
2 boiled eggs.	½ pound roast beef.	½ pound potatoes.
Bread, 1 ounce butter.	½ pound vegetables.	½ pound fruit cake.
Coffee, etc.	1 pound potatoes.	Bread, 1 ounce butter.
	2 ounces stewed fruit.	2 ounces jam.
	1 ounce rice.	Coffee, etc.

Bread, 1 pound; milk, 2 ounces; coffee, ¾ ounce; sugar, including cooking, 3 ounces.

FRIDAY

1½ ounces cereal with soup.	Pea soup.	½ pound sausage.
8 ounces fish.	½ pound fresh fish.	3 ounces stewed fruit.
½ pound jacket potatoes.	1 pound potatoes.	Bread, 1 ounce butter.
Bread, 1 ounce butter.	1 ounce rice pudding and sauce.	Coffee, etc.
2 ounces jam.		
Coffee, etc.		

Bread, 1 pound; milk, 2 ounces; coffee, ¾ ounce; sugar, including cooking, 3 ounces.

SATURDAY

1½ ounces cereal with milk.	Rice soup.	Hot pot (8 ounces meat).
6 ounces liver and onions.	8 ounces corned beef.	½ pound potatoes.
½ pound potatoes.	½ pound vegetables.	½ pound fruit cake.
Bread, 1 ounce butter.	1 pound potatoes.	Bread, 1 ounce butter.
Coffee, etc.	2 ounces stewed fruit.	2 ounces jam.
	1 ounce rice.	Coffee, etc.

Bread, 1 pound; milk, 2 ounces; coffee, ¾ ounce; sugar, including cooking, 3 ounces.

The commanding officer of our troops on each voyage was given a schedule indicating the authorized ration, with instructions to see that it was followed; also he was empowered, if cooking proved unsatisfactory, to substitute Army personnel in the troop mess in place of the ship's crew.²⁰ This put the matter upon a definite basis and the results were satisfactory.

A nutrition officer also visited Base Sections Nos. 1, 2, and 5, in order to investigate the messing condition on transports sailing from these areas, and later held a conference with the chief of Army Transport Service.¹⁸ The action taken in England was duplicated in France, and a definite ration schedule was provided. Boards were appointed at each base to inspect commercial transports before troops embarked; officers of the food and nutrition section were included in these boards for the purpose of inquiring into messing arrangements and determining that they were satisfactory before commands went aboard.

At the port of Brest, Base Section No. 5, commercial transports occasionally were used as hospital ships, carrying sick and wounded only. Upon each such occasion an officer of the food and nutrition section was detailed as mess and diet officer in charge of the feeding of patients en route. This arrangement proved very satisfactory, not only by enabling the officer to supervise the subsistence of the sick, but by placing him in a position to bring back valuable suggestions regarding messing on hospital ships.²¹

FOOD PROBLEMS IN BASE SECTION NO. 3, INCLUDING THE MURMAN COAST*

Base Section No. 3, A. E. F., included Great Britain and the troops of our Murman coast expedition.²² In Great Britain itself there were 7 rest camps for our transient troops, 1 camp for training Tank Corps battalions, and about 75 aviation fields. The Air Service stations in most instances contained both British and American troops and were scattered all over England and Scotland, and 4 of them were in Ireland. There were 5 base hospitals, 3 large camp hospitals, and 2 American Red Cross military hospitals.²³ At all these stations numerous nutritional problems of importance demanded attention.

Base Section No. 3 had no direct control over or responsibility for the foreign transports landing United States troops in British ports, but information of unsatisfactory food conditions on these transports came to the attention of officers of the section of food and nutrition, and several steps were taken to correct defects through the commanding general, A. E. F., and The Adjutant General, through the British Ministry of Shipping and by direct conference and negotiations with several steamship companies in Liverpool.²³

An officer of the section of food and nutrition reached England on March 16, 1918; subsequently four other officers were assigned to duty there. Three officers and one noncommissioned officer of our Air Service were detailed for various periods to the nutritional service.²³ The work of the section was instituted on a definite basis by the issuance of the following instructions from the commanding general of Base Section No. 3:

Memorandum No. 13.

HEADQUARTERS, BASE SECTION NO. 3, S. O. S., A. E. F.

London, May 23, 1918.

1. Maj. A. J. Carlson, Sanitary Corps, N. A., of these headquarters, is charged with the duty of helping to safeguard the nutrition of the troops.

2. He is directed to study the food supply and the messing conditions with a view to bettering the feeding of the men and the elimination of all food wastes.

3. The commanding general directed that he be given all assistance necessary for the carrying out of this work and that report be made to these headquarters, through channels, on the constructive measures taken toward improving the men's mess, as a result of his recommendations.

JOHN R. PROCTOR, *Chief of Staff.*

RATIONING UNITED STATES TROOPS IN GREAT BRITAIN

At the outset all United States troops in Base Section No. 3 were rationed by the British Government according to the scale laid down by the British Army Council for British home troops.²³ Since 1914 the ration for the British home forces had been reduced repeatedly, until on March 1, 1917, the scale was as follows:²³ Bread, 14 ounces; meat, 12 ounces; bacon, 2 ounces; sugar, 2 ounces; tea, ½ ounce; cash, 5½ pence. The cash was expended for food at the Navy and Army canteen stores, a private organization under the supervision of the British Government, which, generally speaking, took the place of the quartermaster sales department in the United States Army. This ration caused so

* A detailed consideration of food conditions in Russia will be found in another portion of this chapter (pp. 762-769).

much complaint on the part of the United States troops in the fall of 1917 that the so-called rest-camp ration was authorized by the British Government in December, 1917, for use by certain American troops in England.

BRITISH REST CAMP RATION

The British rest camp ration as issued to United States troops in England comprised the following articles in the amounts given:²³

TABLE 38.—*British rest camp ration*

Article	Ounces	Article	Ounces
Meat.....	12	Milk.....	1
Bread.....	14	Margarine.....	1
Bacon.....	2	Potatoes.....	8
Sugar.....	2	Coffee.....	1
Cheese.....	2	Salt.....	$\frac{1}{2}$
Jam.....	3	Pepper.....	$\frac{1}{2}$
Rice.....	2	Mustard.....	$\frac{1}{2}$

This ration scale applied only to the troops in the rest camps. Air Service, Construction, and Tank Corps troops subsisted on the British home ration, as shown above, until June 1, 1918, when, on a recommendation initiated in the office of the surgeon, Base Section No. 3, the rest camp ration was made applicable to all United States troops serving in Great Britain.²³ The British home ration was insufficient in quantity for United States troops, as shown by the fact that our troops, stationed in England for any considerable length of time, bought extra food with either private or organization funds; therefore, the short ration resulted in no actual saving of food.²³

The British Army rations included under meat components, rabbit, fish, mutton, and a sausage containing 40 per cent or more of cereal substances.²³ The substitutes for beef were forced issues; that is, organizations had to take what the British Army Service Corps delivered or go without. Because our troops objected strongly to eating rabbit or sausage, both these articles were largely wasted; certain organizations refused to receive the sausage, preferring to go without meat on sausage days. Faulty distribution resulted in some troops having no meat except mutton and sausage for periods ranging from 4 to 10 weeks. This unsatisfactory diet was partly corrected after repeated representations to the British War Office. Rabbit was eliminated from the ration for Americans in May, 1918, and the sausage issue was reduced but not completely abolished.²³

There was much complaint on the part of our troops regarding the inadequacy and monotony in the British rest camp ration.²³ Some of this was due to insufficient as well as incompetent messing personnel, resulting in poor cooking and in the waste of food; but the energy value of this ration was considerably less than the garrison ration of our own Army, and therefore could not be expected to prove satisfactory to our troops in any circumstances. On May 3, 1918, a report as to the insufficiency of the ration furnished to United States troops in Base Section No. 3 was made to the commanding general of that section. This resulted, first, in the rest camp ration being made available to our troops outside the rest camp areas; and, finally, in a

conference between British and American officers at Winchester on June 3, at which a special ration for United States troops was agreed upon. This new ration went into effect July 1, 1918, and was as follows:²³

TABLE 39.—*Modified British rest camp ration*

Article	Ounces	Article	Ounces
Bread.....	16	Milk.....	1
Meat.....	12	Butter.....	1
Sugar.....	2	Or margarine.....	1
Coffee.....	1	Potatoes.....	12
Salt.....	$\frac{1}{4}$	Fresh vegetables.....	8
Pepper.....	$\frac{1}{8}$	Cheese.....	2
Mustard.....	$\frac{1}{10}$	Rice or dried beans.....	2
Bacon.....	3	Or oatmeal.....	3
Or dried fish.....	6	Jam or dried fruit.....	3

Flour may be issued in lieu of bread at the scale of $1\frac{1}{2}$ for 2 ounces. The construction squadrons of the Aviation Corps will draw 16 ounces. Tea in lieu of coffee, $\frac{3}{4}$ ounce.

Construction troops and other units engaged in hard manual labor eight hours or more per day were allowed to draw 16 ounces of meat per day.

Owing to the shortage of cheese, this item was eliminated from the ration August, 1918, the bacon allowance then being increased to 4 ounces, the beans-rice-oatmeal component to 3 ounces.²³ Though this ration, issued in full, proved thoroughly satisfactory for the troops under training in England, it did not prove adequate in quantity for troops in the rest camps, because such troops had been undernourished, or poorly fed, during one or two weeks on the British transports, and hence needed more than the normal quantities of food for a few days after debarkation. This factor was not appreciated at the time the ration of July 1, 1918, was fixed; it became evident from later reports and investigations.²³

With the exception of rabbit and sausage, the quality of the ration components furnished by the British Army Service Corps and by the British Navy and Army canteen stores on the whole was satisfactory.²³ In some camps bread and potatoes were poor; bacon unfit for food was issued occasionally. Some local managers of the Navy and Army canteen stores refused to issue onions, carrots, beets, etc., under the item of fresh vegetables. All these difficulties, however, were to a great extent adjusted in conference with the British War Office and the Navy and Army Canteen Board.²³

TRAVEL RATION

British Army regulations did not specify a travel ration for the home forces, the theory and practice being that the soldier would take with him on train journey or march that portion of the day's ration not consumed in camp before leaving.²³ This practice was adopted for American troops in England; consequently, organizations when arriving in British ports from the United States brought three to five days' travel rations. These rations were, by order, taken from them at the ports of debarkation and were shipped to France. When entraining for another rest camp or for France, our men usually were served breakfast in camp before departure. In most instances the cookhouse facilities were such that potatoes, fresh vegetables, or rice could not be pre-

pared and served for breakfast; potatoes, rice, and fresh vegetables could not be used en route, since the conditions of travel in England were such that the food of the soldier had to be carried upon his person; furthermore, issues like rabbit, mutton, etc., could not readily be served as an individual travel ration; consequently, there was much legitimate complaint on the part of the troops because of inadequate food while traveling. The early ameliorating measures taken were to issue the meat ration in the form of 12-ounce cans of corned beef, to increase the bread allowance to 20 ounces, and to recommend that the United States Army travel ration be not taken from the troops at the ports of debarkation, but be retained for the rest-camp use. Finally, the complaints on the part of troops became so numerous, especially in connection with the Knotty Ash Camp, that the commanding general, Base Section No. 3, A. E. F. directed a food and nutrition officer to investigate the matter and to formulate remedial measures. The report of this investigation was submitted October 30, 1918, but owing to the cessation of troop travel through England at about that date, orders for a new travel ration that had been recommended were not published, nor was the ration used.²³

RATIONING PATIENTS IN HOSPITAL, BASE SECTION NO. 3

Our hospitals in England were authorized to draw the special ration of the American troops for the enlisted personnel and civilian employees, and any part of the ration desired for the nurses and the patients, supplementing this allowance by local purchases, except that meat and sugar could not be bought in excess of the ration allowance.²³ Distance from markets frequently curtailed local buying except in the case of milk. The partial cash basis of messing nurses and patients and the dual source of the ration in kind resulted in a very complicated ration-accounting system.²³

Enlisted patients in British military hospitals were messed not on a cash basis, but on a ration in kind.²³ This had been reduced from time to time since the beginning of the war under the direction of the British War Office. The scale obtaining in 1918 was as follows:²³

Scale of quantities sufficient to feed 100 patients for one day

	Scale A	Scale B		Scale A	Scale B
Meat.....pounds.....	31½	31½	Milk.....pints.....	80	130
Fish.....do.....	18¾	18¾	Sirup and jam.....pounds.....	5	5
Bacon.....do.....	12½	12½	Cereals.....do.....	7	20
Bread and flour.....do.....	69	75	Eggs.....do.....	40	50
Sugar.....do.....	9	9½	Tea and coffee.....pounds.....	1½	2
Edible fat (margarine, suet, dripping, etc.).....pounds.....	6½	6½	Cheese.....do.....	3	3
Potatoes.....do.....	50	70	Approximate caloric value per pa- tient.....	2,700	3,250
Fresh vegetables.....do.....	25	35			
Cocoa.....do.....	1	1			

Scale A represents minimum calories value, below which no hospital should go.

Scale B represents a maximum calories value, which no hospital should exceed, except under special circumstances.

In quite a number of hospitals, depending partly on the class of patients and partly on good cooking and good service, the figures in scale A are found to be ample, but if, in the opinion of the clinical medical officers, the patients require extra feeding, the quantities in scale B are available.

The two scales are applicable to all hospitals treating military patients, both officer patients and "other ranks."

Practical experience showed that this ration was inadequate, especially for convalescents, unless a large percentage of the patients were given meals outside the hospital.²³ Because of the many complaints of insufficient food on the part of American patients in British military hospitals, representations were made by the local food and nutrition officer to the commanding general, Base Section No. 3, American Expeditionary Forces, regarding this matter, but no practical remedy could be found, except that the American Red Cross was in position to furnish extra articles of food to the patients.²³

A conference on the subject of feeding hospital patients was held August 29, 1918, at which representatives of the English, Canadian, Australian, New Zealand, and American forces were present.²³ The English representatives favored a uniform system of messing in all military hospitals in Great Britain in accordance with the following scale.

Scale of quantities sufficient to feed 100 patients for one day

	Scale A	Scale B		Scale A	Scale B
Meat (beef).....pounds.....	38	38	Milk.....pints.....	80	130
Fish.....do.....	18½	18½	Jam.....pounds.....	8	8
Bacon.....do.....	12½	12½	Cereals.....do.....	15	15
Bread and flour.....do.....	75	75	Eggs.....do.....	40	50
Sugar.....do.....	9	9½	Tea and coffee.....pounds.....	1½	2
Margarine.....do.....	6½	6½	Cheese.....do.....	3	3
Potatoes.....do.....	50	70	Total calories.....	3,145	3,442
Vegetables, fresh.....do.....	25	35			
Cocoa.....do.....	1½	1½			

A representative of the food and nutrition section, American Expeditionary Forces, made a report on this conference to the chief of staff, Base Section No. 3, with the recommendation that no change be made in the system of feeding patients in American hospitals in England. This recommendation was approved.²³

Messing in the American military hospitals in England was on the whole satisfactory, except for temporary conditions due to the inexperience with practical hospital management and with the British ration accounting. In consequence it was thought advisable not to make any change in the feeding of patients in our hospitals in Great Britain, nor was any change made.²³

MESSING FACILITIES AT AMERICAN REST CAMPS IN GREAT BRITAIN

The American rest camps were either training camps taken over from the British or were constructed especially for the American Army on British plans.²³ Battalion or regimental messing was contemplated, groups ranging from 1,000 to 5,000 men being fed from one cookhouse. There were no facilities for company messing as practiced in the United States Army. All cookhouses in the rest camps (excepting the new station kitchens at the Romsey and Standon camps) were inadequately provided with ranges, boilers, and other articles

necessary in preparing and serving meals for large bodies of soldiers. On the recommendation, and often under the supervision of an officer of the section of food and nutrition, American Expeditionary Forces, additional cooking equipment was installed, meat preparation rooms and by-products rooms were secured, and measures were taken to improve sanitation.²³ The inferior cook-house ranges of the British camps remained as a constant drawback; installation of United States Army field ranges was impracticable.²³

MESSING FACILITIES FOR UNITED STATES AVIATION TROOPS IN GREAT BRITAIN

Early in 1918, when the section of food and nutrition began its activity in England, none of the United States Air Service troops stationed for training at the British airdromes had separate messing facilities except in the case of a few construction troops.²³ The general policy of the United States Air Service office in London was to discourage separate American messes. Since British army cooking proved to be not palatable to the average American soldier, the policy of separate American messes for the Air Service units in the British camps was advocated by the section of food and nutrition and was approved by the commanding general of Base Section No. 3. Adequate cookhouses and mess halls then became a pressing problem. Many of the squadrons had been deprived of their field equipment in the American rest camps before being sent to the British training points; at some stations the British authorities either did not have messing equipment available for American troops or were slow in supplying it, although the contract between the Governments provided that quarters and messing facilities be supplied by the British.²³ So all kinds of improvisation had to be resorted to, some of them quite unsatisfactory, and much of the time of the officers detailed for nutritional work from the Air Service was given to improving these conditions. The fact that only the squadrons that conducted a separate mess were entitled to the special ration for American troops, to the 10 per cent dividend from the camp canteen, and to the cash derived from the sale of the kitchen by-products was an additional incentive to separate messing. Many of the difficulties would have been more readily overcome if the officers and men had been given some training in actual field messing conditions before being sent overseas.²³

Until March, 1918, the large cookhouses in the rest camps were manned by British Army cooks, an arrangement which did not prove satisfactory. As a result, 75 privates out of the National Guard companies in charge of the camps were sent to the British cooking school at Gosport for three weeks training, and then replaced the British cooks in the early part of April, 1918. However, these men were not trained in the American method of food preparation or service, and few of the mess sergeants were competent to supervise the feeding of two or three thousand persons. The camp mess officer, having had no special training, were equally inexperienced, and some of them were incompetent. Much time was devoted by the representative of the section of food and nutrition to the instruction of mess personnel, with only partial success, for, to add to the difficulties, camp mess officers frequently were changed and many of the partly-trained cooks and sergeants were detailed to other duties or were sent to France. To obviate this unsatisfactory condition, recommendations were

made to the commanding general, Base Section No. 3, with a view to securing a permanent messing personnel for all the rest camps. Based on this recommendation, the commanding general requested that 9 mess officers (Quartermaster Corps) and 48 sergeants, first class, for use as cooking instructors and mess sergeants, be sent to England. This request was granted, but the entire personnel did not arrive until October, 1918.²³

As most of the messes in the Air Service stations, Base Section No. 3, were of company or squadron size, no special personnel was needed, but instruction was given the sergeants and cooks by officers of the section of food and nutrition.²³ Through the chief surgeon, A. E. F., in May, 1918, arrangements were made to provide in the United States special instructions regarding messing economy and the British system of rationing for all Air Service troops destined to be stationed in England for training.²³

Under the direction of an officer of the section of food and nutrition, a school for Army cooks was organized in the Winchester camp, the pupils being mainly casuals and class B and C men.²³ At the end of the first six-weeks course about 50 were graduated as fairly well-trained cooks, and steps were taken to transfer them to the Quartermaster Corps in order to place them permanently in the camps. This transfer had not been completed at the time of the signing of the armistice.²³

INSTRUCTIONS CONCERNING MESSING EFFICIENCY AND FOOD ECONOMY, BASE SECTION NO. 3

A memorandum on messing efficiency and food economy was prepared by the section of food and nutrition and was issued May 22, 1918, by the commanding general, Base Section No. 3, as General Orders, No. 11. A set of more explicit directions and rules governing cookhouse efficiency and by-products salvage also was prepared; the information contained therein was usually issued over the signature of the commanding officer of each camp, read to the organizations, and posted in the kitchens and mess halls. Both sets of instructions are shown below:

HEADQUARTERS, BASE SECTION No. 3, S. O. S.,
AMERICAN EXPEDITIONARY FORCES, LONDON, *May 22, 1918.*

G. O. No. 11.

1. It is believed that the ration now issued to the troops when judicially supplemented with fresh vegetables and fruit through the by-products and the canteen funds will furnish sufficient sustenance, provided the messes are adequately managed.

2. It is reported to these headquarters that waste of food still occurs in some camps through improper cooking as well as careless handling of supplies. In view of the present necessity in all the allied countries of practicing the strictest food economy in order to maintain the requisite food supplies for the armies as well as for the civil populations, the least wastage of food by this command is most reprehensible.

3. Camp and organization commanders are responsible that messes under their control are so operated as to eliminate food waste, convert the inedible parts into by-products, and conserve rations, consistent with the adequate feeding of the troops.

4. The ration being sufficient, if adequately prepared and waste eliminated, camp and organization commanders will take all measures to discourage outside buying of food on the part of the men, in order to conserve the food supply of the civil population.

By command of Major General Biddle.

JOHN R. PROCTOR, *Chief of Staff.*

Official

J. PIERCE, *Acting Adjutant.*

Orders No. —.

1. The food situation in England and other allied countries is such that the utmost care must be taken by the army as well as by the civil population to prevent food waste. Moreover, the ration issued to the American troops in England is not sufficient to feed the men and the garbage cans. The following orders are therefore published for the information and guidance of the troops in this camp. These orders will be read to each organization by the commanding officer as soon as practicable after arrival in camp.

a. The men will take on their individual plates only such quantities of food as they can or intend to eat. Charges will be preferred against men leaving pieces of bread, meat, potatoes, cheese, or other edible food on the tables at the end of the meal, carrying such remnants in their mess kits to the garbage cans, or throwing such food remnant back into the general serving pans on the tables.

b. The food not consumed at any one meal will be left in the general serving pans returned to the cookhouse, and prepared in suitable form for subsequent meals.

c. A noncommissioned officer will be in charge of each table in the mess tents and will be responsible for the enforcement of these orders at this table. Any man violating these orders will be reported by him to these headquarters by name and organization.

d. A noncommissioned officer will be stationed at the garbage cans during each meal. He will report to these headquarters each man violating these orders.

e. The garbage cans will not be emptied until they have been inspected by the camp messing officer.

f. The commanding officer of each organization will designate one officer of the unit as messing officer. The name of this officer will be reported to these headquarters. The organization messing officers will be present in the mess tents of their respective units at each meal and are responsible for the enforcement of these orders by the noncommissioned officers in charge of mess tables.

g. Organization messing officers will report in writing each day not later than 8 p. m. that they have performed the duties assigned them for the day. These reports will mention all, if any, infractions of these orders. Such reports will be forwarded to these headquarters through organization commanders.

KITCHEN BY-PRODUCTS AND CANTEEN DIVIDENDS, BASE SECTION NO. 3

In the British Army the camp canteen or regimental institute is not run by the Army or the regiment, but by a private organization under control of the British Government, which is called the Navy and Army Canteen Board.²³ Ten per cent of the monthly sales is returned to the units patronizing the canteen and this money is expended in the mess and for comforts for the troops. These canteens were in operation in the American rest camps. The quartermaster, Base Section No. 3, A. E. F., had ruled that the 10 per cent canteen dividend represented ration savings, and until March, 1918, this money had been retained by the United States Government. The same disposition had been made of the money derived from the sale of kitchen by-products (fat, bones, cracklings, garbage, etc.). On March 28, 1918, the section of food and nutrition made the following recommendations to the chief of staff of Base Section No. 3:²³

The money derived from the sale of kitchen by-products should revert to the organizations and be used under the direction of the commanding officers for supplementing the ration and improvement of the mess. The 10 per cent dividend from the canteen is not ration savings. It should revert to the organizations to be used to improve the mess and the general comfort of the troops.

On April 20, 1918, a memorandum was addressed to the quartermaster, Base Section No. 3, embodying the above recommendation and demonstrating that the canteen dividend and the by-products salvage were not rations savings as defined by Army Regulations. These recommendations were approved by the commanding general of Base No. 3, by General Headquarters, A. E. F., and by the War Department, Washington, not only for Base No. 3 but for the entire American Expeditionary Forces.²³ In Base Section No. 3 the money dividend from these sources was turned over to the organizations and expended for the mess. The best records of salvage for kitchen by-products in the case of the most efficient organizations were $3\frac{1}{2}$ cents per man daily. The average salvage was probably at the rate of $1\frac{1}{2}$ cents. The 10 per cent canteen dividend depended, of course, upon the amount of money spent by the men. The American Air Service troops stationed at the British airdrome and construction camps received no share of the by-products fund until separate messing was established, and no share of the canteen dividend until this matter was taken up with the Secretary of the Navy and Army Canteen Board on May 22, 1918. There being an average of 20,000 American Air Service troops stationed in England, the amounts distributed from these sources to the organizations for mess improvement during the period June to November amounted to about \$75,000 or \$100,000. The total savings from the canteen dividends and sale of kitchen by-products among United States troops in Great Britain to the end of November, 1918, thus amounted to about \$200,000. This is one of the direct results of the activity of the section of food and nutrition in Base Section No. 3. These funds were almost entirely expended in mess improvement.²³

All the United States troops stationed in Base Section No. 3 were rationed directly or indirectly by the British; hence all matters of adjustment regarding rations or messing were in large part a liaison affair with the British officials, military or civilian. This introduced special difficulties, most of which could have been obviated if steps had been taken at the outset by the American authorities to arrange for rations and messing facilities known to be satisfactory to our troops.²³

FOOD PROBLEMS IN BASE SECTION NO. 1

Base Section No. 1 covered the territory of five departments: Morbihan, Loire-Inferieure, Maine-et-Loire, Vendee, and Deux Sevres.²⁴ Scattered over this large territory were on the average 80,000 to 100,000 troops, stationed mainly in or near the following centers: Vannes, Meucon and Coetquidan (Morbihan), St. Nazaire, Montoir, Savenay and Nantes (Loire-Inferieure), Angers and Saumur (Maine-et-Loire), St. Jean des Monts (Vendee), and St. Maixent (Deux Sevres). During the spring of 1918 an officer of the food and nutrition section made visits from camp to camp, investigating the fitness of the garrison ration as then issued, giving instructions in mess management, kitchen economy, and preparation of menus, looking into the sanitary condition of food supplies, examining the provisions for washing mess kits, and inspecting garbage receptacles for evidences of food wastage.²⁴

The following general observations were made on these tours of investigation:²⁴

(1) The garrison ration as issued at that time was improperly balanced to suit the dietary habits of the troops. The issues of milk and dried fruits and jam were generally pointed out as most inadequate. The lack of oatmeal caused universal complaint. The negro troops expressed desire for increased allowances of rice, hominy, and cornmeal. There was unanimous request for a variety of fresh vegetables, the negroes in particular asking for cabbage and turnips so that they could prepare their highly prized boiled meals. The 20 per cent issue of bacon was found to be excessive, and the issue of lard was judged to be absolutely unnecessary.

(2) The beef was of very poor quality. It was purchased on the French market, being generally from old animals, very lean and tough; furthermore, its sanitary quality was not always above reproach.

(3) High wastage of food was found almost everywhere, even in organizations which complained that the ration was inadequate to satisfy their nutritional requirements on account of the long hours of hard labor. Considerable quantities of edible matter were allowed to reach the garbage cans where it was salvaged by hungry natives. To waste a certain amount of food seemed to the soldiers a matter of small moment, because they had never known the need for extreme economy of materials.

(4) The garrison ration was criticized as insufficient by troops engaged for long hours in hard labor, such as loading ships, working with steel, constructing locomotives, and building railways.

(5) Algerian laborers who had been turned over to our engineers at Camp Coetquidan in April, 1918, could not be fed on the American ration, as ordinarily issued, because it did not provide a sufficient quantity of beans, lentils, rice, and fresh vegetables. Furthermore, the translation of the French term "preserved meat," as applied to these laborers, should have been construed as American canned roast beef, and not as corned beef, which was issued to but not eaten by the Algerians.

(6) The facilities for cleaning mess kits were everywhere bad. It was commonly considered sufficient to set out two or three pails of warm water for the use of 250 men. This procedure was criticised severely, and it was recommended that the mess-kit water be kept boiling during the washing of mess kits.

(7) With the exception of hospitals, all organizations were obliged to use field ranges. Organizations permanently situated, as were most of those in the S. O. S., should have been provided with garrison ranges at the outset. Field ranges consumed very large amounts of fuel, and burning out occurred about every four weeks, because of constant use night and day cooking for many more men than they were designed for. The result was waste not only of stoves but of food as well. No one could expect cooking on a stove, the top of which was caved in and full of jagged holes, emitting flame and smoke. When stoves burned out it was rarely possible to get new ones immediately.

(8) The mess arrangements for the casualties at Camp No. 1 (the receiving point) were very poor. Large kitchens and mess halls with permanent personnel were recommended for this station, with the dual object of securing better nourishment and greater food conservation. Large messes were installed after the armistice when Camp No. 1 was converted into an embarkation rendezvous.

(9) There was a shortage of experienced cooks, especially in the hospitals.

The food and nutrition section had no representative in Base Section No. 1 from May 27, 1918, until September 8, 1918.²⁴ From the latter date until the signing of the armistice, instruction regarding front-line conditions of messing was given to mess sergeants and cooks. At Camp No. 1, Base Section No. 1, the food and nutrition officer met the mess and supply officers, the mess sergeants, and the supply sergeants of incoming troops and lectured to them on rations and messing in the American Expeditionary Forces. These newly arrived officers and noncommissioned officers proved to be most eager listeners because, as a rule, they had no idea whatsoever concerning even the issue of rations in the American Expeditionary Forces.²⁴

Shortly before the armistice began two instructor mess sergeants were assigned to duty in this base section. They proved to be of great value because of the fact that it was not difficult for them to gain the confidence of the enlisted personnel in the kitchens and thus learn more readily than could a commissioned officer the peculiar difficulties encountered in certain messes. These sergeants made regular visits to all messes and gave instruction in management and in the preparation of meals in a variety of ways. They devoted a large part of their time to desserts. Any infractions of regulations governing food conservation and sanitation, as well as cases of exceptionally poor management, were reported to the food and nutrition officer, who immediately made an investigation and took up the matter with the company battalion or regimental commander. Failure to ameliorate conditions on the part of these officials was reported to the base commander, through the base surgeon. By these means the desired effect was always brought about.²⁴

During the armistice two additional officers were assigned to this base section. One officer traveled from camp to camp, spending from two weeks to a month in each; another was assigned to Montoir and vicinity. The officer in charge remained at base headquarters, supervising St. Nazaire messes, and occasionally visiting the other points in the base section.

It proved a serious handicap to arriving troops that a cash ration had been allowed in the camps of the United States, while rationing in kind was the only possible system for use in France. The cooks were not prepared for a régime under which they had to limit themselves to rations in kind, with very few articles of substitution for the components. Men, newly arrived from the United States who had become accustomed to many delicacies in our camps there, such as chicken, sausages, oysters, lamb, veal, lemon meringue pies, ice cream, and angel cake, made general complaint that they were being underfed. In reality they were receiving a more ample food allowance than was the case at the home camps. The inexperience of cooks in handling the ration in kind was the real basis for complaint; they did not know how to prepare a given article in a variety of ways, and the resulting monotony palled upon the men. Instruction in the provisions of the Army Cooks' Manual gradually improved the situation.²⁴

Due to the universal complaints concerning lack of variety in the vegetable component of the ration, the food and nutrition officer, Base Section No. 1, recommended purchase of fresh vegetables, for which the Quartermaster Corps had authority which had not been exercised. He visited several towns around St. Nazaire in order to locate supplies of fresh vegetables, and early in November, 1918, he laid before the section quartermaster information concerning the prices of cabbages, turnips, and carrots, and the quantities available. At the same time he encouraged requests by mess officers for such vegetables, with the result that a greater variety in the vegetables was issued.²⁴

The food and nutrition officer assigned to cover Camps Montoir, Gron and Dodge, in December, 1918, met with interesting problems. The first was an investigation of requests for an increase in rations at Camp Dodge where railway engineer troops were quartered. It was shown that railway troops had to be fed at very nearly all hours of the day and night and that under these conditions the garrison ration was not adequate.²⁴

A close study of the ration as issued at Montoir indicated that a straight garrison ration without frequent substitution, when furnished over a long period of time, was unsatisfactory. The principal difficulties were: (1) Scarcity of onions and other fresh vegetables in lieu of a portion of the potato issue. (2) Lack of variety in the canned-meat issue. Canned salmon had been used in such large quantities over long periods as to constitute an added excuse on the part of the troops for excessive waste. (3) The fruit component consisted largely of sirup, and practically no variety existed in the supply of dried fruit. (4) The bread component was issued as 85 per cent bread, 9 per cent corn meal, and 6 per cent flour. The proportion of bread was altogether too great; the absence of oatmeal and hominy led to monotony at breakfast from the frequent serving of corn meal in the form of mush. A flour issue of only 6 per cent was so small as to prevent the preparation of pastry, biscuits, or hot cakes.²⁴

Complaints concerning the lack of fuel necessary for cooking were general. A study of this problem revealed the fact that field ranges in most instances were designed to burn wood and that the fire boxes were consequently larger than was necessary for coal. Since the majority of the organizations in this area were more or less permanently situated, garrison ranges were obtained. These quickly solved the fuel problem, and improved the quality of the mess from a sanitary and nutritional standpoint.²⁴

In the Montoir reserve area three large mess halls had been planned, each to feed about 4,500 men. After their construction they were turned over to the authorities of the station, then known as Camp Guthrie, an inspection of them being made by the nutritional officer in conjunction with the mess officer. Upon request of the mess officer, the nutritional officer gave much time to helping in the organization and remodeling of the mess halls and kitchens. The more important features receiving attention were as follows:²⁴

(1) The original plan for cooking equipment, consisting of 1 large unit stove, which had surface area for 30 galvanized-iron cans, and 6 No. 5 garrison ranges, was discarded in favor of 3 unit kitchens consisting of (a) 1 large unit stove for its heating surface; (b) a battery of 14 No. 5 ranges, mainly for their oven capacity; (c) a set of 8 roller kitchens for cooking such articles as cereals, beans, etc., which might be burned if prepared upon the unit stove or on the ranges.

(2) A central butcher shop where all meat was properly and economically cut up was established.

(3) A central bakery for supplying pies, cakes, doughnuts, etc., to these general messes was put in operation.

(4) A plant to supply boiling water for washing mess kits was installed. This operated by running live steam into large troughs of water.

(5) A steam coffee percolator connected with plant mentioned in (4) was set up. The percolator consists of a tank having a capacity of 300 gallons. The ground coffee was suspended in a sack and live steam was introduced into the water. This system did away with many galvanized-iron cans and required fewer attendants; furthermore, it provided a uniform brew of good flavor.

(6) The peeling of all vegetables was centralized.

(7) A system of supply control was inaugurated which would guarantee adequate but economical control of the ration.

A highly important duty of the food and nutrition officers had to do with investigation regarding the demands of various organizations for increased rations. In view of the world food shortage and the difficulty in transportation, these claims nearly always were set aside, and advice was given looking to a more economical use of the ration. Only the organizations which appeared to be performing such heavy work over long hours as to require more than 4,200 calories were given any increases. About the middle of January, 1919, the policy was changed to one of greater leniency on account of psychological factors. Very often the desire for increase was due to lack of variety in issue and sometimes to ignorance on the part of the mess sergeant as to the proper way to use the components and to vary the style of cooking a given food article. Soldiers who really merited increases were railway organizations, because of the fact that meals had to be served at all hours of the day and night, and forestry, road building, motor transport, stone quarry, steel construction, and railway shop workers, because of their long hours of hard labor. Stevedores, when worked at maximum capacity, required increases, as did also isolated detachments of less than 100 men regardless of the amount of work performed. From September 8, 1918, until April 15, 1919, requests for increased rations by 46 organizations were investigated; 19 were refused, 5 were granted increases in coffee and sugar only; the increases recommended for the other 22 organizations did not average over 200 calories per ration.²⁴

An interesting case, proving the lack of necessity for extravagant increases in ration, is presented by the study of stevedore messes conducted in May, 1918. The chief quartermaster, American Expeditionary Forces, requested that an investigation be made of the 33 $\frac{1}{3}$ per cent increase in rations enjoyed by the night-working stevedores. A nutritional survey was made by the section of food and nutrition, Base Section No. 1, the food consumption and wastage being carefully measured. Two day companies in Camp No. 1, Base Section No. 1, and two night companies in Camp No. 4 were selected for the comparative study. A summary of the results of this investigation is as follows:²⁴

Ration per man per day ^a	Gross food consumption per man per day, calories ^b	Net food consumption per man per day ^c	Food wasted, percentage
Company A, ^d 1 $\frac{1}{2}$ garrison ration.....	4,498	4,006	13 of that issued.
Company E, ^d 1 $\frac{1}{2}$ garrison ration.....	4,364	4,312	10 of that issued.
Company K, ^e 1 garrison ration.....	4,441	3,951	0.6 of that issued.
Company M, ^e 1 garrison ration.....	4,165	4,021	0.8 of that issued.
Stevedores, cash.....	No record.	3,858	No record.

^a The garrison ration with substitutive articles as issued here figures 3,900-4,400 calories.

^b These figures were obtained from an actual count of the number of men who attended meals.

^c These figures were based on the total company strength, regardless of whether or not all men attended meals.

^d Night workers.

^e Day workers.

^f This figure was obtained by a calculation of the month's food purchases. This is the only instance known where the cash ration was allowed in France.

These figures show that the night workers actually ate only 3 per cent more than the day workers; they wasted 10 to 13 per cent of the food issued (comprising 1.8 ounces of bread and 5.2 to 7.6 ounces of other food daily per

man), in comparison with only 0.6 to 0.8 per cent wastage by day workers. In short, during the period May 7-14, 1918, men of organizations receiving a 33 $\frac{1}{3}$ per cent increase ate only one-tenth of the extra issue, threw one-third of it into the garbage can, and left the rest to accumulate in storerooms. The day workers, on the normal ration, were quite satisfied with the amount of food served to them, actually consuming all but a negligible quantity. By comparing the figures for net food consumption, it is seen that the stevedores, who were on a commutation basis, did not consume so much food as the others. Furthermore, examination of the record of attendance at meals of Companies A and E showed that the men were not present at four meals daily; they attended only three of the four meals served. The total number sitting down to the midnight meal and to breakfast was less, in fact, than the attendance at either dinner or supper. The serving of four meals in these organizations was, of course, necessary, but sufficient food was not prepared for the entire companies at midnight or at breakfast, or if it was prepared in this amount it should not have been.²⁴

As a result of this investigation it was recommended that the 33 $\frac{1}{3}$ per cent increase be discontinued.²⁴

Officers of the section of food and nutrition, Base Section No. 1, frequently were called upon by the quartermaster to pass judgment upon the fitness for human consumption of damaged food shipments. They were requested also on several occasions by the base commander and by mess officers to investigate the reasons for the poor quality of bread. From March 6, 1919, an officer of the food and nutrition section, Base Section No. 1, was a member of the ship inspection board at St. Nazaire which inspected all vessels entering the port for the purpose of carrying troops to the United States. In the case of Army chartered transports, valuable service was performed in judging the adequacy of food supplies and in giving instructions as to how and where additional articles could be obtained, if needed. On the Navy transports there was never any question as to the adequacy of food or the sanitary quality thereof, although quite frequently the design of galleys, bakeries, and mess halls was criticized. As a result of recommendations made by the food and nutrition officer after inspection of the *Liberator* and *Lancaster*, these vessels carried to the United States 1,200 and 1,000 fewer troops, respectively, than had been scheduled on their maiden trips.²⁴

FOOD PROBLEMS IN THE INTERMEDIATE SECTION

Within the district known as the Intermediate Section, American Expeditionary Forces, covering approximately one-fourth of the area of France, troops were stationed: (1) In training centers and depot divisions, acting under orders received direct from General Headquarters, American Expeditionary Forces; (2) at hospital centers, operating under orders from the hospitalization division, at headquarters, Services of Supply; and (3) in a large number of comparatively small scattered units of miscellaneous character, which were administered from headquarters, Intermediate Section.²⁵

The work of the food and nutrition section was performed within this area by the direct assignment of officers to depot divisions and training areas,

by the assignment of one officer to the hospitalization division of the chief surgeon's office, and by the detail of another to the office of the chief surgeon, Intermediate Section, at Nevers, where he was on duty from October 22, 1918, until February 17, 1919, as food and nutrition inspector. The troops controlled from the headquarters at Nevers were engaged in construction, transportation, storage, repair, forestry, and other labor duty, in administration and in maintenance of camp hospitals or hospital trains pertaining to the Intermediate Section. An idea of the extent of these operations may be gained from the fact that the organization list comprised about 1,200 units. It was the duty of the food and nutrition inspector to handle all manner of requests and complaints in connection with rations in this group of organizations; he was charged, specifically, with the investigation of matters relating to transportation, handling, preparation, and conservation of rations as well as with the instruction of mess sergeants and cooks regarding field management and cooking. The work was performed by personal inspection of messes and by issuance of a series of kitchen bulletins which were sent to each of the 1,200 individual organizations. These bulletins included matter relating to varied menus, economical and sanitary kitchen administration, and palatable new methods of preparing staple ration components.²⁵

Among the specific food and nutrition problems which received attention were requests from forestry and other labor troops for allowance in excess of the garrison ration; complaints regarding the condition of food products, shortage in issue, lack of variety, unsatisfactory cooking and monotonous menus; requests from negro troops for changes in the amounts and proportions of ration components; insufficiency of food in casual railroad messes and other organizations serving meals throughout the 24 hours; delay and theft of rations transported by train; instructions as to the disposition of damaged foods; reports from dietitians as to shortage of foods especially adapted for the use of the sick; shortages resulting through spoilage of canned goods, and alleged digestive disturbance from the same cause; reports of improper management of officers' messes.²⁵

As a basis for judgment regarding the practical considerations involved in an adjustment of these difficulties, a careful study was made of the disposition of the food in the kitchens of 11 engineer organizations near Nevers; less intensive investigations were made during the month of November, 1918, in all labor organizations which received food in excess of the garrison ration; invoices of storerooms at the beginning and end of ration periods, accounts of foods received by issue or purchase were noted and statements as to hours and conditions of labor and the satisfaction of the men with the rations were obtained.²⁵

The feeding of that part of the army which was stationed in the Intermediate Section involved no difficulties not met with elsewhere. General shortage of transportation and congestion of traffic on the railroads interfered with the distribution of rations; as a result, local deficiency in one component or another of the ration existed at times, but troops in the Intermediate Section were, in general, as well fed as could have been expected. The greatest cause of complaint was poor cooking. Our army had been assembled with such rapidity that it was impossible to make good cooks as fast as they were required,

and the means were not at hand for the rapid improvement of this condition. Another important deficiency, which, likewise, was not restricted to this section, was the lack of food especially adapted to the nourishment of the very sick. These products were not available in adequate amounts at the commissary stores, nor were they obtainable by purchase in sufficient quantities in the local French markets; however, some help was rendered in this connection by the cooperation of the American Red Cross.²⁵

Feeding problems which were somewhat characteristic of the Intermediate Section, American Expeditionary Forces, were those relating to small organizations located at points remote from sources of supply. These were commonly forestry, engineer, or other labor troops. On account of long hours of work and the conditions of exposure to which they were subjected many of these organizations requested food allowance in excess of the regular garrison ration. The section of food and nutrition, Intermediate Section, investigated these claims and made recommendations for their settlement to the chief quartermaster, American Expeditionary Forces. In the investigation of such requests for extra rations it was found that a variety of factors contributed to a determination as to their justice. When located at such distance from the source of supplies that rations had to be shipped by train the organization often suffered loss, (a) through theft of food, en route; (b) through difficulty in arranging for replacement of spoiled canned goods; (c) through loss of credits with the quartermaster because of the inability of the latter to issue the whole ration at the time due, and the impracticability of arranging for the transportation of the "short" items at later dates. Sometimes there was shortage of fat in the ration because of the necessity of using lean French beef of local purchase. The splitting up of companies into detachments with separate messes, the necessity for serving four meals per day on account of night shifts, the spilling of food, through lack of tight containers, when it was hauled over rough wood roads from the kitchen to men who were obliged to eat at a distance from the camp, and the lack of control over food wastage among men taking meals away from the mess, all were factors of importance. Coincident with these conditions was the increased demand for food on account of the long days of hard, steady labor in cold, rain, and mud, and because a portion of the night shift would arise to eat noonday dinner with the day shift.²⁵

As stated above under the portion of this chapter having to do with the caloric value of the ration, prior to November 1, 1918, extra food was allowed to troops continuously engaged in hard labor in the proportion of 5, 10, and 15 per cent in excess of the garrison ration, according as their working days exceeded 8, 9, or 10 hours' duration.^{6 7} These increases were cut off on November 1, 1918, by a new ration order, in accordance with which extra food could be had only after investigation by an officer of the food and nutrition section.³ A considerable part of the time of officers in this section was occupied by these investigations of working conditions and food requirements.

The food problems involved in railroad operating related to the provision of proper containers for carrying lunches, the arrangement of suitable feeding places at ends of divisions, and the adjustment of compensation for food sup-

plied to casual train crews and to men called out at night after the three regular meals had been eaten. The maintenance of proper discipline in the use of food by train crews was difficult: These men, doing the same kind of work which they had done in civil life and under very trying conditions, naturally retained their civilian attitude toward their food and the right to waste it, especially when taking meals away from the home mess, and beyond the supervision of their officers.²⁵

The particular requirements of negro troops were for increased proportions of bread, cornmeal, fat, and sirup in the ration. Their meat requirement was often lighter than that of white troops except as regards their insistent demand for fat.²⁵

Throughout the Intermediate Section messing conditions were usually good, often excellent, sometimes poor, but never scandalous. In the vast majority of the instances investigated, every person concerned had done his best. The fault usually lay with the uncontrollable features of the great emergency; thus, bread was sometimes bad because the flour was damaged in shipment by rail in open cars, closed cars in sufficient numbers not being available; fresh vegetables were not supplied in sufficient amounts because the summer of 1918 was a very poor one for such crops in France; the cooking was not always what it should have been because of the scarcity of cooks.²⁵

FOOD PROBLEMS AMONG COMBAT TROOPS

A general survey of food conditions among troops in the zone of the advance was made during the months of May and June, 1918, by four officers of the section of food and nutrition, office of surgeon general, American Expeditionary Forces. This survey covered the American 1st, 2d, 5th, 26th, 32d, and 35th Divisions, then located principally in the Vosges. As a result of these investigations it was found desirable to attach parties from the section of food and nutrition for more or less permanent duty with divisions. It was not contemplated that these parties should remain in a given sector, but rather that each one should join a division in its training area and remain with it during movements of the division. The arrival in the American Expeditionary Forces in August, 1918, of additional officers for duty in the food and nutrition section, and of sergeants of the Quartermaster Corps, permitted the formation of parties for duty with the following combat organizations: 1st, 2d, 3d, 4th, 5th, 6th, 7th, 26th, 28th, 29th, 32d, 33d, 35th, 36th, 37th, 42d, 78th, 79th, 80th, 81st, 82d, 87th, 88th, 89th, 90th, 91st Divisions, and the 1st, 3d, 4th, 5th, 6th, 7th, 8th, and 9th Corps.²⁶

A party consisted usually of an officer, and several noncommissioned officers attached for temporary duty. Parties were assigned to the corps surgeon's or division surgeon's office and operated under his immediate direction; although in constant touch with the office of the director of laboratories and the surgeon under whom they operated, they were more or less independent. This arrangement allowed them to use their own resourcefulness and to give such advice, make such plans and assist in carrying out such action as the immediate occasion demanded. They worked in close conjunction with the officers of the divi-

sion, especially the sanitary inspector, assistant chief of staff, G-1, the inspector general, the quartermaster, and organization commanders. The work necessitated detailed inspection of kitchens, and the instruction of personnel, individually, in groups, and in schools. As was to be expected, conditions varied in each division; but, in the main, the program developed along the lines of insuring that the men got food when possible and that such food was handled to the best advantage as far as storage, menus, cooking, serving, sanitation, and economy were concerned.²⁶

The nature of the ration and its distribution, the functioning of the supply organizations through the regulating officer and railhead officer, and the system of automatic issue before the supplies reached the division will not be entered into here. Briefly, from base ports to the front, food moved through France from base depots to intermediate depots, from intermediate depots to advance depots, thence, controlled by regulating stations, to railheads, and from railheads to divisions. As far forward as the railhead, transportation was by rail. Usually for divisions on the march or occupying sectors of trenches the railhead and the divisional dump were at the same point in order to save trucking. During combat, however, when a division was advancing from its railhead, it became necessary to push the divisional dump forward, keeping constantly in liaison with the regiments; this forward movement of the dump necessitated trucking from the railhead, sometimes for great distances. At one time during the Belgian campaign a division had a haul of 60 km. from the railhead to its dump.²⁶

Each soldier had on his person 2 days' reserve ration. In addition to these 2 days' reserve ration, the unit wagon carried 2 days' field and 1 day's reserve rations; the divisional supply train carried 2 days' field rations, making in all 7 days' ration (3 reserve and 4 field); enough, if intact, to subsist the command for 1 week.²⁷ These rations were never used unless a real necessity arose, for at all times new rations continually were being pushed forward in conformity with the daily ration system which had been adopted in July, 1917.²⁸ While serving in the front lines the soldiers were entitled to extra allowances in coffee, sugar, meat, bread, and candies. In general, the garrison ration was supplied unless the field or other ration was designated by the commander.²⁹ It can be said that the food supply of the American Expeditionary Forces was of uniform excellence and, with certain minor difficulties, also in adequate amounts.²⁶

GARRISON RATION AT THE FRONT

MEAT

The meat component was very well handled, no inferior or spoiled meat being seen with combat troops; a small amount needed considerable trimming, but as a general rule the supply was of excellent quality and present in large amounts. Bacon was appreciated up to 20 to 25 per cent of the ration; greater amounts could not be utilized and found their way into the fire. At times only canned meats were available—that is, canned roast beef, corned beef, and corned beef hash; however, the quality of these was satisfactory and the amount issued was not considered excessive. Salmon was an article of food in which considerable wastage occurred because of the limited quantity which the soldier would eat.²⁶

BREAD

During the summer of 1918 a considerable amount of bread baked for our troops at the front deteriorated. There was an epidemic of mold, apparently resulting from delay in handling, methods of packing, and shipping in French cars. Many organizations suffered from this cause, since there was a loss up to 100 per cent, in some instances, with nothing to replace it. After the 4 pound oval loaf was introduced there was very little difficulty, for this bread was sometimes issued three or four weeks after being baked and was found to be still in good condition. Later, the small round 2-pound loaf from the mechanical bakeries at Is-sur-Tille was received and also gave satisfaction. During January, 1919, bread was less satisfactory, and numerous complaints were received as to the quality, texture, and baking, though after February, 1919, no difficulty from this source was met. As for the hard bread, that packed in tin containers was very satisfactory; that issued in cardboard cartons, or the French variety packed loose in crates, suffered considerable loss through moisture and mold.²⁶ One officer reported: ²⁶

There has been a continuous and excessive loss of hard bread in this division for the past seven weeks, due (1) to the unsatisfactory manner of packing hard bread and (2) to the conditions under which this division has been operating. Hard bread has been received by this division packed in three ways: In the National Biscuit Co. packages of 8 ounces, the French 2-ounce biscuit in bulk, packed in wooden boxes, and the French 2-ounce biscuit packed in paper cartons. Of the three methods, the last is the poorest, as the paper box takes in any moisture and the bread rapidly deteriorates. Facilities for proper storage in the field have been continuously poor due to the fact that there has been a great deal of rain during this period. Men on the march carry four of the National Biscuit Co. packages, or if these are unavailable for issue, they will be given the French biscuit loose. Due to the bulkiness of this bread, it is almost impossible to get it in any water-tight portion of the pack; at least it is impossible to protect it and at the same time have it readily accessible. At the end of one march of 18 km. in the rain, I personally checked the hard bread carried by 50 men and found that in excess of 80 per cent of the bread had become soggy. This bread is not available for salvaging nor for use in the kitchen, because of the large supply of soft bread and because of the fact that it is impossible for anyone in this division to anticipate the weather conditions and have the soft bread supplies stopped at the time of probable deterioration of hard bread.

VEGETABLES

Often there was an insufficient issue of fresh vegetables, which was overcome in part by the use of dehydrated products or by local purchase of fresh articles. Many officers reported that both these alternatives caused trouble: The dehydrated vegetables were new to most of our Army cooks, very few of whom had ever seen this form of food and they had received no instructions in its preparation. In some places water for soaking dehydrated food was not available; the result was bad preparation. Fresh vegetables sent by the regulating officer, while very acceptable, were in some cases a total loss: Fresh tomatoes and cabbage on reaching the front lines showed deterioration to an extent ranging from 5 to 40 per cent. The fresh vegetables bought locally were of course much better and were often available even in rapid advances. During the Meuse-Argonne operation great cabbage fields, found in the region mentioned, materially supplemented the diet.²⁶ The following quotation indicates a deficiency in vegetables:²⁶

Average for 27,500 men of 4.1 ounces of fresh vegetables per man per day or 20.5 per cent of vegetable ration. No potatoes or canned tomatoes received. * * * Relative to the quality of supplies, the bread and beef were found in good condition, but the carloads of fresh vegetables were as a rule not found in good shape. The crated fresh tomatoes seemed to have spoiled on account of the majority of the tomatoes being picked too ripe and also due to improper storage in the car.

Fruit, milk, and cereals were deficient, both as allowed by the ration and as actually received. The pepper accumulated. The lard was excessive and went into the fires as an almost universal practice.²⁶ This situation was improved by General Orders, No. 176, G. H. Q., A. E. F., effective November 1, 1918.

When in combat or advancing to the combat the field ration was designated by the commanding officer.³⁰ This field ration consisted of canned meats in place of fresh meats and hard bread instead of fresh bread, and otherwise, from the soldiers' point of view, was indistinguishable from the garrison ration. The reserve ration carried by the soldier and in the field train consisted principally of canned meat and hard bread. Reserve rations on the person caused some trouble because the soldiers either consumed them before they should have been eaten or threw them away, thereafter going hungry. The special trench reserve ration, consisting of 25 rations sealed in metal containers, was designed for use during periods spent in trenches under conditions of a heavy barrage, when it was impossible to bring up rations. With American troops these conditions scarcely arose and consequently this ration was not utilized.³⁰

TRAVEL RATION

The travel ration consisted of canned meat, fresh bread or hard bread, canned beans, and canned tomatoes; sugar and coffee were usually supplied en route. On the whole it was satisfactory.²⁶

RATION SUPPLY WITHIN AN ORGANIZATION

The problem of supply within an organization caused more trouble than was anticipated. During the period in the front when accountability was removed, the supply officers, organization commanders, and mess sergeants assumed that the ration was "Whatever we get." In many cases losses were not made good, spoiled goods were not redeemed, and insufficient rations were received. Part of this difficulty arose from the shortage of transportation, part from petty thefts along the line of supply. There were no ration slips available to check the supplies, so that the more desirable articles had a tendency to disappear before they got to the frontline.²⁶

RATION REPORTS

Ration reports were also responsible for certain delays in getting the food to the men. It was customary for the daily strength to be sent to the battalion headquarters, there consolidated and given to the regimental headquarters where it was again consolidated and given to the supply officer. The supply officer took the report to the railhead as a basis for the ration return. The food was not issued until next day and it was not until the third day that it reached the hands of the regimental supply officer for distribution to the companies.

The officer of the section of food and nutrition suggested that the routes of communication could be simplified considerably by telephoning the daily report to the railhead for issue the same day. This brought about considerable improvement because it eliminated the shortage of food resulting from detachments continually arriving at the front and being without food for three days unless they could obtain some by taking part of that meant for the troops already there. In rare instances only were provisions made for detachments sent forward.²⁶

RATION ISSUES

Ration issues were daily, the purpose of this being to permit unexpected moves without involving much transportation of food supplies.²⁸ This system was not without its difficulties, as can be seen from the following quotation from a report of an officer of the section of food and nutrition:²⁶

With the daily system of issuing rations now being adopted, I advise that the division quartermaster should be allowed three days rations to meet the delay in receipt of rations, and in order to minimize the breaking of packages. The division of sacks of flour, sugar, etc., is wasteful and unsanitary, and should be avoided by the "under and over" system of daily supply from the division quartermaster or from the regimental supply points.

Also, in my judgment, with the daily issues the whole of each ration article or the whole allowance of a substitute should be issued to an individual mess rather than a part of ration article and part substitute. For instance, 60 per cent beans and 40 per cent rice give not enough of either for a meal, and the making of menus becomes difficult.

COOKING STOVES

No description of the food conditions would be adequate without going into the matter of the stoves available for cooking. Some of the troops, when at the embarkation camps, had their field ranges taken from them on landing in France and were practically without cooking equipment of any kind. This was all the more serious in the case of the National Army divisions, since what training the cooks had had in the home cantonments was on large fixed ranges. The officers in the nutrition parties with combat divisions assisted these cooks in making temporary substitutes, such as rock or mud ovens, to tide over the situation until such time as rolling kitchens were available. There were four main types of rolling kitchens in use in the American Expeditionary Forces during hostilities, as follows: Magor, Steinburn, Taylor No. 29, Taylor No. 30. The Liberty four-hole, animal-drawn, and the Liberty four-hole, motor-drawn rolling kitchens also were used, but to a slight extent. Later the Bubb oven was introduced into the army of occupation, but did not function during combat.²⁶

The Magor rolling kitchen is limited by its construction to boiling and frying. It has two ordinary boilers and two double boilers. The double boilers proved a failure; it was impossible to heat the necessary bulk of material with the thin steam jacket available.²⁶

The Steinburn rolling kitchen has four boilers directly over the fire and two small ovens. The kitchen is so heavy as to be hard on horses as well as men; the boilers are so placed that the heat is drawn to them, with the result that the ovens are poorly heated and are useless for roasting or baking²⁶ (fig. 43).

The Taylor rolling kitchen "No. 29" has four boilers directly over the fire and a large griddle for frying. One whole side of the kitchen is occupied by a large oven. Great difficulty was encountered by cooks in obtaining sufficient heat for baking²⁶ (fig. 44).

The Taylor rolling kitchen "No. 30" carries six boilers, the two in the center being double boilers. It has two fire boxes, one at either end, with each

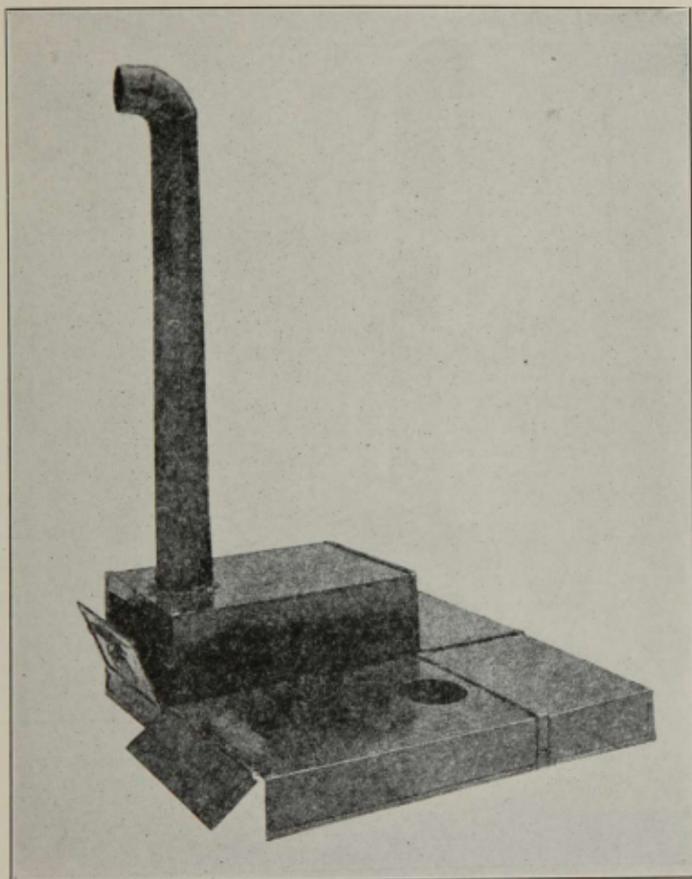


FIG. 35.—Front and right side of field range No. 1, with boiling plate and Alamo attachments, set up

of which is an oven so located that the heat must pass around it before reaching the chimney. One or both fire boxes and ovens may be used. There is a limber, which can be used as a bread, fuel, or forage box, and a table 8 feet long (fig. 45).

The Army field range with the Alamo attachment is thought to have its advantages over all types of rolling kitchens; including the time taken in setting it up, a meal can be prepared on it almost as promptly as with the rolling kitchens; also it can be installed as a semipermanent range which gives excellent satisfaction. During the time when troops are engaged in trench warfare,

in support, in reserve, or in rest billets, this type of cooking equipment is superior in every way. During a rapid advance there is a field of usefulness for mobile cooking apparatus, but even under these conditions it is far from ideal. In the Meuse-Argonne operation the smoke of the rolling kitchens was easily detected by the enemy, resulting in drawing heavy shell fire and in many direct hits; consequently, they were grouped far back of the line and the food had to be carried a long way. Rolling kitchens were very hard on men and

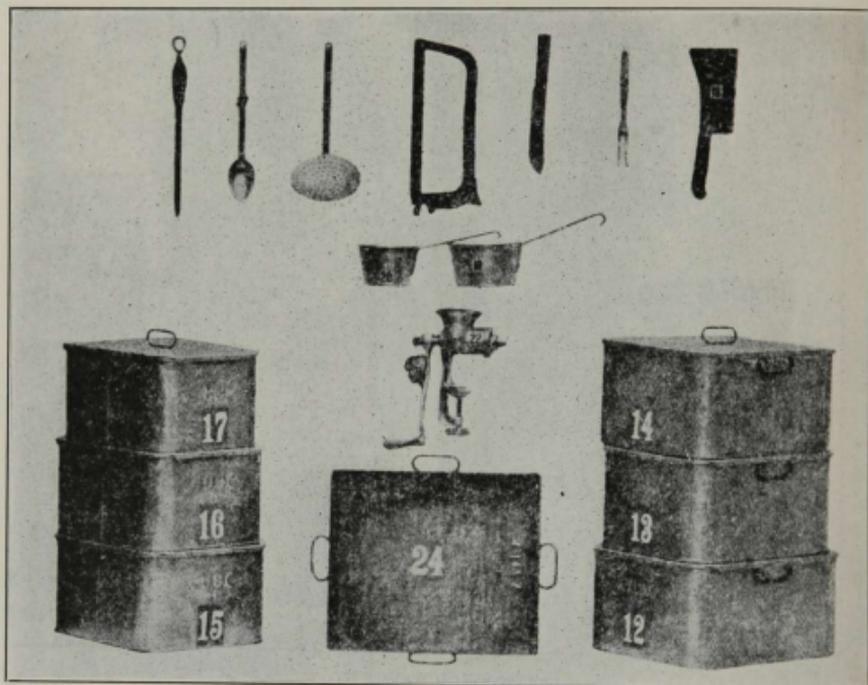


FIG. 36.—Equipment for field range No. 1

- | | | |
|----------------------------------|---------------------------------|------------------------|
| 12. Boiler and cover, No. 48 (1) | 18. Cleaver (1) | 24. Pans, bake (2) |
| 13. Boiler and cover, No. 49 (1) | 19. Dipper, 2-quart, No. 55 (1) | 25. Saw, meat (1) |
| 14. Boiler and cover, No. 50 (1) | 20. Dipper, 1-quart, No. 56 (1) | 26. Skimmer, large (1) |
| 15. Boiler and cover, No. 51 (1) | 21. Fork, small (2) | 27. Spoon, large (2) |
| 16. Boiler and cover, No. 53 (1) | 22. Grinder, meat (1) | 28. Steel, butcher (1) |
| 17. Boiler and cover, No. 54 (1) | 23. Knife, butcher, 8-inch (3) | |

horses and they traveled poorly, especially when trailed behind trucks, the fire boxes breaking up or shaking apart. They supply poor meals, because the cooking is practically limited to stews or "slum."²⁶

FOOD CONTAINERS

Marmite cans or containers for keeping food warm were used in two sizes, a large one of approximately 12 gallons capacity and a smaller one holding about 6 gallons. The lid was of thin material, so that it warped when screwed on. There was a felt washer under the lid, which became soiled and could not be cleaned. Considerable difficulty was experienced during the summer

IMPROVISED COMPANY FIELD KITCHEN

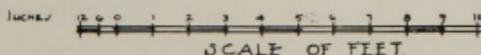
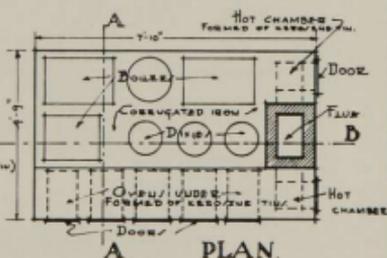
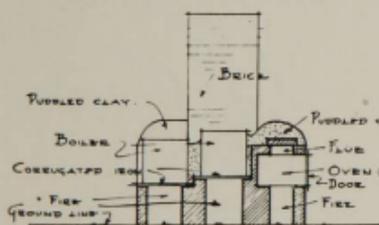
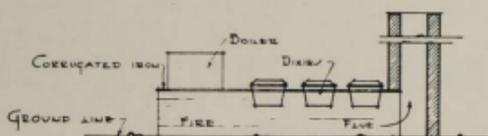
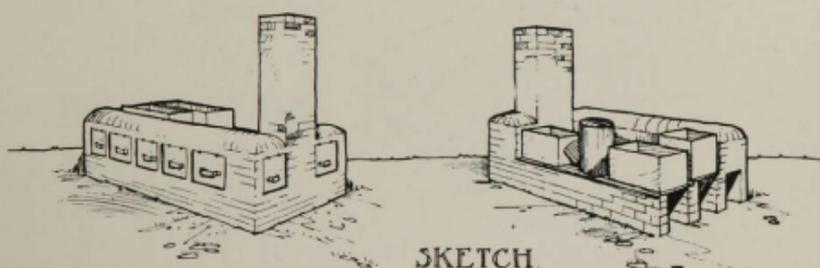
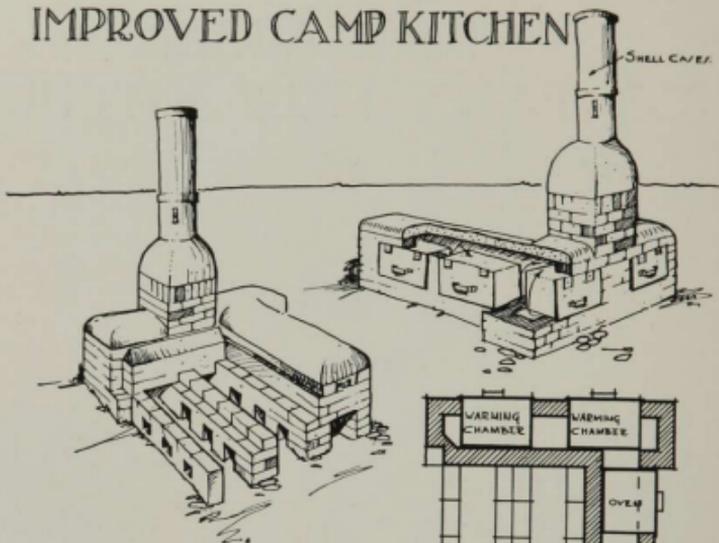


FIG. 37

IMPROVED CAMP KITCHEN



WARMING CHAMBER AND OVEN MADE OUT OF AMMUNITION CASE LININGS.

IMPROVED FIELD KITCHENS.

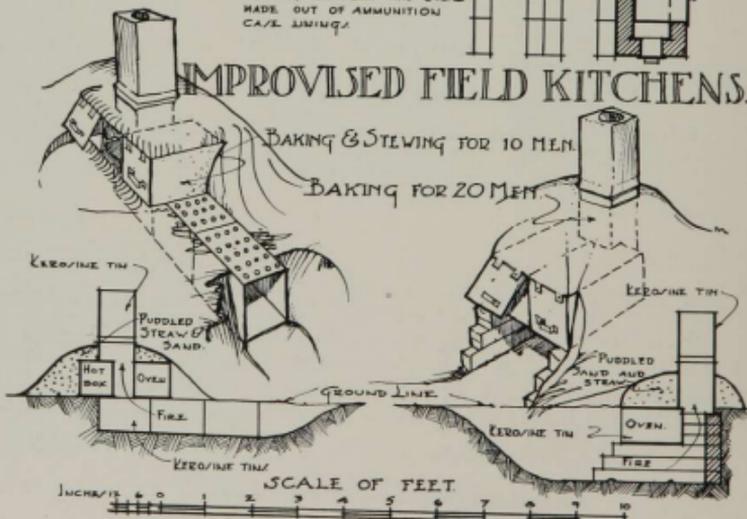


FIG. 38

COOKER FOR CAMPS & BILLETTS

MATERIALS REQUIRED

BRICKS	300
LIME	20WT
SAND	6CWT
CORRUGATED IRON SHEETS	2 (6'x'3')
IRON BARS	30FT.
EMPTY CERJOL DRUMS	6.



SKETCH

COOKER IS DESIGNED TO TAKE FOUR BARS.

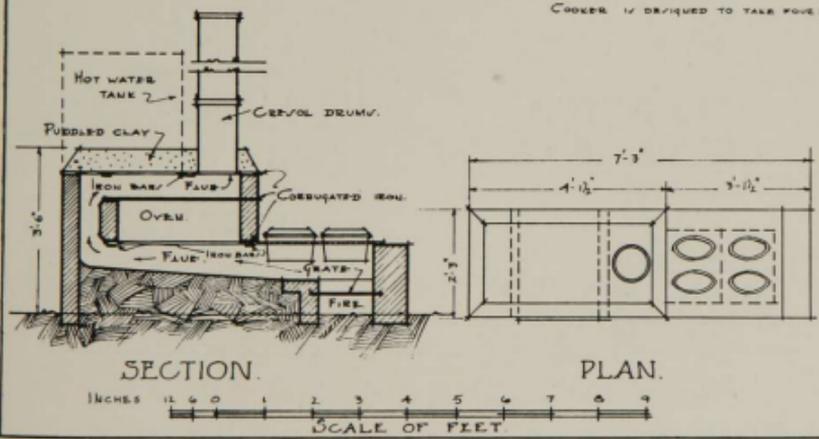
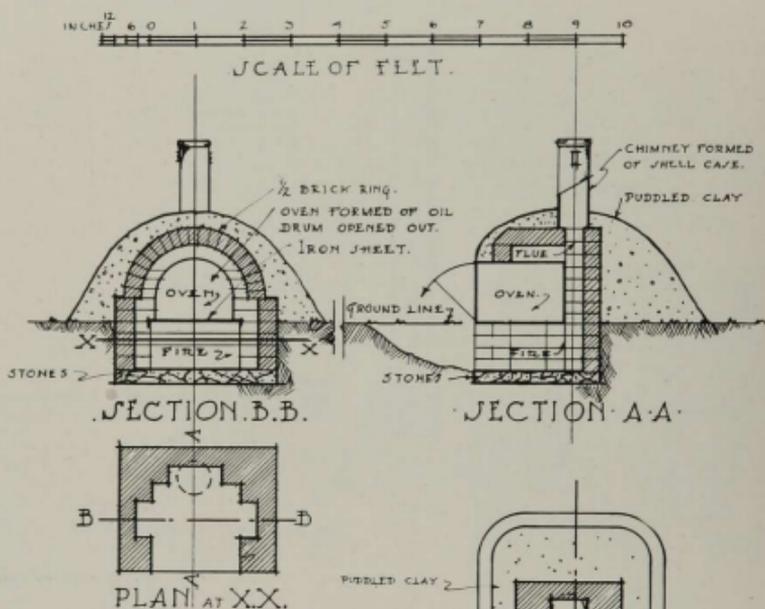


FIG. 39

IMPROVISED SEMI-CIRCULAR OVEN



IMPROVED CIRCULAR OVEN

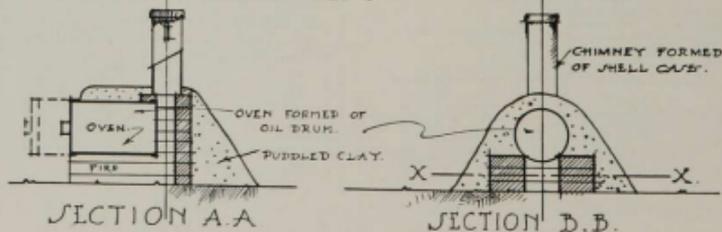


FIG. 40

of 1918 because food sent forward in the night became sour before the men could eat it in the morning. The marmite can as issued to our troops seemed to have been designed on the assumption that men carrying it to the front areas could move upright. In practice, however, when these containers had to be transported 3 to 5 kms. by carrying parties in a crouching position the labor proved very exhausting to the men. British, French, and German containers were all designed to feed a squad of men and could easily be carried by one man.²⁶

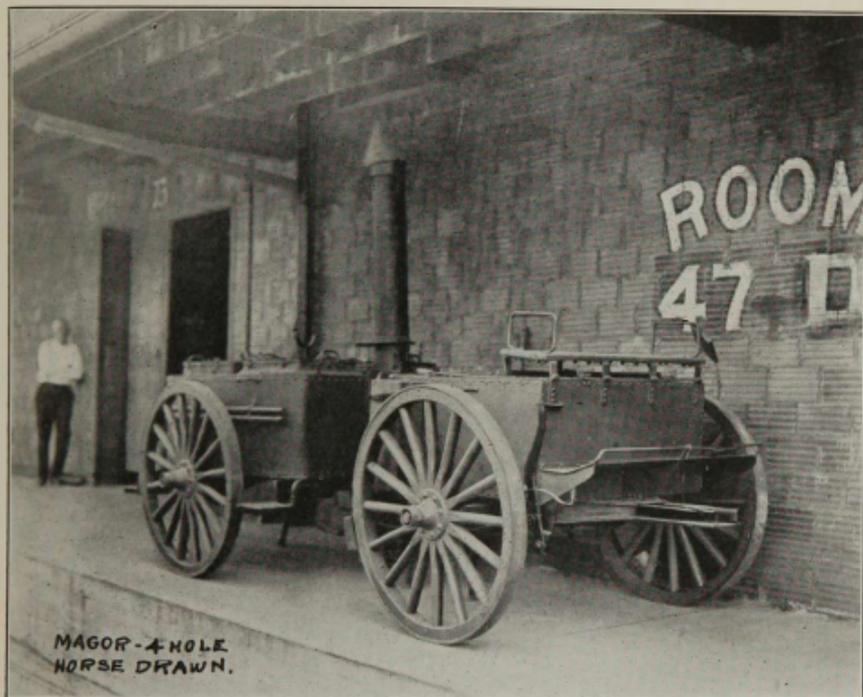


FIG. 41.—The Magor rolling kitchen. Designed capacity, 250 men

KITCHEN EQUIPMENT

Kitchen equipment for the field often was found to be of inferior quality. Better material and workmanship would have obviated the necessity for frequent replacements or for getting along without important utensils when new articles were almost impossible to obtain. In particular the meat saw was too short for company use; the meat grinders, so essential for the Army kitchen, were too small and too easily broken; the butcher knife should have had solid metal handles, thereby avoiding cracks in which dirt and grease could accumulate.²⁶ (See fig. 36.)

FUNCTION OF NUTRITIONAL FIELD PARTIES

The chief function of the nutritional field parties was to improve mess conditions in the divisions, and this duty required the larger part of the time available to the officers and sergeants. The policy of following inspections by elaborate reports containing destructive criticism was not favored. On the contrary, every effort was made to find out what was the matter with the particular mess being inspected and to give such practical advice and information as would overcome the difficulties. Much time was spent instructing the

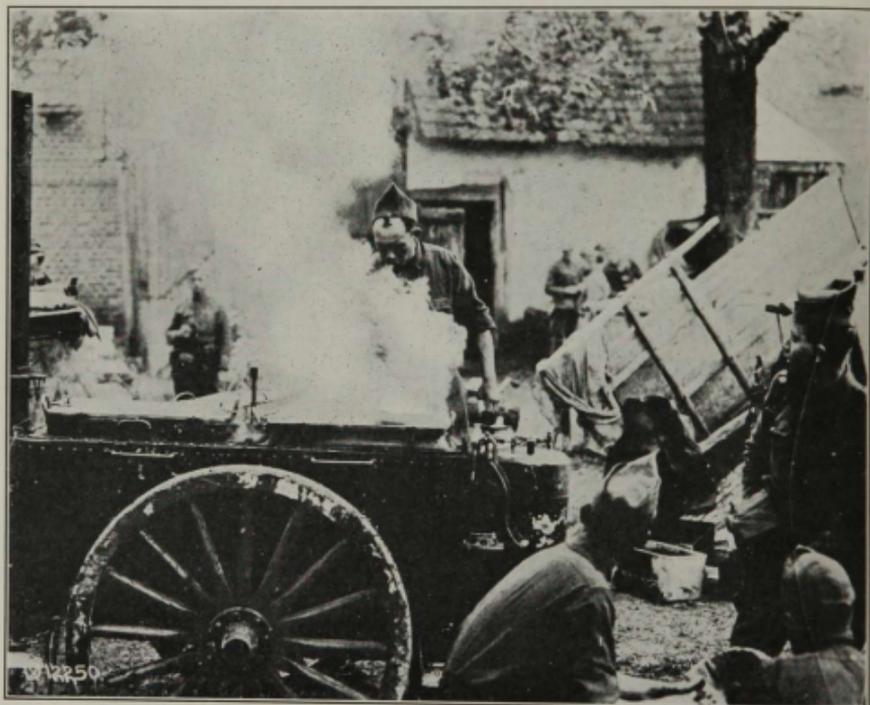


FIG. 42.—The Magor rolling kitchen, showing oil tank for heating purposes

kitchen personnel of individual companies regarding elementary problems of cooking and sanitation, the rudiments of mess management, the drawing of rations, and storage and care of food after its receipt. In this way it was possible to show the company commanders where the faults lay, and to improve the cooking as well as to reduce the waste. Small groups of mess sergeants were given informal lectures; circulars of instruction were issued for general distribution; temporary schools were put into operation. In addition, the officers of the field parties held many conferences and made such reports as were necessary or required to the organization commanders and to supply officers.²⁰

FOOD PROBLEMS OF AN ADVANCING DIVISION

Advancing from a rest area to the front usually was accomplished with little trouble; the ground had all been marched over before, villages were marked for billets, railheads already located, and rapid handling of rations was possible. The method used in such an advance was quite simple; usually divisional headquarters moved once in two days, the same being true of the railhead, both of which on one day were in advance of the moving division and on the next day at the rear. When secrecy of movement was a factor, troop movements were accomplished at night. This "leap-frog" system allowed of

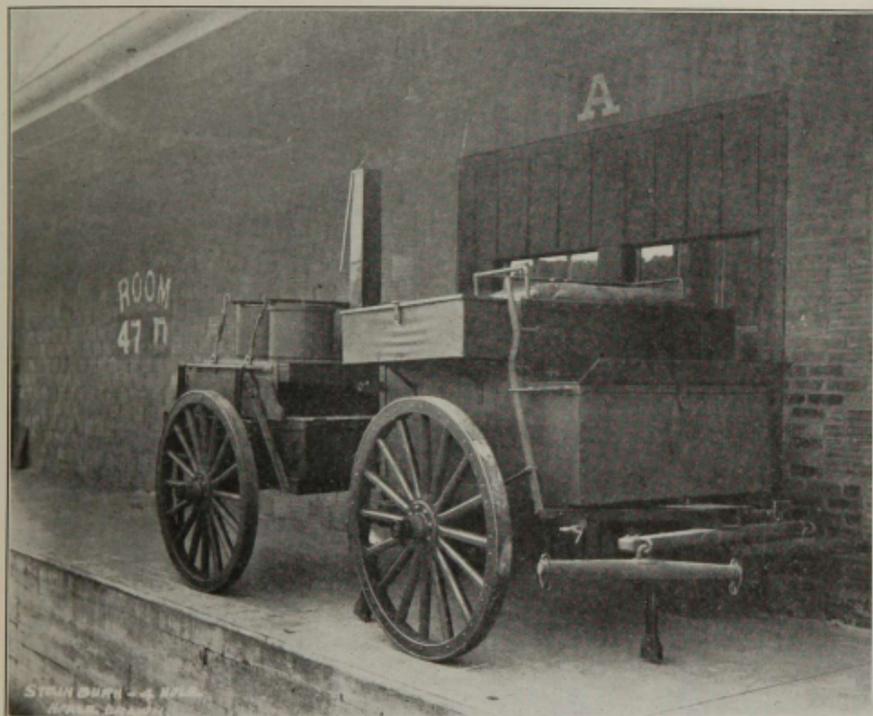


FIG. 43.—The Steinburn rolling kitchen

a semistationary post of command and ration dump while the division continued to advance. Arriving near the front, the advance railhead was passed, and a ration dump was established at some point farther forward while troops passed on to the line. In such a situation rations were hauled by truck from railhead to dump; regimental supply trains (usually animal-drawn) continued the movement from the dump, and in organization ration carts the food from the regimental dump was transported to the kitchens concerned.²⁶

During open warfare, when rapid advances were being made, the necessity of pushing forward the divisional dump, so that it was readily accessible to regiments, constituted quite a problem, which was made all the more complicated by the fact that every forward movement of the dump meant a greater

distance from the railhead, and consequently an increased load on the trucking facilities, though railroads usually could be built as fast as the troops advanced. This, briefly, was the food problem of the advancing division. Theoretically, such an advance should go smoothly; practically, the whole scheme was beset with a thousand difficulties, differing with local conditions, having ramifications into every department of administration, and depending entirely on the common sense and good judgment of the men in charge for a rapid and certain solution.²⁶

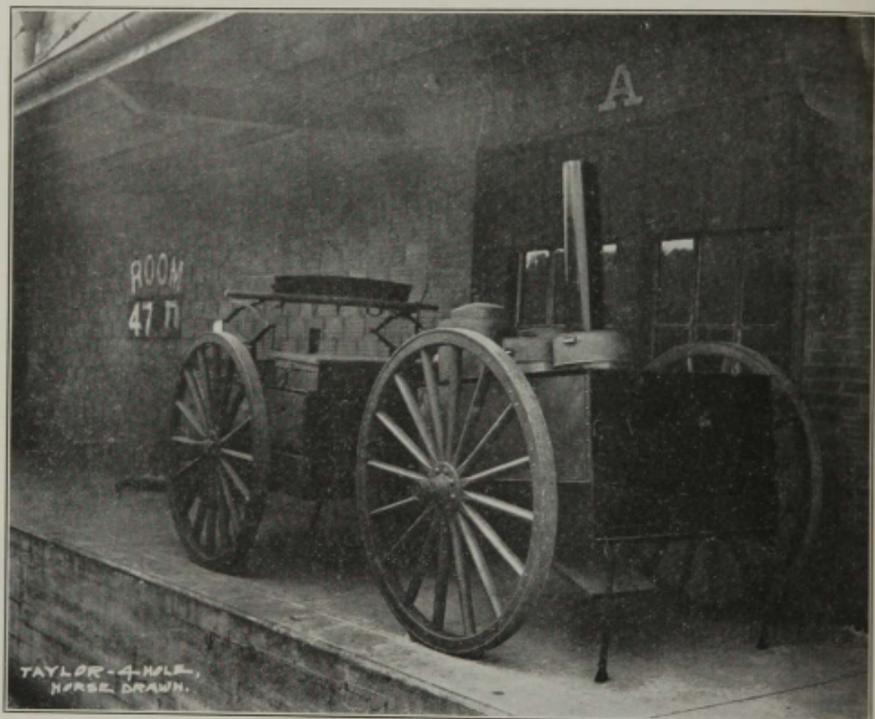


FIG. 44.—The Taylor rolling kitchen No. 29

The following quotations from reports by nutritional field parties are of interest:²⁶

Food conditions during the St. Mihiel operation.—The system of issue of food supplies was by supply train from railhead to distribution points, from there to companies by field train. The ration seemed to have been well taken care of until it reached the supply companies, but after reaching the supply company there seemed to be difficulty in getting it to the company kitchens. There is needed, especially in the line companies, a closer cooperation between the supply officer of the regiment and the various kitchens of the organization. In some cases the food was delivered all right to the kitchens, but the proper guide was not furnished the kitchen authorities, so that the food did not reach the men in action. At one regimental food dump visited by our field party, food was piled in equal numbers of supplies regardless of the number of men in each company to be fed. Also the division of rations was

not plainly separated, so that one organization did not know which was their share or where their share left off. No regimental issue slips were signed or given out at this particular regiment. Nevertheless the men in the Twenty-sixth Division did not go hungry after obtaining their objective in this particular drive on the German trenches, because vast quantities of German foodstuffs were captured, such as oatmeal, unground coffee, with roasted barley, soup cubes 2 inches square wrapped in waxed paper, wrapping paper outside. The soup cubes consisted of cooked, dried vegetables pressed together. In case of beans, the beans evidently were previously cooked, dried, then powdered and pressed into cakes. Fifteen minutes cooking, according to the label, prepared it for use. The German fresh bread was dark in color and of a sour taste and odor. The bread appeared to be made of rye and graham flour, loaves being about 14 inches long and 6 inches in diameter, weight between 2 and 3 pounds per loaf. The hard bread was in small cubes about three-

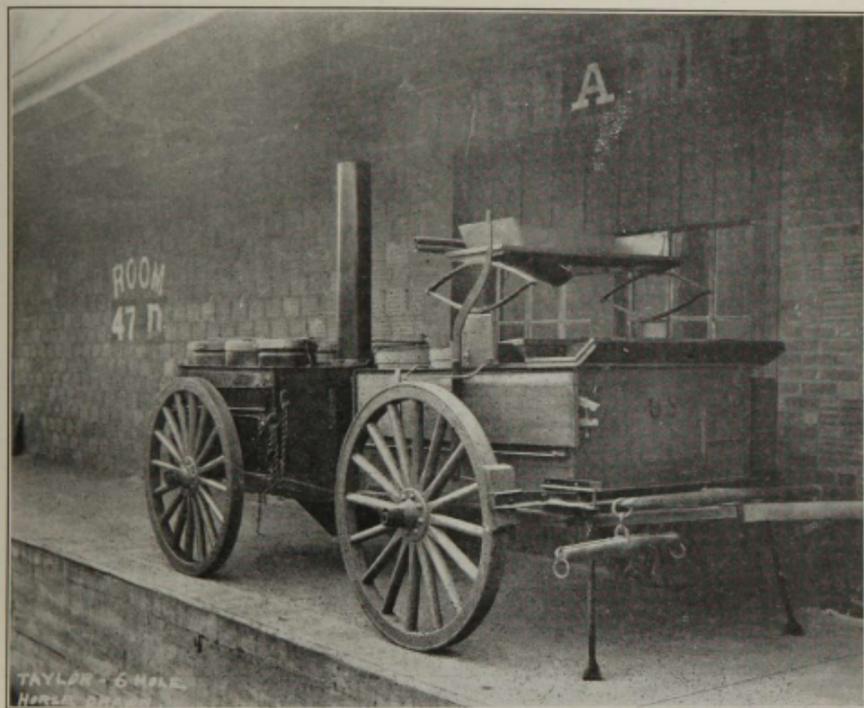


FIG. 45.—The Taylor rolling kitchen No. 30

quarter inch long and one-half inch wide, slightly sweetened and of delicious taste. The Americans also captured and consumed a considerable amount of German canned beef, many barrels of Boche beer, condiments such as dill pickles, sour kraut, and other German food.

Found by inquiry that two days' reserve had been issued for each man of reserve rations and that one day's reserve and two days' field was in the field train and the two days' field was held by the quartermaster. From the talk of the Infantry at the front the day before the drive started I judged that a great many men discarded their two days' reserve so as to be able to travel faster and not be hampered with any "unnecessary" equipment. The day after the advance started the division quartermaster moved the ration dump up to the town on the old line; from there the supply officer sent out trucks to the advanced troops. So rapid was the advance that the supply officer could only designate to the driver the distri-

bution of the rations in the most general terms; they had completely lost liaison with their organizations, and it seemed highly improbable that the ration trucks would find and deliver the rations to the unit for whom they were intended. The congestion of all the main roads was very bad, the rations were delayed 8 to 10 hours between the railhead and the divisional dump with other traffic. On every side I saw rolling kitchens doing splendid work feeding whatever troops were in the vicinity. Field ranges were also hastily set up and in use, but it seemed to me that the rolling kitchen was by far the most practicable and serviceable method of feeding troops. With the congestion of traffic on the roads that seems inevitable during a rapid advance, it would seem necessary for organizations to depend for a few days on their reserve and field rations carried by the men and the field trains. Conditions of



FIG. 46.—The Liberty rolling kitchen, four-hole, animal-drawn

traffic and poor liaison are such as to indicate that supplies sent from the railhead or divisional dumps would not reach the troops for which they are designated for several days.

Food conditions during the Meuse-Argonne operation.—In spite of frequent movements, the railhead and supply train have been functioning admirably though under great difficulties; there is not a full quota of trucks, and since the recent advances the ration dump had to be changed frequently. In spite of this the food has always been on hand, distributed to the supply companies of the regiments and by them to the kitchens. The rations were unloaded at the railhead, through it to the ration dump, and from there distributed to the kitchens. The kitchens were all together. They should be kept together, at least for a battalion. * * * In this way the kitchens would not become lost, as has happened more than once.

On the first troop movement one regiment did not carry their rations with them as they were instructed, and so were without food. Again, this has been a common difficulty. For three days of the advance most of the men were not receiving any hot food; the kitchens had it and cooked it but were unable to find the men to deliver it to. Now that the conditions have become more normal this is being overcome and all are fed.

Practically all the kitchens of the combat units have been seen at least once during the week, but owing to their constantly changing status and the similarity of conditions found it is useless to report on the individual mess. All are using the French type of rolling kitchen with four large boilers and a front or carrying part holding six insulated containers. When the battalions are in support and reserve the men eat at the kitchens; when in the front line the food is carried in the containers to the men. Most of the organizations now in the front can receive food only at night. They eat two meals a day, and the food has been ample for

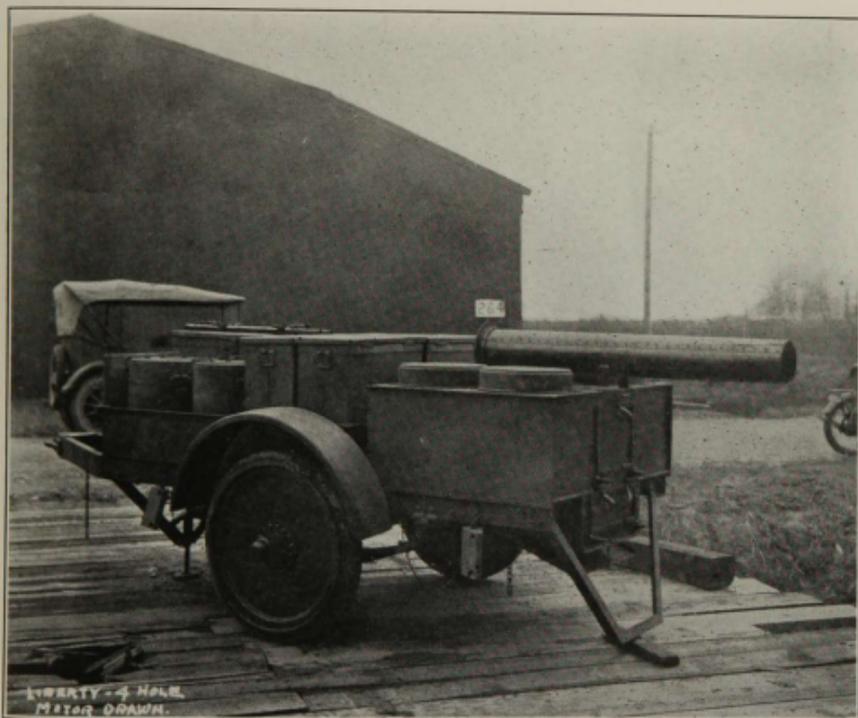


FIG. 47.—The Liberty rolling kitchen, four-hole, motor-driven

these two meals. There has been an occasional shortage of some articles of the ration, due to the fact that it had not been received at the railhead, but on the whole the men fared very well. When in reserve the companies have access to the rolling sales commissary where they buy oatmeal, jam, etc. One trouble in the front is the shortage of water, and particularly for this reason it is hard to utilize dehydrated vegetables; fortunately fresh vegetables have been issued frequently during the past week. It is only possible to use a small amount of flour for gravies in this type of kitchen.

Due to the difficulties of the attack and progress afterwards (shell fire, bombing, rain, etc.) it was practically impossible to get any food forward for nearly 36 hours—that is, late on the afternoon of the 27th of September (the attack commenced at 5.30 a. m. on the 26th) when wagons were pushed ahead with corned beef, baked beans, hard bread, and jam. Due to the crowded conditions of the roads, filled with ammunition trucks, advancing

artillery and ambulances, no rolling kitchens could be carried forward for some time. It became necessary for the men to subsist on what they could get, and as most of the soldiers, as before stated, had eaten the entire reserve, they were hungry before food could arrive. As the attack gradually developed into an enemy retreat, order began to come out of the first few chaotic days, the roads were rapidly repaired and within four days rations were going forward quite regularly—canned meats, potatoes, beans, coffee, milk, etc. No fresh beef and no bacon were received until the division was withdrawn, when the beef component arrived, but bacon was not received by the division until late in November, nearly two months.

Kitchens were placed in any shielded location available. The military phase of these movements were preparations for a surprise attack. Men were bivouacked in the forest of Hesse—under cover, all smoke was avoided—all lights at night were carefully covered.



FIG. 48.—Kitchen of Company A, 126th Infantry Regiment, 32d Division

Usually cooking was done in late afternoon and the food sent forward in marmites. Some kitchens were 2 km. from the organizations, others closer, while one kitchen was located in a cave within 500 m. of the trench. Rolling kitchens had been supplied by this time—but most cooks preferred to set up and use the field range. The food offered little variety—dehydrated vegetables, corned beef, bread, jam, dried fruit, and coffee—these were the chief items.

A rendezvous for supplies, a reserve dump, was built up. This was used, when the attack began, as a dump from which fighting units could be fed. In sending out food from here little system prevailed. Beans in 11½-ounce cans, corned beef and hash in pound tins, and hard bread in 8-ounce packages were the chief items. These were loaded into ration wagons, hauled forward and distributed wherever hungry men could be found. Due to the roads and shell fire it was impossible for these wagons to advance nearer than 4 km. from the fighting line.

During this time considerable attention was given to the reserve rations on each man, it being desired that no man go over the top without the reserve. One of the striking things about the American soldier is his utter disregard for the future, as shown by the avidity with which he will eat a two days' ration for lunch on the first day, throw away his slicker the minute the sun appears, chuck his blankets when going gets hard, and then go hungry, cold, and wet, and cheerfully blame the whole affair on some one else.

There is an increasing laxness since coming to the front in regard to the use of the two days' reserve ration carried by the men. Many will eat it on any pretense, others throw it away immediately, and most pack it in their rolls instead of in their haversacks, and so again it may be lost. In this connection it is noted that a too large percentage of hard bread issued before leaving the rest areas was wet; it is now moldy and consequently useless.



FIG. 49.—Hidden kitchen, 101st Infantry Regiment, Bois de la Voisogne, France

Food as it is eaten by the men is in many cases unsatisfactory and in amount insufficient to maintain health and morale. There is widespread and just complaint about the food by the men, particularly during the time they occupy the trenches.

All systems now in use go to pieces when armies are engaged in active artillery warfare.

From the nutritional point of view it is an interesting fact that men under actual combat conditions, such as in the Meuse-Argonne operation, when it was not possible for kitchens to be brought up, and only one meal a day was supplied, did not complain seriously about being undernourished. This may be ascribed in part to the splendid morale of the American soldier, though from a physiological standpoint it does a healthy man no harm to go for four or five days without food. However, these circumstances of rapid advance and intensive open fighting were only in evidence during the Meuse-Argonne operation, and the actual time spent under these conditions was short and unimportant from the physiological standpoint.²⁶

THE IDEAL FIELD RATION

The problem of the field ration has three aspects: Physiological, psychological, and practical. This subdivision is not absolute, since each subject has ramifications with every other, and overshadowing all this is the question of transportation. The ideal field ration, then, is one which meets all the physiological needs of the body, with no great excess to become a burden on transportation; which is always satisfactory to the soldier's palate and taste, an obviously unattainable ideal; and which permits of ready transportation, in proper sized containers, with good keeping qualities.²⁶

Physiologically, it is relatively easy to lay down a ration. To meet the demands of the average soldier the ration must deliver not less than 3,500 calories, or, allowing for unavoidable losses, it should contain in gross about 4,000 calories with a standard distribution of the elements. Because of its high heat value per unit of weight it is well to have a high fat content. This fact accounts for the popularity of bacon as a regular component of the field ration. Hard bread, like bacon, is classed as a concentrated food, having a caloric value of about 100 calories per ounce. Hard bread, to be satisfactory in the field, must be in tin or some other form of container which will protect it from the wear and tear and action of the elements. By using 16 ounces of hard bread and 10 ounces of bacon it is possible to give the soldier 90 grams of protein with 3,600 calories per day, with a total weight of only 1¾ pounds, whereas the garrison ration, delivering about 4,400 calories, weighs approximately 4½ pounds. The possibility of getting a ration which is too salty and too dry should be avoided, for both will lead to high water consumption, and when an army is operating in a new country without complete knowledge of water sources the practice of drinking at every well or spring becomes a dangerous one. For this reason, corned beef, with its high salt content, should be used very sparingly in the field, especially during operations. In general, the physiological problems are not difficult, it is only the solving of the physiological questions in their relations to the important practical considerations involved that the real complexity of the situation becomes fully apparent.²⁶

Perhaps of equal importance in selecting a ration is the question of psychology. Upon watching troops under all conditions of warfare it becomes clear that no other single factor is so important as diet in maintaining or destroying army morale. Especially is this true in an army composed of men recently drawn from civil life, as our armies usually are. In combat, field operations, or advanced rest areas, where it is impossible to give the soldier much amusement, food becomes an increasingly important factor. For this reason, if the ration is to fulfill its function completely, it must serve not only the body needs of the soldier, but satisfy the palate as well. During front-line duty it was always possible to determine the strong and the weak organizations by visiting the kitchens. Nor can these problems be controlled solely by the officer in command of the organization. General headquarters must have a willingness to meet every reasonable request from the combat divisions, and should give careful attention to the character and variety of the food which is going forward. Some items should always reach the fighting soldier even at the cost of other components of recognized value. Candy should go to these troops at all times;

it is quite remarkable to see the influence of candy on a division which has subsisted for 30 days or more on coffee, sugar, frozen beef, low-grade war bread, and potatoes. Another item is tobacco. Though the amount is small, still it is an important item in keeping the soldier contented.²⁶

In practice the feeding of an army in action becomes eventually a problem in transportation, and any attempt to build a satisfactory ration must give due regard to this circumstance. The size and character of food containers must receive careful thought, and a wise selection in this respect may be quite as important as the question of what they shall hold. Shape, size, and material bear quite important relations to the transportation available and to the type of pack to be used. As to material, fiber may be developed in the future, but up to the present time nothing better than tin has been found in spite of certain disadvantages. The square or oblong container certainly packs more readily, but such containers were impossible to obtain in quantity during the World War because American firms had dies and machinery mainly for the manufacture of round cans.²⁶

The devising of a ration can not be accomplished in an office miles from an organization to be fed, nor can a ration be laid down in Army Regulations which will always suit every condition encountered in the field. The prescribed field ration should be a highly flexible schedule based on (a) intelligent reports from the organization by an officer especially qualified to advise regarding the needs after he knows the transportation situation, the climatic conditions, the character of future movements, the dietary habits of the command, and the status of the local food supplies; and (b) close cooperation on the part of those in charge of supplies in the rear, on the assumption that the officer with a combat division probably knows more about the existing conditions forward than the supply officer in the rear.²⁶

NUTRITIONAL CONDITIONS IN HOSPITALS

For various reasons it was thought best that the nutritional officers for hospitals should be assigned directly to the hospital division of the Medical Department in the American Expeditionary Forces. Recommendations could then be made directly to authorities who had the power of immediate action, rather than through the less direct channels that would be necessary if the nutrition officers acted for a coordinate division. This arrangement worked out most happily. Investigation by the section of food and nutrition was almost without exception confined to base hospitals, or to evacuation hospitals acting as base hospitals, because (a) the entire time of the single officer assigned to this work was not even sufficient to visit all base hospitals, and (b) the camp hospitals, which served under the immediate supervision of the section surgeons, usually were taken care of by the nutritional officer assigned to the respective sections.³¹

In general, it was the plan of the nutritional officer to remain with the organizations being studied for a period of time sufficient to enable him to become familiar with the problems and possibilities confronting the mess officer concerned, and to submit recommendations only after this survey was completed, although minor suggestions often were made in a casual manner

during the course of the visit. At the conclusion of the visit it was the custom to have a conference with the commanding officer of the organization, usually in conjunction with his mess officer, and at this time to discuss the important recommendations, which were submitted in writing. The finance and accounting division of the chief surgeon's office, American Expeditionary Forces, had inspectors in the field, who were very helpful to the mess officers in establishing a proper system of accounting. It was not necessary, therefore, for the nutritional officer to touch this phase of administration. His work was confined to what may be called the practical activities of the mess organization.³¹

The recommendations made covered such points as systems of service; protection of patients during meal hours or while waiting in line; waste and its prevention; sanitation of food, kitchens, mess halls, and storerooms; adequate dish washing; delivery of food to the ward and serving in the ward; menus and menu writing. Recommendations dealt not only with the patients' dietary but also, when necessary, with the subsistence of duty officers, nurses, and enlisted personnel of the Medical Department. The functions of the several members of the mess force and the efficient organization thereof were outlined when it was thought that such action would be helpful.³¹

SPECIAL PROBLEMS REGARDING BREAD; MEAT; RATIONS FOR LABOR TROOPS AND PRISONERS OF WAR; FOOD WORK IN OCCUPIED TERRITORY

MOLDING OF BREAD

General conditions which led to an investigation of the bread supply have been outlined above (p. 708). Following the development of mold in bread shipped to the front in the summer of 1918, the first studies undertaken by the food and nutrition section, office of surgeon general, American Expeditionary Forces, were conducted at the central Medical Department laboratory, Dijon, with a view to determining such points as what molds were present, the temperature of baking and its effect upon the mold growth. In general the aim was to determine the source of infection. It soon became evident, however, that a much more comprehensive study would be necessary, and to this end an officer of the food and nutrition section was brought from our laboratory in Paris and assigned to this specific investigation. After a preliminary inspection of the bakeries at Dijon he submitted findings as follows:³²

In accordance with verbal request that observations be made of the preparation of Army bread with the object of noting possible lines of experimentation, July 13, 14, 15, and 16 were spent in an inspection of the bakeries at Longvic.

From these inspections the following information bearing on bread quality was gathered:

(a) The bread formula is—

Flour.....	pounds..	257	156	100
Water.....	gallons..	17½	10¾	7
Salt.....	pounds..	5	3	2
Yeast.....	pounds (livres)..	1½	1	⅝
Sugar.....	pounds..	3¼	2	2

(b) The dough is set at approximately 89° F. This varies with the time and with atmospheric conditions.

(c) The dough is extremely stiff and very difficult to mix thoroughly.

(d) The average time of fermentation is 5 hours. The first punch is at about 3½ hours, the second at 4½ hours, and the scaling at 5 hours. No proofing is given the loaves other than the time (about 10 minutes) required to scale all the loaves.

(e) The loaf is scaled to $13\frac{1}{2}$ pounds, which should give a 12-pound loaf after 24 hours. It is difficult to handle this quantity of dough and mold it tightly.

(f) The bread is baked for $1\frac{1}{2}$ hours.

(g) The bread after baking is immediately placed on cooling racks, where it is allowed to remain at least 24 hours.

(h) The bread is sacked in jute bags, 5 loaves per bag, for shipment. The jute bags have a strong odor, characteristic of this article.

(i) The quality of the loaf as regards external appearance varied greatly from company to company, and also from one batch to another by the same company. This variation extended from apparently whole surfaced loaves to those manifestly too split to stand long shipping. Some burned bread was also noted.

(j) The yeast is the compressed product of Springer & Co., Maison-Alfort, France.



FIG. 50.—A field bakery, producing 12-pound loaves of bread

(k) The flour varies in grade and miller. Blending is resorted to where necessary, the proportion being ascertained by a preliminary trial of half of each variety. The blending is done at the time of weighing out the flour for the run. In most companies and sections the flour is sifted.

As a result of his observations and other information, it was suggested by the officer making the investigation that the following subjects were of sufficient practical importance to warrant special study at this time:³²

(a) The availability and suitability of dried yeast; (b) the influence of varying hydrogen ion concentration on the quality of field bread; (c) the best size and shape of the loaf for field bread; (d) the most desirable temperature and time for baking a 12-pound loaf; (e) the optimum period for cooling bread before sacking and shipping; (f) the most suitable container for shipping bread; (g) the use of higher milled wheat or foreign cereals in the bread formula.

In regard to these problems the following suggestions were made by the officer detailed on this study:²⁶

The availability and suitability of dried yeast.—The present source of yeast is Springer & Co., Maison-Alfort, France. Its quality is excellent. However, the proximity of this establishment to Paris and the possibility of a breakdown at any time would make it desirable that another source of yeast be available. In lieu of compressed yeast, other ferments can be made by each bakery company; good results can be obtained from these, but their use is troublesome and may be uncertain. Another source of ferment is dried yeast, of which several varieties are on the market. The American product consists of about 30 per cent yeast, mixed with a varying substratum. The potency of such yeast is very variable and does not usually persist longer than three months.

Another form of dried yeast is prepared by Springer & Co. This product, "Sicca," is the desiccated form of ordinary yeast. The manufacturers claim that this product retains its activity for more than a year. The difficulty with dried yeast is its slowness of action, when used in a straight dough. The usual directions call for a sponge dough. This latter method has had many distinct advantages, but is not advisable for present field conditions. It would seem highly desirable that a study be made of dried yeasts, with a view to determining the best conditions for their use under field conditions. The preliminary study can be carried out in a laboratory. Later tests should be made in a field bakery to verify laboratory findings. The index of yeast activity would be the rate of gas evolution from a sugar solution properly reinforced with yeast nutrient. The apparatus required is simple and likely to be found in stock at the central Medical Department laboratory.

Before undertaking this study, the available supply of this product should be ascertained, for it is manifestly of no immediate value to experiment with this yeast, unless a sufficient quantity can be obtained. Similar experiments should be conducted with American or British dried yeast.

The influence of hydrogen ion concentration on the quality of field bread.—The work of Jesson-Hansen has demonstrated that for every flour there exists an optimum hydrogen ion concentration for loaf quality. It should clearly be borne in mind that maximum size of loaf is one of the most desirable qualities in commercial bread; but it is not desired at the present time in Army bread. Size of volume is to be ascribed to gluten quality and quantity. Since a change of hydrogen ion concentration affects loaf volume, it is probable that gluten quality is also changed. Whether an increase in gluten strength, without permitting a corresponding increase in loaf volume, would produce a loaf that would have better shipping qualities is a question of some practical value. Improved internal loaf qualities, such as flavor, texture, and color, are not to be expected as long as the loaf is not permitted to attain its maximum size.

An investigation of this kind would involve the determination of the hydrogen ion concentration of a water extract of the flour and the addition to the flour of a substance (probably lactic acid) in varying amounts, with a subsequent determination of the hydrogen ion concentration. Baking tests would be made with these different flours. The hydrogen ion concentration could be determined colorimetrically using Lubs and Clark's series of indicators. Bakery tests could be conducted in a field bakery.

The best size and shape of loaf for field bread.—The present 12-pound loaf is a very difficult one to mold, to bake, and to handle. It would seem desirable to prepare loaves of different size and shape, using (a) the present bread mixture and (b) other bread formulas, with a view to ascertaining the most suitable size and shape loaf commensurate with loaf quality at the time the bread is to be consumed. This work would have to be done at a field bakery.

The temperature and time for baking a 12-pound loaf.—The present practice is to bake a 12-pound loaf for 1½ hours. In view of the required 14 runs a day, the ovens are used to maximum capacity. Good oven practice utilizes a higher temperature at the beginning of the baking, and a lower temperature toward the end; however, demands for quantity seriously interfere with this method, since no time is allowed between bakings for reheating the ovens. This necessitates an excessive heating at the end of a run in anticipation of the new run. A consequence of this system is the uneven heating of the bread,

causing strains and cracking, together with a too rapid baking of the outside and too little baking of the interior of the loaf. It may be of interest to determine whether a longer time and a cooler oven would produce a better baked loaf that would not be so likely to crack. For this work the services of a field bakery would be required.

The most desirable time of cooling the bread before sacking and shipping.—The necessity of a loaf being thoroughly cooled and dried out before shipping is universally recognized. The present practice of cooling 24 hours is undoubtedly arbitrary. It may be that a longer cooling would be advantageous. The experimental procedure would involve moisture determinations of portions of loaves after various periods of cooling. The loaves would necessarily have to come from the same run of one oven.

The most suitable container for shipping bread.—The present methods of shipping bread cause a considerable reduction in loaf quality. Many of the best properties of good flour and a good loaf are suppressed because of present shipping methods. The practices of the large American bakeries, where a light, spongy bread of good eating quality is shipped hundreds of miles, might be well considered in connection with the furnishing of a high quality bread to the soldiers of the American Expeditionary Force. Bread forms such an important item in the diet that a study of the best means of transporting a loaf of superior quality might well be given first consideration in any extended investigation of field bread.

The present bread, while it may meet shipping requirements, can not be classed as the best product obtainable from the excellent raw materials. Examination of the bread formula shows that a stiff dough is used, having an absorption of 56. In fact, the composition of the mix is such that it is very difficult to make a thoroughly mixed dough. Since the human element enters so largely into the mixing of the dough, it should not be surprising to find doughs insufficiently mixed. This condition is increased by the inconvenience of 13½-pound loaf in the sealing. Such a mass of dough is hard to handle; yet it is highly important that the molding be done carefully, to avoid split loaves. A smaller loaf and a slacker dough would permit of better mixing of the batch and of greater efficiency in handling the product. These conditions could probably be met by a change in the method of shipping.

The use of higher milled wheat or foreign cereals in field bread.—Advocates of higher milled wheat have claimed, among others, the following advantages for bread made from such flour: (a) A loaf which does not dry out so quickly; (b) a loaf which shows less tendency to mold; (c) a loaf which does not crumble so readily as does the bread made from 70 per cent flour.

The disadvantages of 80 per cent or 85 per cent flour are the darker color, the smaller loaf, and the markedly laxative effect. Since, at the present time, maximum loaf volume is suppressed, there would seem to be little ground for objection on the score of size of loaf. Practical considerations would militate against the shipping of a highly milled wheat to France, owing to the readiness with which this product spoils. A basis of exchange with either the French military or civil authorities might be arranged, in the event that an addition of higher milled flour would be considered desirable.

The proportion of 85 per cent flour to be added would have to be determined by experimentation and by practical considerations of supply. As regards food value, a difference of opinion prevails. But this should not be a matter of extreme importance, since the amount of 85 per cent flour added would probably not raise the extraction of the total more than 3 or 4 per cent.

Among other cereals that might be added to wheat flour, two have practical value for the present problem, viz, corn and oats. Each of these had been used as part substitutes for civilian war bread. Each reduces loaf volume. This need be no objection, as pointed out above, since the gluten of the flour now is not utilized to its fullest power. Ten per cent of these cereals may produce a more desirable bread, with regard to drying out, crumbliness, and ability to stand rough usage.

Experience of others would indicate that the cooked cereal is better than the uncooked. This would have to be tried out experimentally. Objections to the cooked cereal on the score of extra labor can probably be overcome should it appear that the cooked cereal was more desirable.

In carrying out all or many parts of the above program, the use of a field bakery would be required. This would include not only a field oven and a baker who could operate the same, but also the services of an experienced baker who could mix and mold doughs and who could offer advice along the practical side of bread making.

Subsequent to this report the following program was arranged as being of immediate value to the Army: (a) Study of the composition of the dough; (b) study of the optimum time and temperature for baking a 12-pound loaf; (c) study of the most desirable weight and shape of loaf; (d) study of the adequacy of present methods for cooling; (e) study of the suitability of dried yeast for field bread.

On August 10, 1918, a preliminary report was made to the chief quartermaster, American Expeditionary Forces, in the following letters.²

To the Chief Quartermaster (letter of August 10, 1918):

1. As you are aware, this office has for some time been attempting to aid in solving the problem of moldy bread so general in the American Expeditionary Forces. One of the officers of the food and nutrition section, Capt. David Klein, who has had considerable experience in French bakeries in Paris, has, during the last two weeks, been engaged in the study of the question at the bakery in Dijon, and while his experiments on the question of moldy bread have not been completed, it seems very probable that the main cause for the mold is in the long transportation in insufficiently ventilated cars from the bakery to the railheads. The observations of others of our officers at the railheads indicate that frequently six, eight, or nine days elapse after the bread is baked before it is received at the railhead. During this time, except for the 24 hours of cooling, the bread is inclosed in sacks piled tightly in unventilated cars, in which condition the sacks and crust become moist, and this is optimum for the development of mold.

The means of avoiding this difficulty appear to be great shortening of the time the bread is in transit or in providing better ventilation during the transit so as to avoid the accumulation of moisture,

2. We believe that one reason why the French have less trouble with moldy bread than we do is that their bakeries are nearer the troops, the transportation shorter, the loaves smaller and round, making tight packing impossible, and, being unsacked, the drying out is not retarded.

3. I inclose herewith a report from Captain Klein embodying suggestions from his experience.

4. In order to reach a solution of the problem as quickly as possible I suggest that wholesale experiments be tried—first, that for a period of a week or ten days all bread shipped to troops at the front be unsacked and stored in the cars in such a way as to provide maximum ventilation.

From the standpoint of sanitation we recognize that this suggestion is somewhat undesirable; active efforts will be necessary to see that the bread is handled in a reasonably sanitary manner. The loss of bread at the present time, due to mold, is very serious, not only from the standpoint of waste, but in loss to the men who need it for food.

5. If you approve of the suggestions above we shall be glad to continue our study of the question at the bakery as well as to have our officers in the field report on conditions there so as to keep closely in touch with the results of this change in procedure.

6. I had a short conference with Colonel Dietrick, and it is my impression that the above suggestions are in accordance with his ideas.

AUGUST 10, 1918.

From: David Klein, captain, Sanitary Corps, N. A.

To: P. A. Shaffer, major, Sanitary Corps, N. A.

Subject: Preliminary report on moldy bread.

1. Preliminary results of the investigation now in progress on the reduction of moldy bread would indicate that improved conditions might be expected from the following changes in transportation:

(a) The shipping of unsacked bread.

(b) The providing of as much ventilation as is possible during transit and in storage.

2. The evidence upon which the above conclusions are based is briefly the following:

(a) Bread exposed to good ventilation did not mold, whereas bread of the same batch placed in a warm, closed box molds rapidly.

(b) Freshly cut surfaces of bread exposed to air dry out and do not mold, while cut surfaces of bread of the same batch butted against each other are prone to mold.

(c) Bread placed unsacked in a closed space retains its original hard crust to a very much greater degree than sacked bread stored under similar conditions. Sacked bread becomes soft in a few days.

(d) The areas of mold found were practically all of surface origin, where the source of infection was easily ascertained. In 2 cases out of more than 40 samples of bread intentionally permitted to mold small colonies were found a little removed from surface contact. In no case was undoubted internal molding observed.

(e) The bread shipped to Maily from Longvic is and has been unsacked. The bread is apparently received in a sound condition. Moldy bread was encountered at Maily when the bread was shipped in sacks. (This information was obtained from Lieutenant Feger, Q. M. C., and enlisted men packing the cars at Longvic.)

3. Five shipments aggregating 2,700 pounds of bread have been made to Fontaine in the regular cars sent to that railhead. This experimental bread has been shipped sacked and unsacked in various parts of the car in relation to ventilation. Reports have not been received to date.

4. Shipping tests on a larger scale would be of more value; if authorization could be had for the shipping of unsacked bread, loaded with a view to maximum ventilation, to railheads and organizations from which reliable reports can be obtained, information could be gathered in a short time on the merits of unsacked bread.

5. The apparent inconvenience of handling unsacked bread at the railhead and beyond should not militate against the tests suggested in paragraph 4. For if it should appear that unsacked bread possesses marked advantages over sacked bread, practical means should be devised for the expeditious handling of the bread after its delivery to the railhead.

Memorandum:

AMERICAN EXPEDITIONARY FORCES, OFFICE OF THE CHIEF SURGEON,
DIVISION OF LABORATORIES AND INFECTIOUS DISEASES,
FOOD AND NUTRITION SECTION,

August 4, 1918.

To Captain WARD, Q. M.:

1. The following arrangements concerning the food section, the bakery, and the regulating officer have been completed:

(a) Captain Klein at the bakery is to prepare experimental bread for shipment to first-line troops. For the present these shipments will be made to the 29th Division only, the method of shipment and making of the bread to be determined by Captain Klein.

(b) On each day that shipment is made notification is to be given to the regulating officer of the nature of the shipment, the method of marking, etc. It is suggested that, subject to your approval, this information be supplied to your office each day by Captain Klein and embodied in your daily telephone report to Is-sur-Tille. Lieutenant Rainey at Is-sur-Tille has been designated to take charge of the matter there.

(c) Lieutenant Rainey will personally notify the railhead officer and the division quartermaster of the disposition to be made of the bread sent and will receive the reports on the bread, which will be collected and sent to the food section.

(d) We will greatly appreciate your personal criticism and judgment upon the results obtained and will see that you are provided with copies of the reports for this purpose.

EXPERIMENTAL BREAD REPORT

(This report to be filled out and returned to the officer in charge of the railhead.)

Loaf number

Date received by the organization

Date served to the men

Condition of the loaf as received ("Yes" or "No" after each question):

Was it broken?

Was it soggy?

Was it moldy?

Condition of the loaf when served to the men: ("Yes" or "No" after each question):

Was it moldy?

Was it soggy?

Was it crumbly?

Was its flavor good?

Was it dry to the taste?

Write here your opinion of the loaf:

Name

Rank

Organization

With the approval of the chief quartermaster, American Expeditionary Forces, the nutritional officer continued his studies, including a series of shipping experiments in which the regulating station at Is-sur-Tille, the bakery at Dijon, and the 29th Division, occupying the Belfort sector, cooperated. The combined reports on laboratory tests, shipping tests, etc., are as follows:³²

American Expeditionary Forces, Office of Chief Surgeon,
Division of Laboratories and Infectious Diseases,
Food and Nutrition Section, A. P. O. 721,
August 28, 1918.

From: David Klein, captain, Sanitary Corps.

To: P. A. Shaffer, major, Sanitary Corps.

Subject: Moldy bread.

1. The appended report represents the practical bakery work and the laboratory tests conducted at Longvic and the central Medical Department laboratory, July 28 to August 19, 1918.

2. The results of this work are as follows:

(a) The source of mold in bread is external, not internal. Except under the rare condition of large, unmixed masses of flour inside the loaf, all mold in the baking materials is killed during the baking process.

(b) Sogginess, lack of proof, the use of young doughs, are not the direct causes of mold. In so far as they prevent the loss of moisture during baking and in storage, they contribute to the rapidity with which bread will mold.

(c) Well raised, sufficiently baked loaves kept in cooling racks at Longvic or at the laboratory became moldy after 9 or 10 days. Four-pound loaves do not seem to resist mold any better than 12-pound loaves, becoming moldy in 7 days. However, the rapidity of molding will vary with conditions of humidity, temperature, and storage.

(d) Sacking of bread increases the susceptibility to mold in that the crust of the bread becomes moist through lack of ventilation.

(e) It is possible to produce bread of good quality, with full age and ample proof, that will have all the requisite qualities for transportation either sacked or unsacked. Fourteen runs of such bread may be made daily with no additional equipment, as detailed in the appended report.

(f) After the first day a 12-pound loaf loses in weight on the average 2 ounces daily for the next 4 days. After that the rate becomes decidedly less. For 4-pound loaves, the rate of loss of weight after the first day is 1 ounce per day for the next 3 days, after which the rate is about one-half ounce per day. Proportionately, a 12-pound loaf would be more palatable than the 4-pound after 6 days, though in no way less likely to mold.

(g) More effective drying out of the bread can be obtained by a few minutes additional baking than by an additional day of storage in the cooling racks. For a well-proofed 12-pound loaf, 1 hour 35 minutes to 1 hour 40 minutes at the proper temperature will give a thoroughly baked loaf, with a thick crust that will stand shipment. A loaf having a minimum height of 5 inches is of good quality and can be shipped if the crust is thick enough.

3. Efforts to prevent moldy bread may be classed under the two general heads:

(a) Reduction of initial mold contamination.

(b) Reduction of rate of propagation of mold.

There seem to be no practical methods to accomplish the reduction of initial mold contamination in a field bakery.

The chief factors in mold growth are time and moisture.

Time.—It appears that the time interval before the appearance of appreciable mold is about five or six days, under favorable conditions. This may be extended by proper control of ventilation. If, therefore, the bread could be served to the men not later than six days after it is baked, there should not be encountered any large percentage of moldy bread. The practical means of reducing the time before the bread is consumed were not within the scope of this investigation.

Moisture is essential to rapid mold growth. The dry crust of bread is an unfavorable medium for rapid propagation. Any circumstance which permits of an increase of moisture on the surface of the bread increases the likelihood of the bread becoming moldy. The shipping of bread in unventilated or insufficiently ventilated cars is a condition of very first importance in causing moldy bread. The use of sacks as a cover for the loaves that are shipped in insufficiently ventilated cars greatly increases the tendency to mold, because of the water-absorbing power of the sacks, and also because the sacks seriously interfere with the adequate ventilation of the bread. The possibility of the sacks being a source of mold contamination will be considered in a later report.

During periods of rainy weather or of high humidity there will probably be more moldy bread than during seasons of dry weather. Considerable moldy bread may be expected during the coming fall, unless ventilation conditions during transportation (as well as time) are modified.

4. *Loaf quality.*—The use of young doughs and no proof in pan are exceedingly detrimental to loaf quality and contribute nothing to shipping quality or to mold resistance. A mature dough with plenty of pan proof, baked for 1 hour and 35 minutes at the right temperature, will give a thick, crusted, well-baked loaf.

A formula which has given good results is 16 pounds flour, $10\frac{1}{2}$ gallons water, 3 pounds 3 ounces sugar, 16 ounces yeast. The first punch is made when the dough is mature ($4\frac{1}{2}$ –5 hours). A second punch is made 1 hour after the first. The dough is taken 20 minutes later. The loaves are allowed to prove about 20 minutes before flattening them. They are given about 45 minutes proof.

The methods by which the above results were obtained were as follows: ²²

REPORT OF BREAD STUDIES, WITH REFERENCE TO ITS MOLD-RESISTING PROPERTIES

I. THE SOURCE OF THE MOLD IN BREAD

(a) A 4-pound loaf of bread was placed in sterile cotton directly from the oven. More cotton was wrapped around the first, and the loaf was placed in a sterile pail in an incubator at 35° C. for six days. The seventh day the pail was at room temperature.

The loaf was examined at the end of seven days. There was no mold either on the surface or in the bread, as determined by careful inspection with a hand lens.

(b) Twelve-pound loaves were made out of slack dough and stiff dough, taking the dough when young and also mature, with no proof and full proof in the pan; thus eight different breads were obtained. A section of every kind was placed in a sterile jar under the

following conditions: With anhydrous calcium chloride with 10 c. c. sterile water, with no addition. The 24 jars were placed in an incubator at 37° C. for five days. The sections in the jars with calcium chloride were not moldy either externally or internally. They had dried out a great deal. The sections in the jars alone or with sterile water were moldy on the surface but internally they were not moldy.

(c) During the course of the bread experiments more than 75 loaves were examined for mold. In all the loaves that were moldy most of the growth was near the crust and could be readily traced as of external origin. In a few cases deeper areas were found whose origin may not have been external. In no case was isolated mold found in the center of the loaves where favorable moisture conditions prevail.

The preponderance of evidence warrants the conclusion that the mold is a result of external infection of the loaves in most cases; while internal infection is not excluded as a possibility, its occurrence may be regarded as very rare.



FIG. 51.—A field bakery, producing the smaller, 4-pound, loaves of bread

II. THE RELATION OF LOAF QUALITY TO SUSCEPTIBILITY TO MOLD

In these experiments two doughs were used having the following formulas:

	Series I	Series II
Flour.....	138 pounds.....	139 pounds.
Water.....	9 gallons 2½ quarts.....	9 gallons.
Salt.....	2 pounds 12 ounces.....	2 pounds 12 ounces.
Sugar.....	2 pounds 12 ounces.....	2 pounds 12 ounces.
Yeast.....	14 ounces.....	14 ounces.

Series I is a medium slack dough, while that of Series II is about as stiff as that usually prepared at Longvic.

From each dough four different breads were made, as follows:

Designation	First punch	Second punch	Scaled	Proved	Baked
a.....	3½ hours.....	4½ hours.....	4 hours 50 minutes.....	0.....	6 hours 20 minutes.
b.....	3½ hours.....	4½ hours.....	4 hours 50 minutes.....	5 hours 30 minutes.....	7 hours.
c.....	4¼ hours.....	5¼ hours.....	6¼ hours.....	0.....	7¼ hours.
d.....	4¼ hours.....	5¼ hours.....	6¼ hours.....	7 hours.....	8½ hours.

The difference in loaf quality was very marked. The unproofed loaves were decidedly soggy and were not baked through. The loaves were smaller than the proofed ones (as was to be expected), thus causing the crumb to be too compact and not agreeable to the palate. The proofed young dough did not produce as good bread as the proofed mature doughs.

Sample loaves were stored in the baking tent for one day; then in a wooden cooling house. No marked difference could be found in the time in which the various breads became moldy. There was an individual variation between loaves of the same series, but, on the average, all series showed moldy bread after nine days.

III. LOAF VOLUME AND SHIPPING QUALITY

Reports on 39 loaves of unsacked bread, representing 14 different doughs, and shipped on 5 different days to Fontaine, indicate that unsacked bread made from mature doughs with long proof in pan can be transported without being broken. In no case was a loaf reported as being damaged when received.

The maximum height of these loaves was 5 inches. There appears to be no basis in fact for the feeling that a loaf must be very compact to permit of its being shipped. A firm crust is the determining factor.

As for the general loaf quality, such as appearance, palatability, completeness of baking, the proofed, mature loaf is vastly superior to the the unproofed or young doughs. A repression of the inherent desirable qualities of high-grade flour has no compensating advantage in the finished loaf.

IV. A TIME SCHEDULE FOR MATURE DOUGHS

The demand for bread is so great that the maximum output must be obtained daily. The factors governing output are oven capacity and time of baking. An oven will hold 18 pans. When 12-pound loaves are made the yield per batch per oven is 216 pounds. If 4-pound loaves are made the yield will be 144 pounds. For properly baked 12-pound loaves the time should not be less than 1 hour and 35 minutes. On the basis of 14 bakings a day, this allows 8 minutes for emptying and refilling.

All other operations are therefore governed by this interval of 1 hour and 43 minutes. In other words, a new dough should be mixed every 1 hour and 43 minutes. However, the time a particular dough stands before going to the oven is subject to wide choice. All that is required is the proper interval for the first 14 runs. The following schedule demonstrates that 14 runs can be made each day for bread made from a mature dough with plenty of proof in pan:

Mixed	First punch	Second punch	Scaled	Proved	Baked
6.15	11.00	12.00	12.30	1.30	3.05
7.58	12.43	1.43	2.13	3.13	4.48
9.41	2.26	3.26	3.56	4.56	6.31
11.24	4.09	5.09	5.39	6.39	8.14
1.07	5.52	6.52	7.22	8.22	9.57
2.50	7.35	8.35	9.05	10.05	11.40
4.33	9.18	10.18	10.48	11.48	1.23
6.16	11.01	12.01	12.31	1.31	3.06
7.59	12.44	1.44	2.14	3.14	4.49
9.42	2.27	3.27	3.57	4.57	6.32
11.25	4.10	5.10	5.40	6.40	8.15
1.08	5.53	6.53	7.23	8.23	9.58
2.51	7.36	8.36	9.06	10.06	11.41
4.33	9.18	10.18	10.48	11.48	1.23

It is clearly recognized that such a variable product as dough can not be made rigorously on any schedule, if uniformity of output is the criterion. However, with a long fer-

mentation period, more leeway is permitted for the qualification of the irregularities which always will occur. Certainly a better, more uniform product, can be expected.

V. LOSS OF WEIGHT DURING STORAGE

At various times, the question has been raised of sufficient cooling before shipping. Thus it has been felt by some that 48 hours would be a more desirable time than 24 hours. To gain definite information on the losses that occur after baking, data were collected over a considerable period of time on many loaves of bread of varying quality.

In the following tables the loaf numbers refer to individual loaves of different bakings.

Series	First punch	Proof	Total time of fermentation
1a.....	3½ hours.....	None.....	5 hours.....
1b.....	3½ hours.....	40 minutes.....	5 hours, 40 minutes.....
1c.....	4½ hours.....	None.....	6 hours.....
1d.....	4½ hours.....	40 minutes.....	6 hours, 40 minutes.....
2a.....	3½ hours.....	None.....	5 hours.....
2b.....	3½ hours.....	40 minutes.....	5 hours, 40 minutes.....
2c.....	4½ hours.....	None.....	6 hours.....
2d.....	4½ hours.....	40 minutes.....	6 hours, 40 minutes.....
3a.....	3½ hours.....	None.....	5 hours.....
3b.....	3½ hours.....	20 minutes.....	5 hours, 20 minutes.....
3c.....	4½ hours.....	None.....	6 hours.....
3d.....	4½ hours.....	20 minutes.....	6 hours, 20 minutes.....
4a.....	3½ hours.....	None.....	5 hours.....
4b.....	3½ hours.....	40 minutes.....	5 hours, 40 minutes.....
4c.....	4½ hours.....	None.....	6 hours.....
4d.....	4½ hours.....	40 minutes.....	6 hours, 40 minutes.....

Series 1a, b, c, d and 3 a, b, c, d were made from slack dough; series 2 a, b, c, d and 4 a, b, c, d from stiff dough.

The loss during the first day after baking is about 4½-5 ounces.

Assuming that the bread is eaten 7 days after baking, the loss in weight of a 12-pound loaf will not be less than 12 ounces, or 6.2 per cent. By calculation, the maximum water content of the 24-hour loaf is 35.5 per cent. After 7 days its moisture content will not be greater than 31.7 per cent. For a 4-pound loaf the loss in 7 days will not be less than 5 ounces. The moisture content of the loaf would be not more than 30 per cent.

These calculations are substantiated by practical observations. A 4-pound loaf is much drier, more cracked, and less palatable than a 12-pound loaf after 7 days. However, neither loaf can compare in palatability with a fresh one, or one not more than 3 or 4 days old.

VI. PRACTICAL SHIPPING TESTS

As part of this investigation, a number of loaves were shipped under various conditions to the Fontaine railhead. By agreement with the regulating officer at Is-sur-Tille these loaves were to be issued to different organizations, from which reports were to be had. To each loaf was tied a report blank, as per copy included with this report. The shipments made were as follows:

Date	Sacked	Unsacked	Number of different bread batches
Aug. 3.....	30	15	3
4.....	15	19	2
6.....	40	20	4
8.....	25	30	4
9.....	15	15	2
	125	99	15

An accurate record was kept of the location in the car of each loaf and its relation to ventilation. The cars varied in ventilation from practically none to a fair amount.

The returns were disappointingly incomplete. No records of the sacked bread were received, while 39 out of the 99 reports of unsacked bread were returned. However, certain points are of interest: None of the bread was moldy or broken; five loaves were reported as being soggy, although other loaves of the same batches shipped under identical conditions were reported as not being soggy. Expressions of opinions regarding the loaf as a whole were extremely divergent, and place great doubt on the reliability of certain of the reports. The general opinions of the 39 are herewith appended. The significance of the loaf numbers is this: The first number refers to the bread batch, while the second number refers to the particular loaf of that batch. Eighteen loaves were baked at one time, from one dough, and represent the same batch number. Reports on loaves 12-16, 15-5, 16-8, 17-14, 19-15, and 20-16 are from the same organization, and are the predominantly adverse criticisms; however, the complete uniformity of these reports on six different batches of bread places some doubt on their value. Owing to the incompleteness of returns, no conclusion can be reached on the moot question of sacked bread. It does seem that unsacked bread may be shipped under very adverse conditions, and yet arrive in good condition. The method of these shipping experiments is essentially sound. The amount shipped should be increased, but the great necessity is a means for obtaining reliable information at the point of consumption.

Loaf No.	Day made	Shipped days after baking	Received days after baking	Eaten days after baking	General opinion
9-3	Aug. 1	2	6	6	The bread was not soggy and was sweeter than the others.
9-7	...do....	2	6	6	Dough was not properly kneaded before placing in pan for baking.
9-15	...do....	2	6	6	Better loaf than previously furnished.
9-12	...do....	2	6	6	The loaf was well baked and in splendid condition. The only thing desired is the maintenance of the standard submitted for the test. The loaf was used at evening mess and the men expressed their entire satisfaction.
10-6	...do....	2	6	6	Very good.
10-7	...do....	2	6	7	Do.
10-17	...do....	2	6	6	When cut, it all crumbles up.
11-7	Aug. 2	1	5	6	It is much better than hard-bread but not to be compared with fresh bread.
11-12	...do....	1	5	6	A good loaf of bread.
12-6	Aug. 3	1	6	7	This bread was satisfactory.
12-16	...do....	1	5	6	Dough not properly leavened. Interior of loaf not sufficiently baked
13-9	...do....	1	5	5	This bread was very much the same as the loaf of Aug. 7, 1918 (9-3)
13-14	...do....	1	5	5	This bread was very good in every respect.
13-16	...do....	1	5	6	Good bread. A better loaf than 11-12 issued previous day.
13-8	...do....	1	5	6	Excellent.
14-16	Aug. 4	2	6	6	Loaf very good in every respect, except not tasty. (Probably due to absence of salt.)
14-13	...do....	2	6	7	Better than any bread received.
15-3	...do....	2	5	6	The loaf had a sour taste.
15-5	...do....	2	5	5	Not properly leavened. Inside of loaf not well baked.
15-18	...do....	2	5	5	Best received to date.
16-2	Aug. 5	1	4	4	In my opinion it was an A. No. 1 loaf of bread. The exterior surface was entirely free from the ordinary cracks which permit mold to work in. If the bread could be maintained at this standard there would be no complaint.
16-3	...do....	1	5	6	Not properly leavened. Inside of loaf not sufficiently baked.
16-3	...do....	1	4	4	Very soggy and not as good as the bread we have been getting. Has a baking-powder flavor.

The results of the investigation of the dried yeast are embodied in the following report:³²

1. Pursuant to the request of the chief of bakeries, A. E. F., a study has been made of the possible use of "Sicca," a dried yeast, as the leavening agent in the preparation of Army bread, where conditions of transportation, storage, or ease of handling render the use of fresh yeast either impossible or undesirable.

2. Personal interview with the producers of this yeast, Springer & Company, Maison-Alfort (Seine) resulted in obtaining this information:

The dried yeast is the same product as the fresh yeast now used by the American Army, but abnormally activated before drying. This activation is accomplished by permitting the compressed yeast to ferment in a sugar solution while air is blown through the liquid. After the proper time, the yeast is again compressed, forced through a macaroni press and dried in a current of air, on iron trays. The drying process lasts about 36 hours, varying with the humidity and temperature of the external air. A little more than three pounds of compressed yeast are used in making one pound of dried yeast.

The present output could be 50 or 75 kilos daily. Never having worked the plant to capacity, the man in charge was not sure just how much he could put out daily. From an inspection of the plant I was impressed with the primitive design of certain parts, especially the drying system. It seems altogether likely that a much more efficient drier could be readily installed, resulting in a greatly increased output. A shortening of the drying process would probably prevent the loss in fermenting power that now occurs during the long period of drying. If the present method of bread making is to prevail, that is, 8 ounces of yeast to 1,296 pounds of bread, 50 kilos of dried yeast should produce 580,000 pounds of bread (assuming that the dried yeast is twice as strong as the fresh variety).

4. The quantity of "Sicca" now available is 20 kilos, which was made last February. The manufacturers have promised to test out the strength of this product. If it is satisfactory, the dried yeast will be subjected to a large-scale test. (See par. 6.)

5. A small sample of the product made last February came into my hands at the time of my work with Professor Lapique in Paris. Recently, its fermenting value was determined in comparison with the fresh product furnished to the bakeries at Dijon. The dried product readily absorbs water and disperses itself, forming a mass similar to the fresh yeast. The fermenting action on sugar solution of the former is very slow at first. However, the action increases, so that after four hours in a 5 per cent sugar solution, the fermenting rate of both products is about the same, using twice the quantity of fresh yeast as of dried yeast. Under the conditions of the experiments, there was no complicating factor of yeast multiplication.

6. Based upon the laboratory tests of paragraph 5, a bakery trial was made of the dried product, using 8 ounces instead of the usual 16 ounces of fresh yeast. The dried yeast was allowed to stand in a dilute sugar solution for four hours. After that time a straight dough was made. The fermentation of the dough proceeded normally; the bread was no different from that made with moist yeast.

7. The manufacturers indicated certain needs in preparing "Sicca," such as sugar and tin containers. These matters as well as the cost of the product were not entered into, as being subjects for consideration by the Quartermaster Corps.

8. It is my opinion that "Sicca" is a dried yeast of excellent keeping quality, of value not less than twice that of fresh yeast. It should be of value under the conditions in paragraph 1.

The work of comparison of French bread with our loaf was also undertaken by the nutritional officer, the results of this investigation being as follows:³²

1. From time to time the opinion has been expressed that the bread furnished to the French Army is of better keeping quality and generally more desirable than our Army bread.

2. The tests described in detail in the appended report show that French military bread, when kept under good storage conditions, will mold in at least 12 days, if not before. In this respect it is not clearly or decidedly superior to our Army bread.

3. French bread after a few days acquires a very hard crust, that makes the cutting of the loaf difficult, and which would render the bread useless under food customs prevailing in the American Army.

4. French military bread dries out at a much slower rate than American bread. In 15 days the loss for 2-pound 8-ounce loaves was 7.6 per cent, while the 4-pound American loaves lost 7.8 per cent in 7 days. This is probably due to the very much thicker crust of the French bread. Yet the American loaf is moister to the taste and more palatable after 10 days.

5. In my opinion, no great advantages are to be expected either in reduction of mold or general keeping qualities, by imitating the style of the French military loaf.

KEEPING QUALITIES OF FRENCH MILITARY BREAD

On September 21, 1918, there were obtained from the French station-magasin of Dijon, six loaves of military bread. These loaves were picked at random from the cooling racks. They had been baked on September 20 from a flour mixture consisting of 75 per cent American flour, 15 per cent rice, and 10 per cent corn. No yeast was used in the process, but the leaven-

ing agent was a portion of one of the previous doughs. The French are emphatic in their belief that bread made with yeast does not keep as well as bread made with sour sponge.

These six loaves were brought to the central medical laboratory where they were placed on a table in the laboratory of the food and nutrition section. Loaves designated as Nos. 1, 2, and 3 were laid flat, while Nos. 4, 5 and 6 were placed on end. The loaves were weighed at various intervals. The losses in weight are given in the following table:

Date	Weight of loaf, in grams						Weather conditions
	1	2	3	4	5	6	
Sept. 21.....	1,245	1,226	1,258	1,165	1,162	1,290	Rainy or very humid.
23.....	1,242	1,226	1,247	1,163	1,157	1,281	Do.
24.....	1,238	1,226	1,241	1,162	1,155	1,260	Do.
30.....	1,227	1,218	1,229	1,153	1,147	.....	Partly Clear.
Oct. 1.....	1,189	1,185	1,185	1,115	1,106	.....	Fair weather.
2.....	1,182	1,177	1,176	1,106	1,096	.....	Do.
3.....	1,174	1,173	1,170	1,098	1,089	.....	Do.
4.....	1,167	1,165	1,160	1,090	.....	.....	Do.
5.....	1,171	1,159	1,154	1,084	.....	.....	Do.
7.....	1,157	1,153	1,148	1,074	.....	.....	Do.
8.....	1,147	1,146	.....	.....	.....	.....	.....

Of interest and practical significance is the slight loss in weight of the loaves between September 21 and 24. This is clearly to be attributed to the humidity of the atmosphere. If thorough cooling and drying of the bread are important factors in the subsequent keeping qualities of the loaf (the French are very insistent on these points) it is evident that during rainy weather a much longer time must be allowed before shipping the bread, since there may be no drying out, or even an absorption of water by the loaf. Too great emphasis can not be placed on the adequate aeration of the loaves on the cooling racks.

On October 2, loaf No. 6 (12 days old) was cut open; there was considerable mold on the inside. On October 4, loaf No. 5 (14 days old) was examined; some small areas of green mold were found near the outer edge. Loaf No. 3 was examined October 5 (15 days old); external mold in cracks and on bottom of loaf, and green mold inside. Loaf No. 2 was examined October 7 (17 days old); external mold and considerable green mold inside. Loaves No. 4 and No. 1 were examined October 8 (18 days old); considerable green mold inside both loaves.

In all cases the loaves had very thick, tough crusts, which made any kind of cutting of the loaves a matter of great physical strength. Slicing the loaves in the sense of prevalent American practice was out of the question. The loaves were also brittle and broke unevenly when being cut. The texture of the loaves was characteristically French; i. e., large and small holes unevenly distributed, quite the opposite of the texture sought after in the American loaf.

It is apparent that all the loaves, beginning with the first one cut open in 12 days, were moldy. How many days before this the loaves began to mold can not be definitely stated; but from the nature and rapidity of mold growth it is safe to assume 2 days; hence, it would appear that the samples of French bread stored under laboratory conditions molded in about 10 to 12 days. Previous tests with American bread under similar conditions of storage (excepting weather) gave results of about the same period before mold set in.

As far as these tests go, there appears to be no very marked superiority in mold-resisting properties of bread made by the French sponge process, or that made by the American yeast method. Certainly the American style loaf is much more suited to the requirements of the American Army than is the French loaf.

The practical results of these studies were a return to the 4-pound loaf and a beginning of plans for bringing bakeries nearer to the front lines. As in many other instances, the armistice and the return to billeting areas ended the problem and made further study unnecessary. However, one improvement,

initiated by the Quartermaster Corps, American Expeditionary Forces, at the suggestion of the food and nutrition section, American Expeditionary Forces, was the use of a paster attached to the bottom of each loaf, giving the source and date of baking; by instructing officers of the division to embody this information in their reports of mold, specific derelictions and unnecessary delay in transportation could be immediately detected.³²

MEAT

Beef was shipped frozen from the United States, and at St. Nazaire, France, was loaded into insulated cars for transfer to refreezing plants at Dijon, Gevres, or elsewhere. From these points it was sent by ordinary box car to the separate organizations as rapidly as possible. Because of delays in transit, however, there was considerable opportunity for partial thawing and surface decomposition. Improper treatment by organizations resulted in still further deterioration; sanitary inspectors called in to pass on such meat made wholesale condemnations resulting in loss of large quantities of valuable food.³²

The attention of the section of food and nutrition was first called to the matter when several thousand dollars worth of beef was returned to Dijon as unfit for consumption. Examination of this material at Dijon, even after the delay and expense of return shipment, showed that proper trimming would render nearly three-quarters of it serviceable; actually one-half was saved by having a force of butchers salvage the good material.³²

The outstanding fact at this time was the necessity for prompt action if future shipments were to be saved. To this end a campaign was organized by the section of food and nutrition. As the first step there was assigned to the section by the Quartermaster Department a certain number of trained butchers who were sent with nutritional officers to organizations where trouble was noted. The regulating station at Is-sur-Tille cooperated in this matter and gave information as to where action was necessary, and later, when field parties were organized by the food and nutrition section, a butcher was made a part of the personnel of such parties.³²

The following report indicates the sort of follow-up work performed at request of the regulating station in this particular:³²

From: Capt. Walter H. Eddy, Sanitary Corps, N. A.

To: Maj. P. A. Shaffer, Sanitary Corps, N. A.

Subject: Report of trip in accordance with S. O. 73, paragraph 1.

1. In accordance with S. O. 73, paragraph 1, and at the request of regulating officer, I proceeded on June 23 and 24 to Sorcy to investigate meat conditions there. In this trip I visited the supply officer at Sorcy and the kitchen at that place, also the camps of the 23d Engineers (Captain Ellis) and Company A of the 21st Engineers at Rangenvil and the Mobile Hospital No. 39 at Vertuzzey. These latter were visited at the request of the supply officer to give special instruction to medical officers there on the conservation of beef and incidentally to obtain information as to food difficulties.

2. *At Sorcy.*—No trouble with beef since June 16. Previous to that trouble was from bad beef refrozen at Dijon and from too sweeping condemnation of beef rather than attempt to salvage it. Met the beef that day. Arrived in excellent condition, still frozen. Opened up two quarters in the adjoining kitchen and tested and demonstrated its proper handling. Found bread O. K. recently, no mold, some breakage. Found some sour figs here. Also

found some British jam in paper cartons in bad shape. At request of Captain Lightner, supply officer, went on to medical officers who had condemned most beef and incidentally followed ration train to dump.

3. *At Hospital No. 39, Yale Unit.*—Lieutenant Streeter, supply officer and medical inspector. In addition to demonstrating proper beef handling, received complaint of difficulty in obtaining hospital food supplies. Requested memo. specifying details which is to be sent in.

4. *At Camp, 23d Engineers.*—Took up matter of beef with Captain McLaughlin, medical officer, and he states that he will be personally responsible for proper beef handling by medical officers of the 23d Engineers hereafter.

5. *At Company A, 21st Engineers.*—Went into matter of proper meat handling in detail with Lieutenant Gifford, medical officer and company commander. Also discussed at some length the question of a proper ration for labor troops. The 21st are railway construction and the 23d highway construction units for this section.

6. Captain Lightner has promised to assemble and forward to us directly such data as he can collect on ration needs as they appear at that section of the advance, and especially the needs of labor troops.

The second step was to reach the sanitary inspectors. Personal visits did this in part only, and in order to reach all the officers concerned the following instructions were prepared by the food and nutrition section and inserted in the Weekly Bulletin of Disease, No. 16, as issued by the chief surgeon's office, American Expeditionary Forces:

Whenever a quarter of beef is suspected of taint, first thoroughly wash the quarter with brine, examine the exposed surfaces, and if these are tainted cut off such portions as are affected. If the covered surfaces seem to be affected, have the butcher remove the covering tissue, taking care not to cut into the flesh. Do not condemn any part of the beef until these preliminary steps have been taken.

To determine whether decay has started within the beef, introduce a probe at the shoulder and hip joints; by the smell at the end of the probe you can determine whether the joints are affected or not. If they are affected dissect out the bone and trim away the adjacent meat until a sound layer is reached. In no instance is it desirable or necessary to slash the quarter, the object being removal of affected parts with as little waste as possible.

To prevent flyblow, make sure that fly eggs are immediately washed off when the beef arrives. These are usually found on the shank.

The following methods are recommended for the best care of frozen beef:

It is better to hang beef in an airy, well-ventilated place out of the direct rays of the sun rather than to store it in damp, dug-out refrigerators. Meat safes, covered with cheesecloth to exclude flies and with free access of air, will protect the beef for several days if it is wiped as frequently as moisture accumulates on the surface.

If it is necessary to retain cut-up beef for more than 24 hours it may be placed in a container and covered with brine, but in cutting up beef require the butcher to first remove any tainted outer skin before he cuts into the meat; this avoids the carrying of the decayed portion into the sound meat.

In some places such safes can be constructed in the sides of the Adrian barracks, in others they have been erected in sheltered places out of the sun and near the kitchen. The cheesecloth that comes around the beef can be used to exclude flies. The main object is to keep the beef surface dry and with a free current of air passing over it.

Another method of reaching sanitary inspectors was through lecture and instruction to the students of the Army sanitary school, Langres. The instruction by field parties soon produced effect, and the frozen beef problem may be said to have been fully solved.³² The following order shows how line organizations took up the matter:

HEADQUARTERS, U. S. TROOPS, A. P. O. 172,

August 16, 1918.

General Orders, No. 44.

1. All mess officers, mess sergeants and cooks will be governed by the following regulations in handling fresh beef at this station.

2. Each mess hall will be provided with a frame sufficiently large and strong enough to contain suspended from a cross beam, from meat hooks, the necessary meat to supply the demands for 24 hours. The meat will be so hung that it will not touch the frame, and the frame is to be covered with burlap or some sanitary covering that will prevent flies, etc., from getting to the meat. The meat upon arriving at the kitchen will be immediately unwrapped, burlap and gauze removed, and hung in the frame as directed so as to defrost naturally. Under no circumstances must meat be permitted to lie around where flies will be able to get to it.

3. In case an oversupply of meat is on hand and it is seen that it will spoil before it can be consumed, it must be cut in small pieces and placed in a strong salt brine, in a wood keg, or crockery, and under no circumstances in zinc or tin, the brine to be sufficiently strong to float an egg. Meat thus handled may be preserved for several days and can be used for hash, stews, or hamburger, or soaked and cooked in the ordinary way. If the brine becomes ropy and slimy, remove the meat and wash it thoroughly and make a new brine. This condition is sometimes caused by brine kept in too high a temperature.

4. Meat shall not be ground for hamburger more than two hours before using. Meat to be used one day must not be prepared on the previous day.

5. Meat sweating in defrosting should be thoroughly wiped two or three times daily and in case of odor in or around flanks of skirt it should be wiped with a salt bath. Do not put too much water upon the meat until it is to be prepared for cooking.

6. Frozen meat will not be cooked except in cases of emergency and when it is absolutely necessary.

7. Not more than 24 hours supply of fresh beef will be on hand in a kitchen at one time if it is practical to receive meat daily.

8. If in doubt as to the proper method of handling meats apply to the C. O. of Butchery Company No. 301. He will supply upon request, a butcher who will instruct mess attendants in properly cutting and caring for meats.

9. Meats will be kept as far from the ranges and in as cool a spot as possible. Nothing with an odor that would be likely to taint the meat, such as onions, etc., will be kept near it. By order of Colonel Farmer.

JOHN W. HALL,
1st Lt. Cav., U. S. N. G.,
Ass't. Adjutant.

NOTE.—This order will be posted in all kitchens.

RATIONS FOR LABOR TROOPS

Previous to the organization of the food and nutrition section, office of Surgeon General, American Expeditionary Forces, the chief quartermaster, American Expeditionary Forces, had increased the ration allowances to the extent of 5, 10, and 15 per cent for troops working over 8, 9, or 10 hours, respectively, and to the extent of 33 per cent for stevedores.³² This action in many instances was unnecessary and resulted in food waste. In view of the fact that the garrison ration when fully issued provided sufficient protein, fat,

carbohydrates, salts, and food accessories (having a total fuel value of over 4,200 calories, as compared with the 3,500 calories of British line of communications ration and the 3,400 calories of the French ration) and for other reasons based on observation of the messes concerned, it appeared desirable to exercise a better control over such increases for labor troops. To accomplish this there was inserted in General Orders, No. 176, G. H. Q., A. E. F., 1918, the following paragraph:

3. The chief quartermaster, A. E. F., is authorized to grant such increase in ration, or to make such modification of the ration, allowed to troops not serving in front-line sectors who are engaged in hard labor for long periods as he may consider necessary; provided that the cost of the ration as increased or modified may not exceed the value of the garrison ration by more than 10 per cent and that cash savings will not be paid. The need for such additional allowances or modifications will be investigated by the director of laboratories, food and nutrition section, Medical Department, who will report the findings with recommendations to the chief quartermaster.

The inclusion of this statement within the ration order was somewhat unfortunate because it stimulated many organizations to demand increases that would otherwise never have been thought of and for which no real need existed. On the other hand, it rendered investigation necessary before increased issue, and thereby safeguarded against waste. In carrying out the provisions of this paragraph, members of the food and nutrition section studied the messes of nearly 300 organizations. In the original plans it was assumed that the organizations requiring increases would fall into a few groups and that the recommendations for increases would be few. It soon appeared, however, that this was not the case and, while the food and nutrition section endeavored to develop a system which should be as general as possible, the variations necessary to meet actual needs caused comment from the office of the chief quartermaster, American Expeditionary Forces. The following correspondence illustrates chronologically the problems as they arose:

AMERICAN EXPEDITIONARY FORCES, OFFICE OF THE CHIEF SURGEON,
DIVISION OF LABORATORIES AND INFECTIOUS DISEASES, A. P. O. 721,
November 18, 1918.

From: Office of director of laboratories, A. E. F., food and nutrition section.

To: The chief quartermaster, American Expeditionary Forces.

Subject: Additional ration allowances.

1. Referring to the letter of the chief quartermaster, under date of October 11, copy attached, and to the procedure to be followed in the investigation of requests for additional ration allowances, we inclose herewith a copy of a letter being sent to officers of the food and nutrition section in the intermediate and base sections.

2. We realize fully the importance of simple and uniform schedules for granting additional ration allowances, and we have attempted to keep in mind the conditions emphasized in the above letter. You will note that of the six recommendations made so far on old rations, two have involved no increase, one an increase of 10 per cent of 5 components. These recommendations are in keeping with the former schedule of 5 per cent, 10 per cent, and 15 per cent, except that the recommendations have been limited to the components thought to be necessary in the particular cases.

3. Would the following plan be feasible? That where investigation shows it to be desirable we be authorized to recommend the following schedules:

(1) That the organization be allowed to draw no less than 80 per cent straight garrison ration, and in lieu of the remaining 20 per cent to draw any amounts of any ration components or substitutes of a total money value not exceeding the rations not drawn; no cash saving being allowed and no articles other than ration components or substitutes being issued under this plan.

(2) That 5 per cent additional rations, 105 per cent, be authorized to be drawn as above provided.

(3) That 10 per cent additional rations, 110 per cent, be authorized to be drawn as above provided.

4. This plan would permit organizations needing more bread or vegetables or dried fruit, for instance, to obtain them at the expense of meat or other vegetables or articles, and would, we think, provide in the most economical way for these organizations which need additional food allowances. The plan would, of course, involve more accounting, but would meet the demand which is often expressed for a measure of the freedom of choice enjoyed in the home camps.

5. If the above seems to you impracticable we shall prepare detailed schedules as suggested in your letter.

At the same time the following instructions were sent to the officers of the food and nutrition section:

FOOD AND NUTRITION SECTION,
November 13, 1918.

From: Office of director of laboratories, A. E. F., food and nutrition section.

Subject: Instructions to officers of the food and nutrition section.

1. It is apparent that a considerable number of requests for investigation of special food requirements as provided in G. O. 176 will be made by labor organizations within the Services of Supply. The following procedure is suggested:

Obtain from depot quartermasters a list of all organizations which were allowed during the month of October, 1918, additional ration allowances, and the reason for the allowance. It is likely that among these organizations will be some which will request extension of the allowance.

The modifications of the ration provided in G. O. 176 will, it is believed, result in a net-increase of the garrison ration, since the amount of surplus fat has been reduced and replaced by other material which will be eaten rather than destroyed or sent to salvage. In view of these changes, it is hoped that the present garrison ration will be found ample, even for troops engaged for long periods at hard labor. In order to determine whether or not this expectation is to be realized, it is desired that additional food allowance be not recommended until the organization has subsisted on the new ration for a reasonable period and has learned to administer it with the greatest possible economy.

When organization commanders consult officers of the food and nutrition section in regard to additional food allowances, they should be informed that requests must be made through military channels, to the chief quartermaster, A. E. F., and that a formal investigation of their requests can not be made until after the trial of the new ration referred to above.

During such trial period our officers should give close attention to these messes and make every effort to accomplish such improvements in their operation as may make additional allowances no longer necessary. They will impress upon organization commanders the importance of food conservation and the necessity of full compliance with G. O. 70, G. H. Q.

When a formal request for an investigation is referred to you for report it is suggested that you proceed according to the plan outlined in Office Letter 20. Reports will be transmitted through this office.

Whenever there is waste of edible food which can be avoided by the efforts of the commanding officer or his subordinates, applications for additional allowances should not be approved.

2. It is possible that even with most careful administration there will be a few instances where additional food allowances, or some modifications, will be justified and necessary. It is considered essential that there be not more than two or three different schedules to meet the needs of all types of organizations, and suggestions are invited as to the best way of formulating such schedules. That is, when additional food is necessary, what components and in what amounts are considered best suited to the organizations under your observation?

It is requested that your comments be sent to this office as promptly as possible.

On this basis the investigations proceeded and the results were forwarded to the office of the chief quartermaster, American Expeditionary Forces, from time to time. On December 16, 1918, following a conference at which the representative of the Quartermaster Corps again expressed a desire for a reduction of the recommendations to a single schedule and submitted suggestions in that direction, the following letter was submitted:

DECEMBER 16, 1918.

From: Office of Director of Laboratories, A. E. F., Food and Nutrition Section.

To: The Chief Quartermaster, A. E. F. (attention Major Connatser).

Subject: Rations for labor troops.

1. In view of the fact that according to our understanding no action has yet been taken by the office of the chief quartermaster concerning additional allowances of rations to labor troops, we have taken the occasion to reconsider the matter in connection with a considerable number of applications and reports of investigations thereon which are now in this office for our recommendation.

2. We believe that the following schedule of additional allowances, which is a modification of that stated in your memorandum of December 2, 1918, if given to Major Carlson at the time of his interview with you, will meet all of the requirements. It is therefore suggested that it be adopted as "Extra ration allowance No. 1" and that it be substituted for the schedule submitted to you in our letter of December 4 concerning recommendations for extra ration allowances to the 52d Regiment, Transportation Corps, at Perigueux. The full value of the additional allowances stated below is about 380 calories, and the money value, according to our calculation, is about 4 cents.

Extra ration allowance No. 1.—Beef and its substitutes, no increase, but issued in the proportions of fresh meat, bacon, canned meats or fish, as may be desired by organization.

	Per cent increase	Ounces
Bread * and its substitutes.....	20	3. 2
Butter and its substitutes.....	100	. 5
Or jam and its substitutes.....	50	1. 5
Potatoes and their substitutes.....	10	2. 0
Coffee.....	25	. 28
Sugar: Permission to draw candy component in form of sugar, at equal weight if desired by organization.		

3. In the separate recommendations concerning individual organizations which we are sending herewith, the above schedule is referred to as "Extra ration allowance No. 1." It is hoped that there will be no occasion to recommend any other schedule than that given above.

Soon after this a representative of the food and nutrition section went to Tours for the purpose of consulting with the chief quartermaster, American Expeditionary Forces, in the hope of reaching a definite understanding. On arrival he found that the Quartermaster Department had independently adopted a schedule of increases as follows:³²

(a) For messes consisting of 75 men or less: 10 per cent increase in the bread component; 10 per cent increase in the meat component; 5 per cent increase in the vegetable component; 10 per cent increase in the coffee component; 10 per cent increase in the butter component.

(b) For messes consisting of 75 men or more: 5 per cent increase in the bread component; 5 per cent increase in the meat component; 2.5 per cent increase in the vegetable component; 5 per cent increase in the coffee component; 5 per cent increase in the butter component.

* Extra bread allowance may be drawn wholly or in part as bread or any of its substitutes, 1 ounce baking powder with each 20 ounces of flour or cornmeal.

Objections to these issues being raised by the food and nutrition representative, the chief quartermaster, American Expeditionary Forces, agreed to certain modifications but insisted on publishing the amended schedule in accordance with the authority given him by General Orders, No. 176, G. H. Q., A. E. F., 1918. On return of the officer representing the section of food and nutrition, a letter, setting forth the views of the Medical Department, was submitted, which, together with the reply of the chief quartermaster, American Expeditionary Forces, is as follows:

DECEMBER 23, 1918.

From: Director of Laboratories, Food and Nutrition Section.

To: The Chief Quartermaster, attention of Major Connatser.

Subject: Ration allowance to labor troops.

1. In spite of the conference by Major Carlson, and more recently Captain Eddy of this office, with you, concerning the action on ration allowance for labor troops, the status of the matter is not wholly clear.

General Orders No. 176, paragraph 3, gives the chief quartermaster authority to modify or increase rations for labor troops, this office only investigating the need for additional allowances or modifications and making recommendations to the chief quartermaster. This provision was proposed by us only as a measure for the conservation of food.

2. You will recall that previous to November 1, 1918, a scale of 5, 10, and 15 per cent of the whole ration was allowed by the chief quartermaster to troops working over 8, 9, and 10 hours, respectively.

After we had made several different recommendations for different organizations, we were requested by Colonel Crusan, in a letter of October 11, to modify the old schedules if desired, but saying that not more than three scales could be allowed, and that a simple and uniform treatment was essential. After extended inquiry through our officers in the sections of the Services of Supply and after a proposal in letter of November 16, to which we received no reply, we proposed a single scale on December 4 and modified it in our letter of December 16. The last proposal was as follows:

Extra ration allowance No. 1.—Beef and its substitutes, no increase, but issued in the proportion of fresh meat, bacon, canned meats or fish as may be desired by organizations.

	Per cent increase	Ounces
Bread ^a and its substitutes.....	20	3.2
Butter and its substitutes.....	100	.5
Or jam and its substitutes.....	50	1.5
Potatoes and their substitutes.....	10	2.0
Coffee.....	25	.28

Sugar: Permission to draw candy component in form of sugar, at equal weight, if desired by organization.

This has a fuel value of about 380 calories, or 9.3 per cent of the ration, and a cost of about 4 cents, with variation in both values, depending upon the proportion of substitutes issued.

Following this we received a copy of your letter of December 17 (430.2-3) to the quartermaster, Bordeaux, granting the following very different scale for the 52d Regiment, Transportation Corps, at Perigueux: (a) For messes consisting of 75 men or less, 10 per cent increase in the bread component; 10 per cent increase in the meat component; 5 per cent increase in the vegetable component; 10 per cent increase in the coffee component; 10 per cent increase in the butter component.

(b) For messes consisting of 75 men or more, 5 per cent increase in the bread component 5 per cent increase in the meat component; 2½ per cent increase in the vegetable component; 5 per cent increase in the coffee component; 5 per cent increase in the butter component. "A" is equivalent to about 267 calories, or 6.5 per cent of the ration, and "B" to 133 calories, or 3.3 per cent of the ration.

^a Extra bread allowance may be drawn wholly or in part as bread or any of the substitutes; 1 ounce baking powder with each 20 ounces of flour or cornmeal.

In your conference with Captain Eddy on December 20 the scale discussed was: (a) For mess of 75 men or less, bread component 15 per cent; vegetable component 20 per cent; coffee component 25 per cent; butter component 50 per cent. (b) For messes larger than 75 men, one-half of (a). "A" is equivalent to 275 calories, or 6.7 per cent, and "B," which is the scale which will generally apply, is 137 calories, or 3.3 per cent of the ration.

This, as we understand, is the scale which has been granted on the recommendations sent you so far. Or is it the scale quoted above from the copy of your letter of December 17 concerning the Fifty-second Regiment, Transportation Corps, which has been adopted by your office?

We wish to make the following comments on this matter. With excellent messing administration and with a regular and complete issue of the ration—the first condition rarely exists, and the second often does not—the present ration contains enough food except for the following classes of troops during the periods of their work: Troops engaged in forestry, road construction, railway or car construction and operation. Reliable observations indicate that men engaged in such work as forestry require food equivalent to about 5,000 calories. For such troops it amounts to very little to allow them an addition of 137 calories. On the other hand, it is not practicable to determine the food needs of an organization with enough accuracy to say whether or not the men need an additional 137 calories. They will either need a good deal more or no extras at all.

It is therefore suggested that the scale you have adopted is not suited to the conditions. To reach a prompt settlement and avoid more changes than are necessary, it is recommended that your scale "A" should be applied to all troops for whom extra allowances are approved and not limited to messes under 75 men, and that your scale "B" be abandoned. If scale "A" should prove seriously inadequate, which is possible in a very few cases, further allowances can be considered later.

In view of the considerable delay which is caused by our investigation before granting requests, and because there is considerable uniformity of conditions with troops of the types above referred to, we suggest that the scale be increased, allowances adopted be made to apply to all forestry, railroad, and road-construction organizations so long as they are engaged at such labor; and that this office be informed of all organizations granted extra allowances for our later investigation and report to you.

We request that you notify us (1) of this extra-ration scale now adopted, and (2) the organizations, and their locations, to which allowed.

To this the following reply was received on December 31, 1918:

HEADQUARTERS, SERVICES OF SUPPLY,
OFFICE OF THE CHIEF QUARTERMASTER,
AMERICAN EXPEDITORY FORCES,
December 31, 1918.

From: The Chief Quartermaster, A. E. F.

To: Director of Laboratories, Medical Department, Food and Nutrition Section, Dijon.

Subject: Increase of rations.

1. Reference your letter December 23, 1918, file 430.2-2632. There were so many different recommendations received and the need for coming to a decision on some item was so pressing that this office arbitrarily made the decision following closely the increase recommended by you as extra-ration allowances No. 1, and were taken as the average of numerous recommendations received from your office.

2. We feel that this was the better method rather than to continue to search for an ideal. If 30 days' try-out proves that we have still not found the solution, please have your officers advise us and the matter will be given due consideration.

In view of the action of the chief quartermaster, officers of the food and nutrition section were instructed to continue making recommendations as heretofore, stating what was actually needed; these reports were forwarded by this office with recommendation that the quartermaster increase be granted or not granted, as the circumstances might warrant.

On January 25, 1919, the question of allowances for certain organizations was again raised by a letter from the chief quartermaster, American Expeditionary Forces, which is quoted below, together with the indorsement thereon and subsequent correspondence:

HEADQUARTERS, SERVICES OF SUPPLY,
OFFICE OF THE CHIEF QUARTERMASTER,
AMERICAN EXPEDITIONARY FORCES,
January 25, 1919.

430.2-s.

From: Chief Quartermaster, A. E. F.

To: Director of Laboratories, Medical Department (attention Food and Nutrition Section),
Dijon.

Subject: Increase in rations.

1. In connection with your recommendation that increased rations be authorized to the following remount squadrons, 316, 328, and 338, the 532d Service Labor Battalion, and Depot Labor Company No. 33, your second indorsement, January 20, 1919, file 430.2-3077, your attention is invited to your recommendations, December 28 and January 2, that no increased allowance be granted Veterinary Hospital No. 10, A. P. O. 720, although it would appear that the organizations are engaged in similar duties.

2. Your attention is further invited to recommendation for increased rations to Company B, 504th Labor Battalion, St. Blin (Haute Marne), January 19, and your recommendation that no increased rations be granted to 2d Labor Battalion, 20th Engineers, Epinal (Vosges), January 19; also your recommendation, 5th indorsement, January 17, that increased rations be granted to 75th Field Artillery doing guard dock duty at Nantes, which is a purely military duty. Paragraph 3, Section II, General Orders, No. 176, G. H. Q., A. E. F., 1918, is not authority for this office to grant increased rations to organizations performing ordinary military duty.

3. The above is brought to your attention with a view to securing uniformity in reference to increased rations. The fact that an increase has been authorized or disapproved spread among organizations very rapidly and is sure to result in a charge of favoritism unless we stick to a uniform policy as regards recommendations and approval of increases in rations.

4. We appreciate very much the assistance your office has rendered in the matter of furnishing troops of the American Expeditionary Forces satisfactory rations, and reports received from your office indicating a shortage in the ration component issue to troops, which to date appears to be the most serious complaint, have been the basis of immediate action by this office to correct same.

5. Please go over the above and give us your views concerning same.

[1st ind.]

OFFICE D. OF L., FOOD AND NUTRITION SECTION,
AMERICAN EXPEDITIONARY FORCES, A. P. O. 721,
France, January 31, 1919.

To: Office Chief Quartermaster, American E. F.

1. In reply to paragraph 1, investigation of Veterinary Hospital No. 10 showed a very poor mess administration at the time of the visit. It has been the policy of this office to require the organizations which demand increases to demonstrate the need of the increase by showing that they are properly administering the ration and that waste is low. In this case the investigator felt that at present an increase would simply increase the waste, and for that reason the increase was disapproved. Assistance was given to remedy the mess administration, and if desirable we are ready to reinvestigate this case.

2. In reply to paragraph 2, attention is called to the fact that while theoretically a given type of organization does a particular type of work, the work actually performed varies with the individual organizations. This was the case with the 20th Engineers. In the disapproved cases, while the hours of labor were maintained, the work had so slackened that the activity was much reduced, with corresponding effect upon appetite and nutritional needs. We consider that our recommendations are justified by our findings.

3. In regard to military organizations, a point is raised on which we desire information. Our attitude has become this: It is our function as advisors to the chief surgeon to investigate and recommend ration changes where organizations need such increases. In the case of the Field Artillery at Nantes, such a need does exist, and as the ration recommended by your office seems to meet the need we therefore recommend such increase. We have a number of similar cases under investigation. It is requested that these be considered on their merits without regard to the provisions laid down by your office for labor troops and that you advise us further as to the attitude of your office in this matter.

4. Our object in these investigations is identical with yours, to conserve food and at the same time meet the nutritional needs of the organization. We find it difficult to classify organizations arbitrarily, for many factors enter into the determination of the needs of the individual unit. On the other hand, we realize the administrative difficulty of individual treatment and wish to cooperate to our best ability in this direction. We therefore welcome any suggestions you may have to make relative to facilitating our common interest in the matter.

AMERICAN EXPEDITIONARY FORCES,
HEADQUARTERS SERVICES OF SUPPLY,
OFFICE OF THE CHIEF QUARTERMASTER, A. E. F.,
February 12, 1919.

From: Chief Quartermaster, A. E. F.

To: Director of Laboratories, Food and Nutrition Section, Medical Department, Dijon.

Subject: Increase in rations.

1. Referring to your first indorsement of January 31, 1919, reply to our letter 43.2-s of January 25, 1919, in connection with increase in rations, you are advised that on your recommendation increase in rations has been granted to Company B, 504th Labor Battalion and to Remount Squadrons Nos. 316, 328, and 338; also to 532d Service Labor Battalion and Depot Labor Company No. 33. In all cases copies were furnished your office.

2. As regards organizations doing purely military duty, this office is without authority to grant any increases in rations, and in the case of line organizations increases in rations can not be granted unless they are assigned to duty involving hard labor for long periods of time.

3. The increases in rations granted to date by this office have been of a uniform nature, as per copy inclosed. This increase has now been in operation for a considerable period, especially so in the case of forestry troops and Transportation Corps troops, and should your observation or that of your field officers show that same is inadequate or that the same is unsuited for the purposes for which intended, it is requested that you please furnish us with a proposed schedule of increases that would meet the average nutritional needs of organizations in need of an increase in rations, as well as the administrative difficulties to be encountered in administering same.

Following the receipt of the above letter new studies were made of certain conspicuous cases where the quartermaster increase had proved unsatisfactory, viz, among forestry troops of Base Section No. 2, the quartermaster mess at Montoir, etc., as a result of which these schedules were altered. The changing conditions of labor following the armistice made it difficult to administer the problem satisfactorily. One of the problems of the Army ration that should receive careful study for the future is the provision of suitable increases in rations for different classes of labor organizations. There are cases where no increase over the garrison ration is adequate, for example, negro troops; what is needed for them is a totally different ration based on appetite and racial characteristics.²²

AMERICAN PRISONER OF WAR RATION

At Berne, Switzerland, the American Red Cross directed the sending of food packets to American prisoners of war in Germany. The food and nutrition section, American Expeditionary Forces, was invited by the director to cooperate in determining the best content of such parcels. The following letter indicates the scope of the section's activities in this connection:

AMERICAN EXPEDITIONARY FORCES, OFFICE OF THE CHIEF SURGEON,
DIVISION OF LABORATORIES AND INFECTIOUS DISEASES,
FOOD AND NUTRITION SECTION, A. P. O. 721,
July 28, 1918.

From: The Director of Laboratories, Food and Nutrition Section.

To: Mr. Atholl McBean, director prisoner's relief, Berne, Switzerland (through Military attaché, American Embassy, Paris).

Subject: Rations for prisoners of war.

1. The military attaché of the embassy phoned to me your request that we send you at once our suggestions on the composition of food parcels sent to Americans in Germany. I am sorry that Captain Eddy's letter with his calculations had not reached you. I inclose copies of those calculations.

2. Captain Eddy and I have again gone over the matter, and I inclose a list of what seems to be a satisfactory ration for 10 days. We have tried to consider the size of packages, for this must determine to a large extent the amount of each article to be sent. We inclose a list of sizes of packages, now in France, or as we think the articles should be repacked, when necessary.

3. We have started on the assumption that it is desirable to send practically a full ration to our men, leaving them dependent upon the Germans for at most some potatoes or fresh vegetables and some bread, the articles most likely to be supplied to them. The ration proposed is equivalent to about 3,500 calories per day, which in spite of the waste always resulting from cooking or eating singly or in small groups but with small additions of potatoes, etc., will insure the maintenance of good nutrition—assuming of course almost complete delivery. The protein and fat nutrition content as well as the total calorie value is ample for moderate amounts of work.

4. The ration as issued to troops in France is now about 4,200 calories, or more in special cases. If from information at your disposal you conclude that the food parcels or any portion of them should provide full rations for men at hard labor, the contents of the parcels should be increased by about 500 calories by the addition of a suitable amount of hard bread, etc., beans, etc., fruit or sugar.

5. I would suggest that each package, and where possible succeeding packages, be varied as much as possible. Such food mixtures, with hard bread and canned goods are apt to become tiresome, but other material can not be shipped. By varying the kind of fruit and jam, the kind of candy, and the sort of sweet cakes from time to time—with the occasional addition of a bottle of pickles or perhaps lemon or lime juice (or even lemons wrapped if available, might be sent as a experiment)—would help to relieve the monotony. The last mentioned fruit juices are desirable but not necessary additions from the nutritional standpoint.

6. You will notice that we do not include bacon or fatback. Their shipment except in small cans would seem to be difficult and wasteful. The butter, milk, and canned meats contain enough fat and in a better form.

7. I would suggest that your reply cards request suggestions from the men as to changes in the packages they may wish. Such wishes when consolidated should be helpful.

8. We shall be glad to give you any information we can about the value of the food parcels or the composition of the components. Please feel at liberty to call upon us at any time.

SIZES OF INDIVIDUAL PACKAGES INCLUDED IN THE 10-DAY BOX FOR PRISONERS

- Canned roast beef, canned corn beef, canned corn-beef hash, and canned salmon, 16-ounce or 12-ounce cans.
- Canned sardines, 4-ounce cans.
- Cheese, 500 grams or 1 pound.
- Hard bread (chief quartermaster, American Expeditionary Forces, is having made in France 5½-ounce tinned packages).
- Cakes, sweet (suggest manufacture in Switzerland to be in 1-pound or ½-pound packages).
- Oatmeal (should be in 1-pound packages).
- Rice (should be in 1-pound packages).
- Tomatoes, No. 3 cans or 32 ounces. Actually No. 3 can holds about 33 ounces.
- Beans, baked, canned, in No. 1 cans (10½ ounces), or 16-ounce cans, or No. 2 cans (20 ounces).
- Peas, canned, in No. 1 cans (11 ounces), or 16-ounce cans, or No. 2 cans (20 ounces).
- Corn, canned, in No. 1 cans (11 ounces), or 16-ounce cans, or No. 2 cans (20 ounces).
- Dried fruit, if possible, should be repacked in 1½-pound packages.
- Jam, No. 1 can (14 ounces), No. 2 can (24 ounces).
- Coffee, repack in ¼-pound packages.
- Tea, if necessary, repack in ⅛-pound packages.
- Cocoa in ¼-pound packages.
- Milk in 16-ounce cans.
- Sugar, repack in 1½-pound packages.
- Butter, repack in pound paraffin cartons wrapped inside in paraffin paper.
- Soup cubes can be purchased in France; one cube, 50 grams.
- Salt, repack in ¼-pound package.
- Pepper in 2-ounce cans.
- Candy in 1-pound packages.
- Tobacco, 10-20 cigarettes or 1 ounce smoking tobacco.

Suggested ration for prisoners of war

Article	Number	Weight	Calories
Canned roast beef in 16-ounce cans	2	2 pounds	2,210
Canned corned beef in 16-ounce cans	1	1 pound	1,280
Canned corned-beef hash in 16-ounce cans	2	2 pounds	900
Canned salmon in 16-ounce cans	1	1 pound	680
Canned sardines in 4-ounce cans	2	½ pound	475
Cheese	1	½ pound	1,024
Bread, hard, 5½-ounce cans	20	6.571 pounds	10,980
Cakes, sweet, 16-ounce cans	1	1 pound	1,970
Oatmeal in 16-ounce cans	1	1 pound	1,860
Or rice in 16-ounce cans	1	1 pound	1,632
Or flour, with 1-ounce baking powder, in 16-ounce cans	1	1 pound	1,650
Beans, baked, canned, in 20-ounce cans	2	2½ pounds	1,500
Or beans, dry, in 16-ounce cans	1	1 pound	1,600
Tomatoes in 32-ounce cans	1	2 pounds	192
Peas, canned, in 20-ounce cans	1	1¼ pounds	320
Or corn, canned, in 20-ounce cans	1	1¼ pounds	570
Dried fruit in 1½-pound cans	1	1½ pounds	2,180
Or jam in 24-ounce cans	1	1½ pounds	1,410
Sugar in 1½-pound cans	1	1½ pounds	2,790
Coffee in ¼-pound cans	1	¼ pound	0
Tea in ⅛-pound cans	1	⅛ pound	0
Cocoa in ¼-pound cans	1	¼ pound	580
Milk in 16-ounce cans	1	1 pound	780
Butter in 16-ounce packages	1	1 pound	3,650
Soup cubes in 50-gram cubes	3	5.5 ounces	525
Salt in ¼-pound packages	1	¼ pound	0
Pepper in 2-ounce cans (1 in every fifth box)		2 ounces	0
Candy in 1-pound packages	1	1 pound	1,650
Or chocolate, sweet, in ½-pound packages	1	½ pound	1,400
Cigarettes			
Soap			

This represents a 10-day package with a total of about 35,000 calories, or an average of 3,500 calories per day. Approximately 130 grams protein, 115 grams fat, and 495 grams carbohydrates.

FOOD WORK IN THE OCCUPIED TERRITORY

The work of the food and nutrition section with the department of civil government in the occupied area included a thorough investigation of food conditions throughout the civil population of that territory. Details of the findings need not be gone into here; however, the following report is quoted as illustrating the nature of the findings which formed the basis for the action taken in regard to revictualing the area:³²

1. It is quite impossible at this time to present a fixed program in regard to feeding the German civil population which can be carried out with any certainty until the new harvest (September 1, 1919). The food conditions within the area are changing from day to day; new supplies arrive, other stocks are lost, this being especially true of the potatoes of this harvest, which have a great tendency to rot. Other than the broad lines laid down in the attached chart, there is no further report to make on distribution. It is essential, to insure a fair distribution, that all foods be handled by the Germans through their already established channels. Further, it seems that all goods shall be delivered to the Oberpresident on the barge at Coblenz, instead of unloading the same for him. This will save the Americans a warehouse and much labor.

2. The population of the area occupied by the Americans is 850,000 (round figures).

3. Before setting down any estimates of foods needed and reasons, it will be well to state in a broad way what the Americans hope to accomplish. To make the American position clearer, it must be borne in mind that, first, due to the low maximum prices and great demand, there has developed throughout Germany a great amount of illegal trading called "Schleichhandel." We believe that from 25 to 33 per cent of all foods have moved through this channel. Second, that there must be a great deal of food hidden away to maintain this business. Third, the present prescribed German ration is far too low to maintain health. Consequently steps must be taken to remedy all three troubles. To wait until any particular item is exhausted and then supply the same amount which the legal ration prescribes will accomplish nothing; rather it will tend to encourage hoarding. To give the civilians just what they receive now will in no way correct the deficiencies of the present diet. Following the rather broad economic and dietetic lines laid down, the Americans propose (1) to make available for the German civil population such quantities of food as will insure, taken with their present ration, a living diet; (2) to make this food available at prices so low that all can buy; and (3) to supply more especially the foods lacking in the present diet, viz, fats and meat. The availability of the recommended quantities of foreign foods will so greatly discount the present means for hoarding that many hitherto unsuspected stocks will be brought out of concealment and added to the market. This will greatly increase the total supply available for all. Collection and distribution of food will thus be made easier, prices will tend downward toward their natural level, and the present deficit of food will be met. All this will tend to establish a normal exchange of food products within the area along natural economic lines. It will be seen that this program calls for immediate deliveries of food.

4. The American area has 850,000 inhabitants. Of that number 190,000 (round) are urban. On the prescribed ration each person receives about 1,400 calories daily. In addition there are vegetables of various sorts to be had—so that there is little reason to believe that many people have to exist on the prescribed ration alone. This ration is deficient in (1) meat or protein and (2) fat and high in carbohydrate. From a food census, taken on February 1, it was found that there was on hand in the area enough food to subsist approximately 700,000 persons on the present low ration until September 1. The difference between 700,000 and 850,000 is 150,000, corresponding to the urban population. From reliable sources we have information which makes us believe that the food census taken does not represent all the food in the area; probably 75 per cent has been reported. Consequently there is, if available for sale, enough food to maintain the entire population on the low diet. It is not only impractical but impossible to get these hidden stocks except by the method outlined in paragraph 3. The Americans propose, therefore, to supply monthly, beginning

as soon as possible, enough food to make up the deficit between the poor ration now allowed and a living ration. To do this relatively greater amounts of fats and meats must be imported as well as flour and potatoes, or a potato substitute, rice. The method of arriving at the final amounts needed each month is here given:

[All figures are in grams per week]

	Present German ration	Needed	To be supplied weekly	Metric tons per month
Flour.....	1,470	2,250	780	2,830
Potatoes.....	2,300	4,000	1,500	5,750
Meat.....	200	1,000	800	3,030
Fat.....	62.5	500	437.5	1,632

It would seem that at least 5,000 tons of flour should be placed on the German market the 1st of the month in order to reduce prices and produce hidden stocks.

5. The feeding of the sick in the German rationing system is in the hands of a special bureau. Instead of allowing articles intended for the sick to be sold in the shops, this bureau maintains its own store and salesroom. It is hoped that a stock of oatmeal, imperial granum, rice, dried fruits or canned fruits, cocoa, etc., will be supplied to the area. The German authorities could then requisition from this stock. Since it is impossible to accurately estimate the needs, such a plan would be feasible. For an initial stock the following is suggested:

	Kg.		Kg.
Oatmeal.....	10,000	Dried fruits.....	^a 3,000
Rice.....	10,000	Cocoa.....	^a 1,000
Other cereals.....	10,000	Milk (condensed).....	^b 225,000

By checking the requisitions for a month a fair estimate of future needs could be made.

6. The Germans estimate that they will need 2,200 tons of oil cake for fodder for June, July, and August.

* * * * *

8. It is impossible to set a price without data. As a general principle, it might be stated that unless the price is low enough to permit of purchase by the poor, the food will never come into the hands of the people who need it most. For that reason it would seem that there would be two prices necessary: First, price at which the food is sold to the German Government; a price fixed by the current prices in the land of origin plus transportation, and second, price at which the food shall be sold—to be determined by the present maximum prices as fixed by Germany. The cost to the German Government would probably be higher than the legal selling price, but it is of prime importance that the price to the consumer be kept low enough to permit purchase by the poor; consequently, it would seem wise for the German Government to arrange to care for the loss. Since the supply allowed is to be limited, strictest measures must be taken against profiteering of any sort. The expense of getting food from the barge to the consumer must be calculated on the final cost. This office has no official data on this question, but from the statements of German officials it would seem that an average of 20 per cent added to the cost price should cover the expense.

9. The German channels of distribution should be used.

LABORATORY INSPECTION AND FOOD ANALYSIS

The inspection and chemical examination of food samples formed a part of the activities of the chemical department of the central Medical Department laboratory, Dijon, working in very close cooperation with the food and nutri-

^a Or equivalent in canned.

^b Cans.

tion section, office of the chief surgeon, American Expeditionary Forces. Thus, although the food and nutrition section possessed no laboratory of its own, it was possible to meet the requests for analysis within the scope of the laboratory at Dijon.³³ The inadequacy of this arrangement will be considered below.

The sources of the food samples may be classified roughly as follows: (a) Food and nutrition section officers doing field work; (b) medical officers; (c) Quartermaster Department; (d) organization commanders.

The chemical laboratory began work in March, 1918, and up to May 1, 1919, 595 samples of food had been examined. The following classification shows the nature of the samples:³³

Apricot conserve.....	1	Milk, evaporated.....	4
Bacon drippings.....	1	Milk, sterilized (Swiss).....	1
Bananas.....	2	Oleomargarine.....	3
Beef, fresh.....	1	Pork and beans.....	11
Blackberry jam.....	1	Peas (canned).....	1
Bread.....	6	Prune jam.....	1
Candy.....	14	Rice.....	2
Candy coloring.....	4	Salmon (canned).....	391
Corn (canned).....	1	Soup cubes.....	4
Corned beef.....	116	Smoked pork.....	1
Corned beef hash.....	2	Sugar.....	3
Cheese (canned).....	1	Sirup (table).....	1
Chili sauce.....	1	Yeast, dried.....	2
Flour.....	17		
Fish, dried.....	1	Total.....	595
Milk, fresh.....	1		

Seldom were samples accompanied by requests for specific information. On that account the chemist was obliged to exercise his own judgment as to the probable reason for the request, and to make such tests as seemed to him pertinent. Ordinarily the objects sought in the examination of a food sample were: (a) To determine its fitness as an article of food; (b) to determine its compliance with Quartermaster Department specifications; (c) to determine the quantity for ration issue; (d) to attempt to improve quality or production.³³

By far the greater number of the samples were analyzed to determine their fitness for food. Considering the enormous quantity of food produced and transported under conditions by no means favorable to the highest degree of conservation, it is not surprising that doubt often was expressed as to whether or not it was safe to issue the product to the soldier. Under ordinary circumstances and as a general proposition it would seem a safer policy to condemn all articles concerning which there is the least doubt. Circumstances, however, were by no means ordinary before the armistice began, and it was imperative to save as much food as possible, safely and legitimately. Thus the vexing question of food spoilage always was uppermost and opinions had to be rendered on border-line cases of bulged canned goods, wormy dried fruit, soft fresh meat, or salvaged products, for which no adequate basis of judgment existed. The question "When is a decomposing food dangerous to health?" is the most difficult to answer in the domain of food chemistry. The following examples illustrate the type of problem in this connection: (a) A certain

brand of pork and beans was regarded with suspicion. In some instances the cans were badly attacked; the beans were discolored and unsightly. An examination of representative cans from thousands of cases showed that the product was safe as food but of decidedly inferior quality. (b) A certain pack of condensed milk aroused suspicion because the cans were bulged; careful examination showed that the product was fit for food, the cause of the bulging having no relation to decomposition, but to poor methods in filling the cans. (c) Samples of flour, rice, and sugar were submitted to the laboratory because of their peculiar yellow color; they were found to be contaminated with cresol derivative. (d) Many samples were examined for ground glass. Certain blackberry jam samples did contain an undue amount of quartz sand, but only one sample (chewing gum) actually contained ground glass. In this case the crime was easily detected. (e) A suspicion having arisen in regard to the 1918 pack of salmon, samples of all brands on hand in the American Expeditionary Forces were submitted. There were in all 391 samples (991 cans). Of these, 37 samples were unsatisfactory. (f) Samples of rendered and clarified fats and grease waste were examined for the kitchen economics branch of the Quartermaster Corps, American Expeditionary Forces. In one instance spoiled oleomargarine had been clarified and offered for issue. It was found to be so high in free acid as to be unfit for human food.³³

Determining whether an article complied with specifications always was difficult. This was due sometimes to the nonexistence of any chemical standards in the contract, and at other times to the nonavailability of such information if it did exist. Many examples of corned beef were examined for the Quartermaster Department in an attempt to decide whether specifications were being complied with. The shipments came directly to France from South American factories. Though the beef for the most part was of good quality, some samples contained an excessive amount of salt, one brand giving 5.2 per cent as the average of tests made upon five separate cans; the best samples generally contained about 3 per cent. More than this amount is not only unnecessary but even detrimental, for corned beef containing more than 3 per cent of salt, when used by troops as an emergency ration, produces undue thirst; again, the quality of the beef is always inferior when the salt content is high. At a cost price of 40 cents per pound for corned beef, the Government actually was spending, when the salt content reached 5.2 per cent, 88 cents per hundred-weight for mineral matter which contained no nutriment and which was harmful in many respects. Definite standards should be adopted by the quartermaster limiting the salt content of corned beef to 3 per cent or even less.³³

As a basis for settlement, chemical analyses were requested of many French flours returned to the Quartermaster Department, American Expeditionary Forces, as replacement for flour previously issued to the French Government. These flours were very inferior in quality to practically all American brands (certain western soft flours being excepted). The best basis of evaluating flour being a baking test, an improvised oven was set up, and from the observations made it was possible to grade the French products on their basis of admixture with high protein American flours.³³

In connection with the inspection of candy factories operating under Quartermaster Corps supervision, samples of the finished product were submitted for analysis. In many cases modifications and improvements were suggested by these analyses. The hard candies were shown to be very high in invert sugar as the result of overcooking.

TABLE 40.—*Analyses of candies made in French factories operating under Quartermaster Department, American Expeditionary Forces, supervision*

No.	Kind	Moisture, percentage	Ash, percentage	Reducing sugar as invert, percentage	Sucrose, percentage	Citric acid, percentage	Protein, N/6.25, percentage	Fat, percentage
C-236.	Bonbons:							
	Coating	1.35	1.34	2.88	54.56			
	Filling	5.04	.39					
C-237.	Lemon drops	3.91	.13	9.00	87.37	0.96		
C-238.	Stick	2.32	.29	19.43	79.82			
C-239.	Bonbons:							
	Coating	1.25	1.26	2.00	56.01			
	Filling	3.38	.13					
C-240.	Bar chocolate	.64	.98	.44	55.55		7.62	25.65
C-241.	Bonbons:							
	Coating	2.25	1.37	3.83	57.89			
	Filling	7.94	.21					
C-242.	Bonbons:							
	Coating	1.29	.91	.70	56.21			
	Filling	6.15	.09					
C-243.	Stick	.81	.33	32.10	64.7			
C-244.	Lemon drops	.97	.45	36.80	60.96	.38		
C-245.	Stick	.23	.59	67.81	27.90			
C-246.	Lemon drops	.99	.66	62.75	34.80	.57		
C-247.	Hard	.86	.69	36.00	63.66			

Analyses of German flour and bread intended for the civil population of the occupied zone were made with the idea of calculating their nutritional value. It was claimed that the samples of flour were made by grinding the whole head of the wheat and rye, subsequently winnowing out the coarsest of the chaff particles, leaving about 80 per cent of the original head in the form of a coarse flour. A copy of the report on these samples follows:

TABLE 41.—*Analyses of flour and bread samples intended for issue to German civil population*

Analytical data	Wheat flour, percentage	Rye flour, percentage	German ordinary black bread, percentage	Bread for the sick, percentage	Bread for the very sick, percentage	Zwieback, percentage	American white bread, percentage
	Sample No.—						
	C-279	280	281	283-a	283-b		
Moisture	10.99	10.45	38.03	38.92	33.79	13.72	35.3
Ash	1.91	2.05	2.13	1.87	1.88	1.87	1.1
Sodium chloride			.49	.43	.65	.55	
Protein (N/6.25)	10.05	8.37	6.173	7.05	7.60	8.55	9.2
Fat	2.55	1.84	1.12	1.72	1.48	1.16	1.3
Crude fiber	2.84	2.52	1.84	1.83	1.07	.33	.5
Acidity as lactic acid	.65	.46	1.25	.58	.45	.52	.29
Carbohydrates (including crude fiber)	74.5	77.3	51.3	49.9	54.8	73.9	51.1
Calories per pound	1,693	1,671	1,116	1,132	1,203	1,588	1,215

The flour samples exhibited very high ash and crude fiber content, as would be expected from the method of preparation. For comparison, the average analysis of American white bread is given. When contrasted with American bread, the ordinary German black loaf was found to be very high in moisture, ash, crude fiber, and acidity. While the calculated food value appears to be only about 100 calories less, this figure is subject to a correction because of the fact that the crude fiber is included as carbohydrate, resulting in a factor of digestibility much lower than in the case of American bread. The high acidity of German bread raised the suspicion that lactic or some other acid had been added; this is not an uncommon means of improving doughs made from low-grade flours. The bread was soggy, sour tasting, and not very palatable. The color was dark, the crust being nearly black. The other samples of bread, except for the high crude fiber content, were about normal and appeared of good quality.³³

● An analysis of Bear brand milk, received from Switzerland, revealed it to be simply whole milk of good quality sterilized without evaporation. This article was being issued by the Quartermaster Department, American Expeditionary Forces, on the assumption that it was an equivalent for ordinary condensed milk. Inasmuch as condensed milk is concentrated about two and two-tenths times, the issue of the unevaporated sterilized canned milk resulted in reducing the milk allowance to 45 per cent. This difficulty was remedied by doubling the quantity issued.³³

The equipment of the chemical laboratory was at all times insufficient to handle the work required. A fair supply of common glassware and chemicals, a balance, electric-drying oven, and colorimeter were the main features. A very simple and inadequate nitrogen distillation set only was available, and before the armistice began the gas supply was so poor and intermittent that three days were required to make a digestion and distillation. The unreliable gas supply was always the most difficult problem of the laboratory work.³³

In connection with the baking tests, a very rough outfit was devised out of incubators and hot-air ovens, using a porcelain laboratory sink as a mixer. This is but a sample of the handicaps under which the work was carried out. Provision should be made for a complete chemical laboratory for foodwork in the subsequent organization of a field army.³³

FOOD FACTORY INSPECTION

Active interest of the food and nutrition section, office of the chief surgeon, American Expeditionary Forces, in the sanitary conditions of French food factories originated in the following letter of request for inspections from the office of the chief quartermaster, American Expeditionary Forces.

AMERICAN EXPEDITIONARY FORCES,
HEADQUARTERS S. O. S.,
OFFICE OF THE CHIEF QUARTERMASTER,

October 26, 1918.

From: Chief Quartermaster to Director of Laboratories, A. E. F.

1. Request that you issue instructions that when any of your officers are in the vicinity of factories being operated by the Quartermaster Corps, turning out hard bread, crackers, candy, macaroni, or coffee, that they be directed to make an inspection with a view to noting the sanitary conditions existing at such plants based on their observations and submit report to this office.

* * * * *

Pursuant to this request, an officer of the food and nutrition section was ordered to Paris November 11, 1918, to make the necessary inspections in cooperation with the chief purchasing agent.³⁴

For a correct appreciation of the situation, it must be borne in mind that owing to the shortage of ocean transportation a number of food products for the American Expeditionary Forces were made in France, either out of raw materials obtainable in Europe or from such originating in America; this was done especially when the finished product was bulkier or more perishable than the separate ingredients. Moreover, the war outlook for the greater part of 1918 made it desirable to provide for large immediate production, as well as for possible future demands. At this time, most French factories were busy with contracts for their own Government. Accordingly, American contracts were awarded upon the sole basis of output. In none of the earlier contracts (prior to November 25, 1918) does there appear any requirement for cleanliness or sanitation, nor does it appear that many of the factories were visited or inspected before the award of the contract.³⁵ In one instance, that of a candy contract, the production was "farmed out" to many small factories, without any previous inspection of these places by American officials.³⁵

The magnitude and extent of French food production for the American Expeditionary Forces and the Young Men's Christian Association are shown in the following table:

Production in the month of maximum activity

Food product	Month	Number of factories	Daily factory output, pounds		Total output, during month, pounds
			Greatest	Smallest	
Hard bread.....	November, 1918.....	14	37, 881	22, 622	753, 273
Macaroni.....	December, 1918.....	7	25, 300	4, 840	396, 723
Cookies.....	February, 1919.....	18	51, 462	22, 293	1, 317, 844

During the period from August, 1918, to March, 1919, the following approximate quantities of products were made in France for the Quartermaster Department, American Expeditionary Forces:³⁵

	Pounds
Macaroni.....	4, 287, 901
Cookies.....	8, 881, 701
Hard bread.....	11, 291, 232
Candy (chocolate bars, chocolate candy and hard candy).....	4, 782, 837

For the Young Men's Christian Association the following amounts were made:³⁵

	Pounds
Total production of biscuits.....	21, 397, 126
Chocolate bars.....	21, 397, 126
Assorted candy.....	1, 486, 999
Jam.....	5, 011, 122

The number of plants operating at one time for the Young Men's Christian Association included 13 chocolate factories, 2 candy factories, 2 caramel factories, 20 cookie factories, 8 jam factories. Seven other factories were operating at various times, making the total 52.³⁵

Emphasis was not placed upon the sanitary conditions of the factories until the results of a preliminary survey of 25 factories in the district of Paris had been placed in the hands of the chief purchasing officer, American Expeditionary Forces, in Paris.³⁴ The foods produced were candy, macaroni, hard bread, jam, and cookies. Following an inspection of these factories report was made to the director of laboratories, American Expeditionary Forces, on November 25, 1918, in which their faults were indicated.³⁵

The results of this report were the promulgation of a set of sanitary regulations written in French, and the issuance of instructions to American inspectors in the several factories to the effect that these regulations must be enforced.³⁵ The food and nutrition section, was authorized to continue inspections and to bring about improvements. The sanitary regulations were as follows:³⁵

SANITARY REGULATIONS

I. Toilet facilities:

- a. Flush by water must be provided after each use of the toilet.
- b. Ample supply of paper (toilet paper, newspaper, or any kind of paper). All toilets must be kept clean by scrubbing daily or oftener, if necessary. They must be clean at all times.

II. Washing facilities:

- a. Running water.
- b. Soap.
- c. Towels. One square foot for each separate use of towel. That is, a towel 3 feet square can be used nine times by one individual or one time each by nine individuals at the maximum.

III. Use of washing facilities:

Each employee handling product, outside of original package and before it is packed in the wooden case in which it is to be shipped, shall wash his hands at the factory:

- a. Before beginning work in the morning.
- b. Before beginning work at noon.
- c. After each use of the toilet.
- d. Before returning to work, if work is discontinued for any cause for any length of time.

IV. Wetting of fingers in handling or in packing of food must be prohibited.

V. No person having open sores or infections shall be permitted to handle food products or raw materials.

VI. All utensils, tables, racks, and floors shall be maintained at all hours in as clean a condition as is consistent with the work.

VII. It is the business of the employer to see that his factory is conducted so that the rules laid down herein are observed. You will report immediately to this office any failure on the part of the manufacturer to carry out any one or more of the provisions herein.

By authority of the chief purchasing officer.

Immediately after issuing these regulations a vigorous inspection campaign was instituted; all defects were pointed out and improvements were demanded.³⁵ The results were gratifying in most instances and for the most part cooperation was excellent. In certain cases drastic action, even to the extent of closing the factory, had to be resorted to before the desired innovations were made. It is impossible to detail the improvements in all factories. Suffice it to say that in the short interval of three weeks most of the factories (especially the larger ones) were clean; the workwomen remarkably improved in neatness; soap, towels, and toilet paper were on hand and used.³⁵

The work in Paris proved of such advantage that the inspection work was extended to the factories outside of the district of Paris. Accordingly, inspections were made at St. Amand Mont Rond, Bordeaux, Nantes, Blois, Grenoble, Aix-en-Provence. Among these are included some of the best French factories, as measured by their standards. Yet gross objectionable conditions were found in many of them. The total number of factories inspected was 62. In connection with this work reports were made to the chief purchasing officer on the following topics: (a) Use of bad eggs in cookies; (b) use of talc in confectionery; (c) quality of the product of one factory; (d) methods of various factories in disposing of broken cookies; (e) use of questionable fruit pulp in jam factories.³⁵

Throughout this inspection work the one factor of greatest value in effecting improvements was the standard set by the American Army itself. The relationship between employer and employee in France is such that most employees conform to a certain discipline. However, it was soon discovered by the employers that no temporizing was to be tolerated, and fear of cancellation of contracts produced immediate and startling improvement in sanitation.³⁵

The experiences with French factories have shown that it is possible to have a food product made in a foreign country under suitable sanitary conditions if the American Government insists.³⁵

FOOD CONDITIONS IN THE AMERICAN NORTH RUSSIA EXPEDITIONARY FORCE

The American North Russia Expeditionary Force left England on August 27, 1918, and arrived at Archangel on September 4. The personnel of the expedition consisted of the 339th Infantry, the 1st Battalion 310th Engineers, and the 337th Sanitary Train, made up of a field hospital and ambulance company; totaling approximately 5,000 men.³⁶ Previous to the dispatch of the expedition from England, the chief surgeon, Base Section No. 3, American Expeditionary Forces, London, had learned that the expedition would be rationed by the British and that the rations had been especially designed to meet Arctic conditions, in consequence of which the attention of the chief quartermaster, American Expeditionary Forces, was immediately invited to the desirability of making certain changes so far as American troops were concerned, these changes dealing chiefly with the distribution rather than the components.³⁷ The net result of the correspondence which ensued was that the whole question of food for the American contingent should be settled in Archangel between American and British authorities.³⁸

Additional supplies were sent to the American forces by the United States Army, to be used as seemed necessary and advisable for supplementing the regular issue. However, it was felt at headquarters, Base Section No. 3, that food conditions in North Russia were not entirely satisfactory; consequently, an officer of the food and nutrition section, with two quartermaster sergeants, were sent to Archangel on December 21, 1918, with instructions to report to the commanding officer, American North Russia Expeditionary Force, for duty.³⁹ They arrived in Archangel on January 13, 1919.

From a practical standpoint, the amount of food which was issued and actually reached the men was governed by two main considerations; first, the supply on hand in Archangel, and, second, the transportation facilities between the base (Archangel) and the troop units.³⁹ Archangel was practically isolated from the outside world, so far as shipping facilities were concerned, from December 1, 1918, to May 1, 1919, and large quantities of subsistence and other supplies were delayed and held over the winter at Murmansk, the terminal of the Murman Railway, at the mouth of the Kola River, on the Murman coast.³⁹ Occasionally ice breakers made their way down through the frozen White Sea, but the quantities of supplies they were able to bring were small. Some of the quartermaster supplies destined for American troops shipped from England early in the autumn of 1918 did not reach Archangel until about May 1, 1919.³⁹ The distribution of food from Archangel to the fighting forces was greatly hindered by the meager and unsatisfactory transport service. This condition affected the bulk of American troops since 10 companies of infantry, 2 companies of engineers, and the greater part of the enlisted personnel of the sanitary train were at or near points on the front during the greater part of the time. These front points were determined largely by the character of the country and averaged approximately 175 miles from Archangel.³⁹

The whole country is of a character known as tundra, a vast expanse of timber-covered swamp, practically unpopulated, with the exception of peasant villages scattered along the river courses. The swamps in the summer time are quite impassable, and communication during this season is maintained by boat on the various rivers. All the vital front points held by the allied forces were on rivers, with the exception of one, which was on the railway connecting Archangel with Vologda, a point on the Trans-Siberian Railway directly south of Archangel. This railway is on a straight embankment or levee through the uninhabited tundras, and the only important villages on it are at points of intersection with rivers. Transportation between the railway front and Archangel was satisfactory.³⁹

In the winter of 1918-19 all supplies had to be taken overland, on winter trails through the forest, on sleighs drawn by horses and driven by peasants. Necessarily such communications were imperfect and the quantities of supplies had to be kept at a minimum. The character of these supplies was dictated by military consideration and subject to sudden and unforeseen changes. Fortunately, the front lines occupied by the American troops were established before the rivers froze up in the fall of 1918, and considerable quantities of food supplies were taken to important points on the rivers in barges and stored

for later distribution during the winter months. This was true of the articles of the regular ration issue, but all the additional American supplies were stored at Bakaritzza, a point directly across the Dwina River from Archangel. Apparently it was impossible to distribute these as in the case of the rations, due to their late arrival and the inadequacy of transport. The distribution of these supplies under winter conditions to points on the front not reached by the railway was practically impossible, and as a consequence the American troops while at the front could not benefit from them. However, at various times during the campaign, troops from certain sectors were relieved from the front and brought back to Archangel for rest. During these intervals such troops could purchase any American food supplies that were available. Practically all the companies had ample mess funds, and it was felt that it would be better to put the American stores on sale than on issue, due to the fact that they could not be transported to the front, and it would have been manifestly unjust to issue supplementary food supplies to some companies and not to others.³⁹

The following is the official ration which was issued to British, Americans, French, Italians, and Serbians, of the North Russia Expeditionary Force:⁴⁰

Meat.....	ounces.....	14	Sugar.....	ounces.....	3
Bread.....	do.....	14	Salt.....	do.....	$\frac{1}{4}$
Jam.....	do.....	2	Pepper.....	do.....	$\frac{1}{16}$
Bacon.....	do.....	4	Mustard.....	do.....	$\frac{1}{16}$
Lard or margarine.....	do.....	$3\frac{3}{4}$	Oatmeal or rice.....	do.....	$1\frac{1}{2}$
Peas (not split) or beans.....	do.....	$2\frac{3}{4}$	Pickles (3 times a week).....	do.....	1
Tea.....	do.....	$\frac{1}{2}$	Lime juice.....	gallon.....	$\frac{1}{16}$
Coffee (for Americans, French, Italians, and Serbians in lieu of one-half ounce of tea).....	ounces.....	* 1	Marmite.....	ounce.....	$\frac{1}{2}$
Milk.....	do.....	1	Tobacco or cigarettes.....	ounces a week.....	2
			Matches.....	boxes a week.....	2

It will be noted that no fresh vegetables were issued according to the official scale. However, at times during the winter, fresh potatoes (8 ounces) were substituted for beans or peas. Part of the time these potatoes were frozen when issued, but with proper care and preparation, could be put in an edible condition. The meat consisted of mutton, fresh beef, frozen Australian rabbit, "bully beef," and a mixture of meat and vegetables known as "M. & V." or "McConokey." The lard issued proved excessive in amount, for it could not possibly be used for cooking in the absence of flour and fresh potatoes; however, it was utilized to a very good advantage in bartering with the natives for fresh vegetables consisting of potatoes, cabbages, turnips, carrots, and rutabagas. The bread was issued generally in the fresh state, although during active campaigning and critical periods on the front the bread was wholly hard. Troops with defective teeth suffered somewhat during prolonged periods of enforced hard-bread consumption, and companies and detachments having meat grinders that could be used for grinding hard bread were particularly fortunate. The soft bread was of fair quality, but insufficient in amount to satisfy the men. The beans were rangoon beans and were

* Four-fifths ounce roasted and ground.

not as suitable for our troops as the navy bean of the American ration. Coffee (1 ounce), green and unground, was supposed to be issued to the American troops in lieu of tea (one-half ounce). However, for long periods on the front the American troops received practically no coffee. During the latter part of the campaign coffee, roasted and ground (four-fifths ounce), was issued more frequently. The sugar ration (3 ounces) was necessarily reduced to 2 ounces on the Dwina River front during the latter part of the winter and early spring because of insufficient supplies and inadequacy of transportation. The insufficient salt ration of one-quarter ounce was increased to one-half ounce early in the winter.²⁹

COOKING EQUIPMENT

The equipment for the preparation of food among the American troops was meager. The greater part of the excess field equipment had gone through to France with that of the remainder of the 85th Division; the American contingent of the North Russia forces was detached in England while en route for France. Each company on its arrival in Archangel had in its possession a field range and a few galvanized-iron cans. However, due to the wide area necessarily covered by the troops in a rapid advance immediately after their arrival in Archangel, much of their equipment was lost, and the fact that during the latter part of the campaign some units were very widely scattered made it impossible to use the entire kitchen equipment of any company at a central point. The result was that "Dixies" were drawn from the British ordnance stores, and distributed for the use of the various detachments. The "Dixie" is a galvanized bucket, oblong in shape, provided with a heavy iron bail and a lid about 3 inches in depth which can be securely fastened on. This lid may be used as a skillet as well as a serving dish. The capacity of the "Dixie" is approximately 3 gallons. "Dixies" were distributed among the various companies, at the approximate rate of one per squad. They were used throughout the railway front on field ranges mounted in box cars, on small Canadian heaters in dugouts, on improvised stoves made of brick and sheet iron in block-houses, and finally on the brick and clay stoves of the peasant houses in which our men often were billeted. Oftentimes one "Dixie" made up the entire kitchen equipment of a squad, but this was usually supplemented by crude implements obtained from the natives. At the base in Archangel the kitchen equipment was somewhat more elaborate, very good ranges with ovens, boilers, and boiling plates having been installed in most of the barracks or other buildings occupied by our troops.³⁰

PREVENTION OF SCURVY

As a preventive of scurvy, lime juice, one one-sixtieth of a gallon per ration, was issued daily during the entire campaign. Also during the major portion of the winter, 1918-19, the troops had instructions to germinate all peas and beans before cooking as an added precaution against this disease. American medical officers were required to report on the compliance with the above regulations. There were no cases of scurvy among the American troops. The entire lack of fresh vegetables on the issued ration and the scarcity of these

necessities in the market made imperative their very economical use in the troop messes, and various memoranda were issued and inspections made to insure this. In view of the increasing scarcity of native products the following recommendations were made to the American headquarters and approved, but the requested supplies did not arrive until immediately prior to the departure of the American troops from Russia:³⁹

OFFICE CHIEF SURGEON, UNITED STATES TROOPS,
Archangel, Russia, February 13, 1919.

From: Detachment sanitary inspector.
To: Commanding officer, United States troops, Archangel.
Subject: Securing dehydrated potatoes for American troops.

1. There are no fresh vegetables in the ration as issued and none available in military stores for issue. Some are being obtained from local sources for use of the messes in Archangel, approximately 8 ounces per man per day on the average, or about two-fifths of the amount used in the American field ration. The local supply will grow scarcer as spring comes on, and the lack of fresh vegetables is sure to be reflected in the health of the troops, especially next spring.

2. The experience of the American Army in France has been that dehydrated potatoes form an excellent substitute for fresh. They have the great advantage of being easily kept and easily transported. They can be used under garrison or field conditions with equal facility. When properly prepared they can not be distinguished from the fresh product.

3. Recommend that a request be made for the shipment, as early as possible, of three months' supply of dehydrated potatoes for 5,000 American troops. The stipulation should be made in the request that these be of the "sliced" and "French fried" variety; not "cubes" or "riced." One hundred and twelve thousand five hundred pounds would be a sufficient quantity for 5,000 men for three months.

4. Recommend that authority be secured for the issuing of this product when it arrives on the same scale as issued in the American field ration.

OFFICE CHIEF SURGEON, UNITED STATES TROOPS,
Archangel, Russia, February 14, 1919.

From: Detachment sanitary inspector.
To: Commanding officer, United States troops.
Subject: Supplements to present ration.

1. The ration as issued at present to American troops is chiefly deficient in vegetables, flour, and fruit. Dehydrated potatoes and dried fruit are urgently needed because they are dietetically important, easily preserved, concentrated so that transportation space is reduced to a minimum and both easily prepared under field conditions. Additional flour is very desirable to supplement the ration and give the men pastries and gravies.

2. The matter of dehydrated potatoes has been made the subject of a special report. The present bread ration is 14 ounces if drawn in bread, or if all is drawn in flour, 10 ounces. Any portion of the component can be had in flour in the same ratio. The bread can be increased to 20 ounces or the flour to 15 ounces if the organization will forego all the oatmeal and rice component and either 2 ounces fresh meat, one-eighth tin of bully beef, or "M and V," or 2 ounces of lard. The only dried fruit available are dates, which are issued alternately with jam.

3. Recommend that the following amounts of food be requested from the chief quartermaster, to be shipped at the earliest available transportation:

Flour, 112,500 pounds (sufficient for 5,000 men for three months at 4 ounces per man per day).

Baking powder, 2,500 pounds.

Dried yeast, 500 pounds.

Dried fruit, 85,000 pounds (to consist of apples, prunes, and raisins).

Spices, 400 pounds (cinnamon, cloves, allspice, and Chili powder. No spices or baking powder available in Archangel).

Considerable quantities of frozen potatoes were obtained in Archangel and were placed on issue to some extent. As the possibility of their use depended upon a close observation of definite rules of preparation, the following memorandum was issued to American troops and followed up with as frequent inspections as possible:

OFFICE CHIEF SURGEON, UNITED STATES TROOPS,
Archangel, Russia, March 11, 1919.

Memorandum to company commanders:

Frozen potatoes will be issued three times weekly in lieu of beans or peas. The use of these vegetables is very important, and none of them should be lost through lack of exact conformance with the following directions. Company commanders will take special precautions to see that each cook who prepares food for companies, platoons, or detachments knows and follows directions implicitly.

304—COOKING—FROZEN POTATOES

Frozen potatoes must be kept in a frozen condition until actually required for consumption. They should then be scrubbed in tepid water and immediately immersed, unpeeled, into boiling water in their frozen conditions, to cook; if left in a warm place and allowed to thaw out prior to use they become spongy and turn black in cooking.

INADEQUACY OF THE RATION UNDER FRONT-LINE CONDITIONS

The inadequacy of the ratio under front-line conditions was particularly illustrated on the railway front.³⁹ This was made the subject of a special report, which is given below. The only practical result of this report was the investigation of the coffee ration, which was improved, not in quantity but in frequency; however, since the men on this front were relieved at frequent intervals, serious results from malnutrition were prevented.

OFFICE CHIEF SURGEON, UNITED STATES TROOPS,
Archangel, Russia, February 28, 1919.

From: Detachment sanitary inspector.

To: Commanding officer, United States troops (through military channels).

Subject: Food conditions at the front.

1. The following is a comparison of some components of (a) the American garrison ration; (b) the increased ration for our troops at the front in France; and (c) the ration as issued to the North Russia Expeditionary Force.

Article	American garrison ration, ounces	On front in France		North Russia Expeditionary Force, ounces	Difference, ounces
		Ounces	Percentage increase		
Bread.....	16	17.6	10	14	3.6
Coffee.....	1.12	1.68	33½	.8	.8
Sugar.....	3.2	4.28	25	3	1.28
Meat.....	20	25	25	14	11
Pepper.....	.02	0	25	.01	.01

2. The American troops can subsist in this latitude on the North Russia Expeditionary Force ration, when living under garrison conditions where advantage may be taken of the bartering privileges. For our troops at the front it is quite inadequate. They are actually suffering. This is due to a number of reasons. Work is particularly fatiguing. Men are building blockhouses, for example, cutting down trees and carrying them through snow waist deep in places. The ration is necessarily issued in containers and quantities which can not be easily and equitably divided. This works a great hardship in case of details, or small

detachments of men out where they must carry and prepare their own meals. A company in some cases has to divide a day's ration into four or more parts without scales and without additional suitable containers where cans have to be split. The detachment of the machine-gun company serving on the railway front was comprised of approximately 30 men. The entire ration in the case of a mess of this size is insufficient. The most common single complaint at the front is that the bread, the one article which can be most fairly divided, is totally insufficient. For breakfast the men have been getting one hard-tack and for dinner and supper one slice of bread of approximately 4 by 6 by $\frac{1}{2}$ inches or equivalent dimensions. The mutton is frequently moldy, according to every mess sergeant and cook, and mutton of undoubted quality is not relished by our troops.

The division of fresh meat on an equitable basis, where the company is divided into small detachments, is very hard. For example, a detachment which draws a piece of "loin" or "plate" has approximately 40 per cent of fat or bone. The American troops have been getting much more tea than coffee, although they would prefer the latter, and the quantity of coffee when it is issued is quite inadequate to fulfill the needs of the troops. It is particularly desirable that the men drink as much liquid coffee as they wish, since this reduces the amount of water required and thus minimizes the danger from drinking possibly polluted water under field service conditions. The administration of lime juice, which is being carried out, is best done with sugar, as the men are nauseated in many cases where the juice is taken undiluted and unsweetened. This increases the need of sugar. The issuing of additional sugar to the extent of one-half to two-thirds as much sugar as lime juice has been authorized in various rations for British troops, namely, in Africa and Mesopotamia. There is an acute need of additional pepper, the present issue being but one-half the amount of the American ration component.

3. The inevitable conditions of front-line service make impossible the same economical use of food, which can be practiced under garrison conditions or in messes of 150 to 250 men. Furthermore, the severity of the work increases the food needs of the men to a great extent. Our men at the front are complaining of hunger and lack of food to a greater extent than in any Army organization I have ever investigated. The men are suffering from malnutrition, without any possible doubt, and the resulting lowered resistance of the men will inevitably show itself in increased susceptibility to disease among troops next spring which, especially at the front, is very serious and should not be minimized.

Recommendations.—That every possible effort be made to get the following increases of ration authorized and initiated at the earliest possible moment for the troops serving at the front:

Article	Present issue, ounces	Proposed issue for all at the front, ounces	For men in small detachments, ounces
Bread.....	14	18	20
Meat.....	14	20	24
Sugar.....	3	3.75	3.75
Coffee.....	.8	1.6	1.6
Pepper.....	.01	.02	.02

* * * * *

Another problem on the railway front was the lack of central points for food preparation. This necessitated the repeated subdivision of the meager ration and rendered kitchen equipment inadequate. The condition was largely remedied as a result of inspections and reports.³⁹

The absence of fresh vegetables from the ration, as it was issued, was much felt on the railway. At other points on the front, however, this was fortunately not an all-important factor for the reason that considerable quantities of fresh vegetables, left behind by fleeing natives, were discovered and used by American troops. These stores admirably supplemented the ration.³⁹

MESSING CONDITIONS AT ARCHANGEL

At Archangel, to which point troops were brought from the front at intervals for rest periods, messing conditions were found to be very unsatisfactory upon the arrival of the nutritional officer, in December, 1918. He immediately submitted a report on messing conditions at Smolny Camp at which the troops from the front were quartered. His recommendations, which follow, were approved. The kitchen was rebuilt and reorganized, a special mess sergeant being placed in charge; the feeding of troops from the standpoint of ration, food preparation, and variety in diet was greatly improved.³⁹

Recommendations.—1. That a single general mess be instituted, which shall be operated by a permanent staff; a mess to which companies can be attached for rations from time to time while at Smolny for rest. 2. That the stoves be entirely reconstructed, with proper and sufficient ovens. 3. That the large cesspool already dug be covered and used for the kitchen waste water, the present method of disposal to be discontinued at the earliest possible moment. 4. That a proper storeroom for rations, with adequate shelving, be constructed in the kitchen. Also that kitchen tables with suitable tops be made. 5. That provision for sufficient hot soapy water for washing mess kits be made and strictly enforced. 6. That additional lights be provided in the kitchen and the walls be whitewashed. 7. That the cesspool at the end of the mess hall be abandoned and an incinerator be constructed to take care of tin cans and other refuse. 8. That the mess-hall floors, doors, and windows be repaired.

There was no scurvy or any other evidence of disease resulting either directly or indirectly from nutritional disturbances in the American troops in North Russia. The general physical conditions of the men on leaving Russia was very good, despite a deficiency in the ration, most of them having gained in weight and in general military bearing. The American troops were good foragers at the front, and the climate, especially during the long winter, was very healthful. The market conditions and the presence of American stores enabled the troops stationed at Archangel to supplement their ration; the abandoned food supplies left by the natives contributed to the same end at most other points. The conditions found and reported on the railway front were unique and were fortunately not prolonged over periods sufficient to bring about serious results. The winter was mild (the temperature for January, 1919, averaged -10° F.) and the clothing furnished was in general quite adequate and suitable for protection against the weather conditions encountered. There was much grumbling against the character, quality, and quantity of food, but while many of the complaints were justified, there was very little if any acute suffering from hunger, and there were no permanent or serious ill-effects; however, the absence of such effects was due to the fortunate availability of native food and additional American stores rather than to the sufficiency of the ration.⁴⁰

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- (35) Report on inspections of French factories manufacturing food products for the American Expeditionary Forces, from Maj. David Klein, San. Corps, undated, to the director of laboratories, A. E. F. On file, Historical Division, S. G. O.
- (36) Report on North Russia; General Richardson.
- (37) Letter from the chief surgeon, Base Section No. 3, A. E. F., August 9, 1918, to the chief quartermaster, A. E. F. Subject: Ration for American troops for Northern Expeditionary Force. On file, Historical Division, S. G. O.
- (38) Letter from Francis Darnell, Director of American Section, War Office, Contracts Department, London, August 23, 1918, to Col. Samuel G. Jones. Subject: North Russia rations for American troops. Copy on file, Historical Division, S. G. O.
- (39) Report on food conditions in the American North Russia Expeditionary Force, from Capt. F. J. Funk, San. Corps, undated, to the director of laboratories, A. E. F. On file, Historical Division, S. G. O.

CHAPTER VII

WATER SUPPLY AND PURIFICATION.^a

WATER SUPPLY IN THE THEATER OF OPERATIONS

Prior to our participation in the World War our Army had entertained the assumption that when actively engaged in the field our troops could depend on the country for their water supply. This assumption was natural in view of the fact that our Army had never been faced with the problem of concentrating huge numbers in a limited area. Locations for camps and for lines of march were selected where springs or good streams were convenient; artillery and cavalry were encamped along streams where animals could be watered; regions without good water were avoided in so far as it was possible to do so.¹ In other words, it was expected that adequate supplies of water always could be located, and not much thought was given to the necessity for their development.

In Europe during the war, 1914-1918, where an army of 500,000 troops and 200,000 animals was not infrequently quartered on a territory occupied in peace time by 20,000 to 30,000 inhabitants, it was evident that the water resources which had been installed by the inhabitants would furnish a totally inadequate amount of water for such an army and that important additional water works were essential. Such was the experience of the French army at the beginning of the war in 1914, when great difficulty was encountered in supplying a sufficient amount of pure water for the troops.² This difficulty increased until the summer of 1915, when it became a menace to the success of one of the campaigns that had been arranged for. As a solution of the problem confronting them, the French Government called upon an eminent sanitary engineer to take charge of the situation. As a result of his efforts a supply of water was quickly developed in the special region concerned, and plans were proposed for the purification of the water and for its delivery to troops. His work resulted in the organization of a service of water for the French Army.²

WATER SUPPLY SERVICE

The first American contingent arriving in France after the United States entered the war was impressed with the necessity for having within the American Expeditionary Forces a water supply service to carry on the same function as the Service of Water of the French Army. A memorandum from the chief surgeon, A. E. F., to the commanding general, June 21, 1917, plainly indicated the necessity for specialization in this respect;² and the chief engineer, A. E. F., at about the same time secured from the French Government a state-

^a Because of the division of duties concerning water-supply work in the American Expeditionary Forces between the Engineer and Medical Departments, it is impossible to record herein such facts regarding water in the American Expeditionary Forces as are considered highly desirable for the present volume without duplicating somewhat the history of the Engineer Department. With this in mind, the chapter as it now appears was submitted to the Chief of Engineers for his examination and approval. The publication herein by the Medical Department of statements relative to Engineer activities has the approval of the Chief of Engineers.—Ed.

ment prepared by the chief of the Service of Water, French Army, covering in general terms the principal requirements in personnel and material the French service had found necessary for its work.³

The War Department, in compliance with a cabled request from General Pershing in the summer of 1917, authorized the organization of a special service regiment, the Twenty-sixth Engineers, for water supply work in the American Expeditionary Forces, and sent to France certain officers who possessed sound experience in the various phases of this branch of engineering.³

The officers who were selected by the War Department, because of their water-supply experience and sent to France in the midsummer of 1917, set

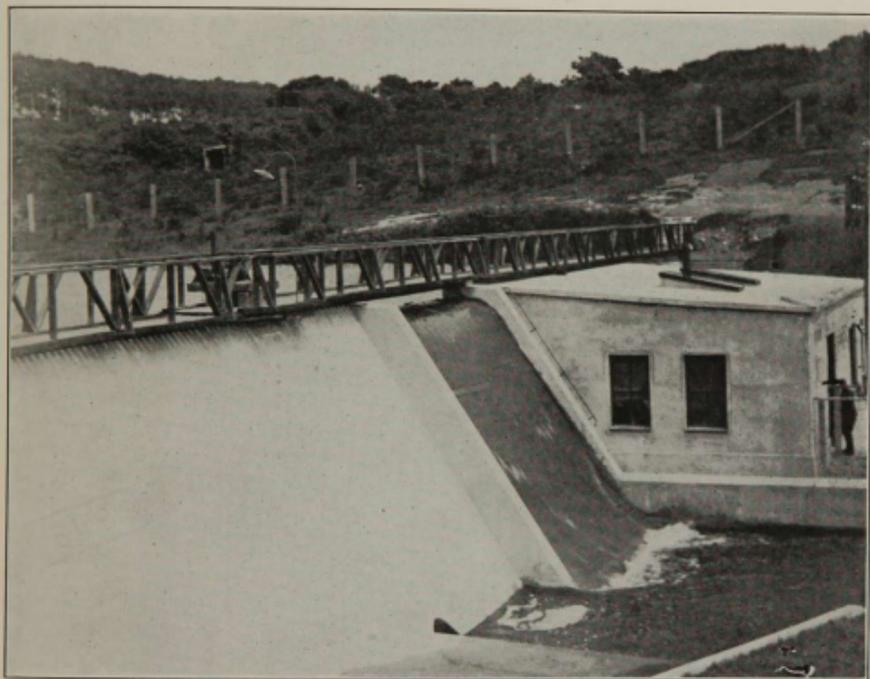


FIG. 52.—Penfield Dam, Base Section No. 5, A. E. F.

themselves to the task of inquiring into and of preparing to meet the water-supply needs of the American Expeditionary Forces. Almost immediately it was clear to them that the water-supply activities fell naturally into three groups: Water-supply work for the armies, water-supply work for the lines of communication, and supply of materials for the water-supply work for both the armies and for the lines of communications.³

It was obvious that during the early part of our service in France the water-supply work of the Line of Communications (afterward Services of Supply) must constitute by far the larger volume of work. Active work in the field for the water-supply service for the armies would commence only with the assumption of responsibility by the armies. For a number of months, therefore, the water-supply work consisted of developments for hospitals, small towns

camps, depots, railways, base ports, etc., and in these the entire water-supply force was engaged.³

As the volume of work in the Services of Supply increased, as the organization for this work became more definitely crystallized, and as the studies and investigations of various sorts relating to prospective work for our armies

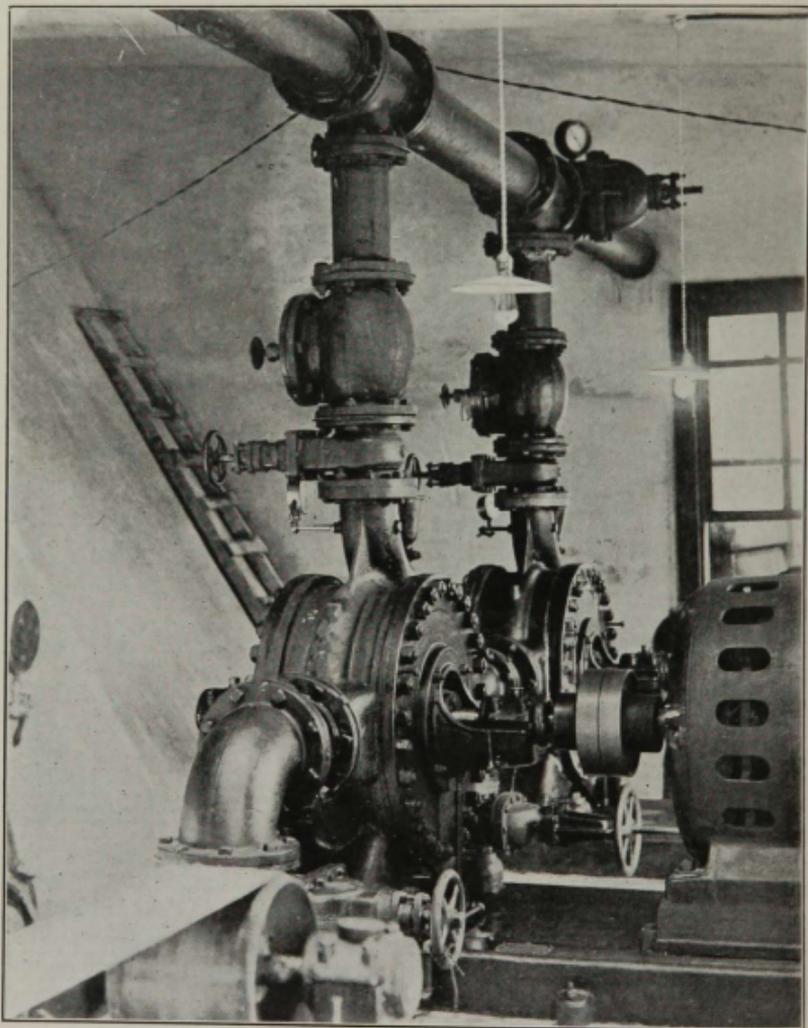


FIG. 53.—Interior of pumping station at Penfield Dam. Here the water was treated with liquid chlorine

developed, a division of functions resulted along the lines indicated in the preceding paragraph. The water-supply work for the armies, and certain functions concerning the supply of materials and equipment were handled in the office of the chief engineer, A. E. F., and the water-supply work in the Services of Supply was handled in the office of the director of construction and forestry.³

CONTROL OF WATER SUPPLY

One of the first questions to arise in the American Expeditionary Forces having an important bearing as regards the determination of a policy of control of the handling of water-supply work concerned the respective duties of the Corps of Engineers and the Medical Department in so far as water was concerned.³ Both of these departments of the Army were vitally interested.

The laboratory examinations, sanitary inspections, and other activities that pertained primarily to the question of the quality of water supplies were so intimately related to the design, construction, and operation of the water-works that it was found practically impossible to separate them. On the other hand, the Medical Department had certain highly important responsibilities connected with the quality of the water actually used by our troops overseas.³

By mutual agreement of the chief of engineers, A. E. F., and the chief surgeon, A. E. F., the substance of a general order was drawn up which appeared as General Orders, No. 34, G. H. Q., A. E. F., February 25, 1918. In this order the responsibility for the water supply in the Army zones was divided as follows: Special engineer troops (water supply) assigned to armies were made responsible in the Army zones for the supply of adequate amounts of water at "water points" located as conveniently for the troops as service conditions permitted; in addition and when necessary, they were required to purify the water by filtration or disinfection in such a manner as to insure the delivery of water of a quality as good as practicable under the conditions. It was a duty of the proper officer of the Corps of Engineers to inform the proper officer of the Medical Corps as to the character of the water furnished, so that adequate steps could be taken by the chief surgeon of the army concerned to insure the potability of the water. The Medical Department was made responsible for any disinfection treatment the water required beyond the "water points," as well as for the supervision of the handling of the water and of the water containers to prevent contamination.

Since the foregoing instructions were silent as to responsibility for water supply in areas outside of Army zones, additional instructions were issued in August, 1918, which placed such responsibility on the Engineer Department.⁴ Also, it was specified in these instructions that all water used by American troops was to be considered of doubtful quality and, when required for human consumption, was to be purified unless proven good by a succession of satisfactory examinations and laboratory tests. For the laboratory tests, water analysis laboratory facilities were required to be provided, generally as sections of the Medical Department laboratories, in charge of officers of the Engineer Department (water supply section) who were charged with making the necessary water examinations and laboratory tests.

WATER-SUPPLY SERVICE OF AN ARMY

At about the same time, a bulletin was issued by General Headquarters, A. E. F., in which the organization of the water-supply service, A. E. F., was given in detail.⁵ Therein it was specified that the water-supply service of an army would consist of army engineer troops (not to exceed one regimental

headquarters and six companies) especially trained and equipped for water-supply work. The functions of the army water-supply organization included the investigation of water resources, the development of water supply, and the construction of such works as necessary to make water available at water points, including conveniences for watering animals, for filling water carts, water-tank trains, buckets, canteens, and other containers. Provision for the transportation of water from "water points" to place of consumption was required of tactical units.

The commanding officer of the water-supply regiment was normally the water-supply officer of the army, serving as an assistant to the army chief engineer. He was required to anticipate and to make suitable provision to meet the water-supply needs of the army to which he belonged, and to exercise such technical supervision and control over water-supply work in the entire area occupied by the army as necessary to coordinate water-supply developments and to economize on time, material, and labor. Under the direction of the army chief engineer he was required to direct laboratory and sanitary inspections necessary to determine the potability of the water supplied and to prevent its contamination.⁵

The following memorandum issued by the chief engineer, First Army, A. E. F., June 21, 1918, prescribes in detail the duties of the sanitary officer of the water-supply service of that army:

The water-supply officer, army, is the assistant and representative of the chief engineer, army, in matters concerning water supply.

The sanitary officer of the army water service is the assistant and representative of the army water-supply officer in matters concerning quality of water. He shall have supervision of:

(A) Field sanitary work; in general through the technical supervision of those activities of the sanitary officers attached to the subarea companies (of 26th Engineers) involving:

1. Surveys of sanitary conditions affecting sources of supply within the several subareas.
2. Sanitary conditions at water points.
3. Disinfection of water at ordinary water points, when required, by addition of:
 - (a) Hypochlorite of lime.
 - (b) Liquid chlorine.
 - (c) Javelle water.

4. Operation, principally as regards quality, of mobile purification units (sterilabs and chloro pumps) when these are temporarily assigned to subarea companies.

5. Operation of special filtration plants.

6. Collection of samples of water for transmission to laboratories for analysis.

7. Decision concerning quality of waters and corresponding placarding of water points.

(B) Laboratories, fixed and mobile, for water analysis:

1. Technique and methods employed.
2. Equipment.
3. Operation.

4. Use of laboratories by branches other than water service.

5. Relations with Medical Department in cases where water-service laboratories operate within Medical Department general laboratories.

(C) Quality phases of operation of mobile purification units (sterilabs and chloro pumps) when not operated, under temporary assignment, by subarea companies.

(D) Reports from "proper officers of Engineer Department to proper officers of Medical Department." (G. O., G. H. Q., 1918.)

DEVELOPMENT OF WATER SUPPLIES AT THE FRONT

For our troops at the front, water was obtained from springs, streams, and wells.³ The water-supply service, A. E. F., drilled a few wells in the army zones; however, the number of these wells was not great enough to make it a feature of the operations of that service. The French Army which had been operating in the region later occupied by the American Armies had drilled numerous wells. In 1918, when the American Army took over the responsibility for that part of the front lying to the west of the Moselle River, steps were taken at an early date so to improve the wells found there as to develop the maximum yield of each well. This was done by replacing the pumps by new and larger ones from American stores.³

WATER POINTS

At the front, sources of water supply were designated "water points." At these points water was stored in reservoirs, either elevated tanks or excavated reservoirs lined with canvas or concrete, whence it was distributed in gross to the troops, or the tactical units themselves provided for its distribution. Making the water thus available involved construction work including some or all of the following facilities:³ Pumping stations, pipe lines, purification apparatus, water troughs for horses and filling points for water carts, water-tank trucks, and tank cars.

When there were large numbers of troops in areas in which there was not a satisfactory development of water supplies, it was necessary to distribute water to the troops in gross. This was done from existent water points by means of water-tank trucks made up into water-tank trains, and was a function of the water-supply service.³

During the St. Mihiel operation, September, 1918, the initial water points were between 10 and 15 km. (6 to 9 miles) back of the front line. A large part of the region covered by the operation was very dry and was devoid of natural water resources.³ Over a wide area there were practically no springs; there were dry wells, and these were used to the limit of their capacity. A single hand pump, however, frequently exhausted the storage in these dry wells in a short time, and the inflow into them thereafter was very slow. There were also bored wells, some of which had been constructed by the French Army. When equipped with suitable pumps these bored wells could be made to give a certain yield, but it was small, averaging only 10 to 20 gallons per minute. None of them near or beyond the enemy lines were provided with pumps at the time of the operation; therefore, they did not constitute an available resource for some time after the operation was begun.³

Very promptly after the beginning of the advance, detachments of water-supply troops went forward, keeping close as possible to the advancing lines, and built canvas reservoirs or made other arrangements for containers in suitable locations. The water-tank trains then carried water from the filling points in the rear to these newly constructed reservoirs, making trips as frequently as traffic conditions would permit. As quickly as possible new filling points for the tank trucks were established in the new areas in order to reduce the length of necessary hauling on the congested roads.³

In the activities west of Verdun the water-tank trains were used extensively and were indispensable in many parts of the region.³ In order to facilitate the prompt utilization of the detachments of tank trucks, the water-supply companies constructed forward reservoirs. The water-supply detachments, with horse-drawn vehicles carrying canvas and the necessary tools for the

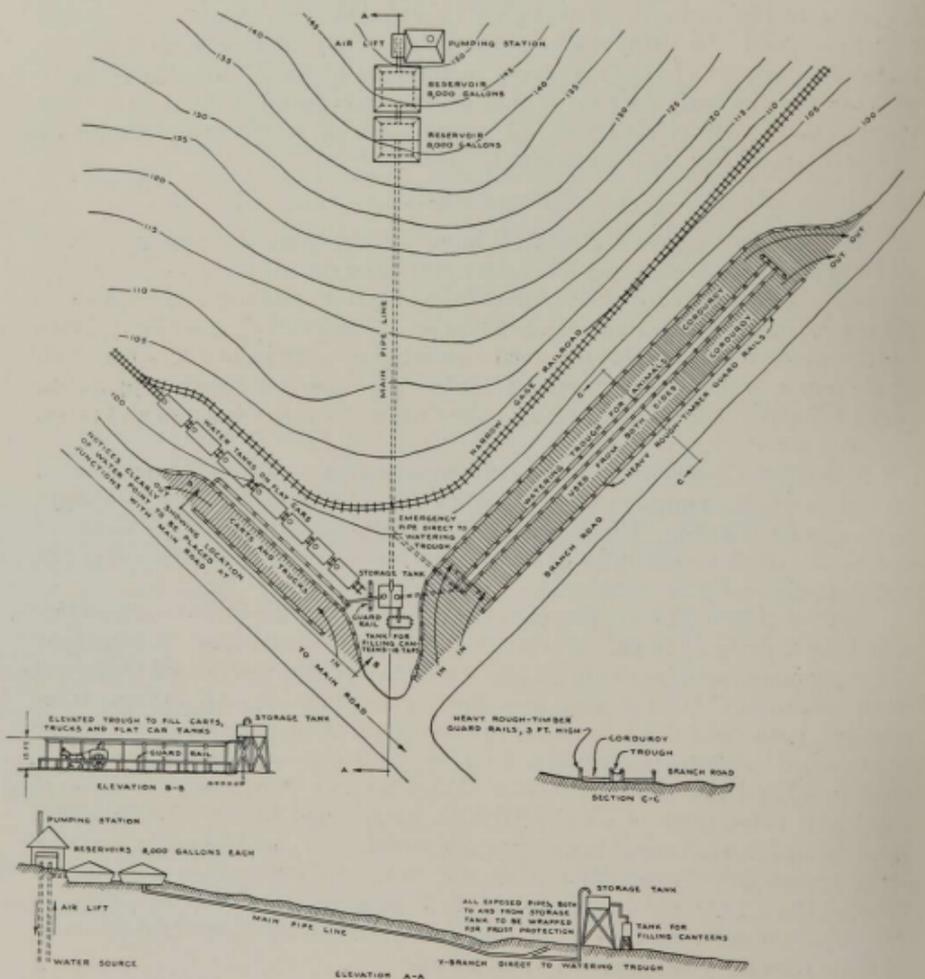


FIG. 54.—A typical water point in the front zone, American Expeditionary Forces

rapid construction of these reservoirs, were in some instances the first vehicles to go forward over the roads, following the advance of the infantry lines.³

INTRAORGANIZATIONAL WATER SUPPLY

From the water points organizations obtained water by means of water carts or motor trucks. Water carts were assigned to dismantled organizations

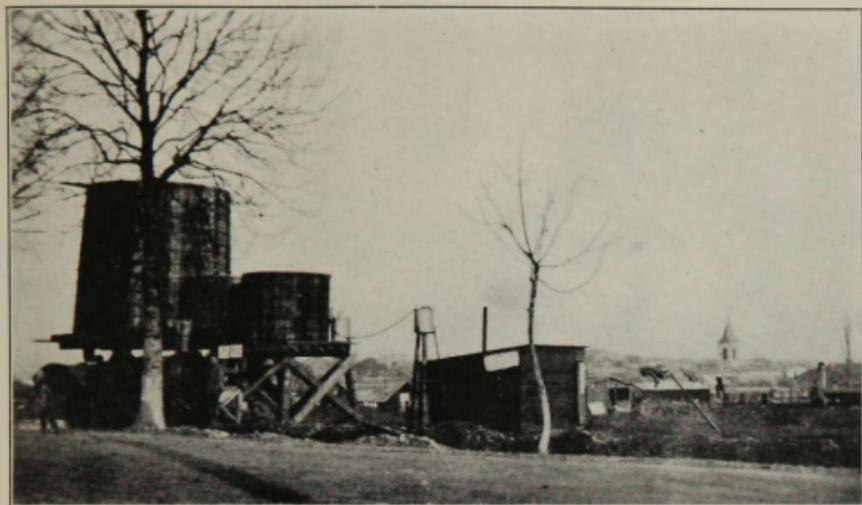


FIG. 55.—Water point, Grosrouvres, A. E. F., showing reservoirs and shower bath

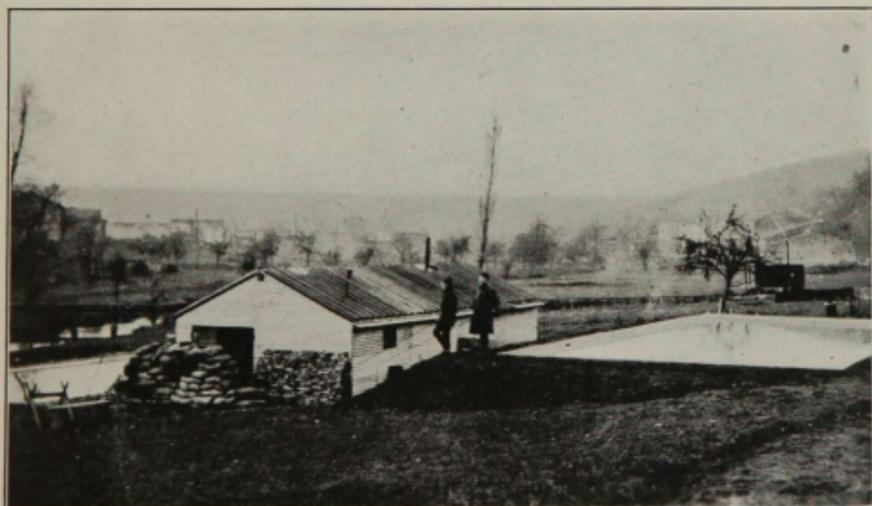


FIG. 56.—Euvezin water plant, American Expeditionary Forces. Exterior view

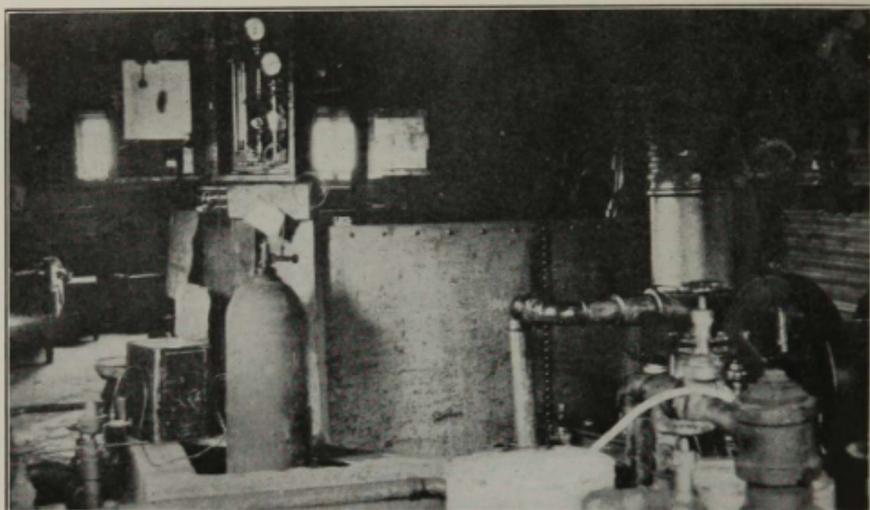


FIG. 57.—Euvezin water plant, American Expeditionary Forces. Interior of pump house, showing filter and chlorimeter

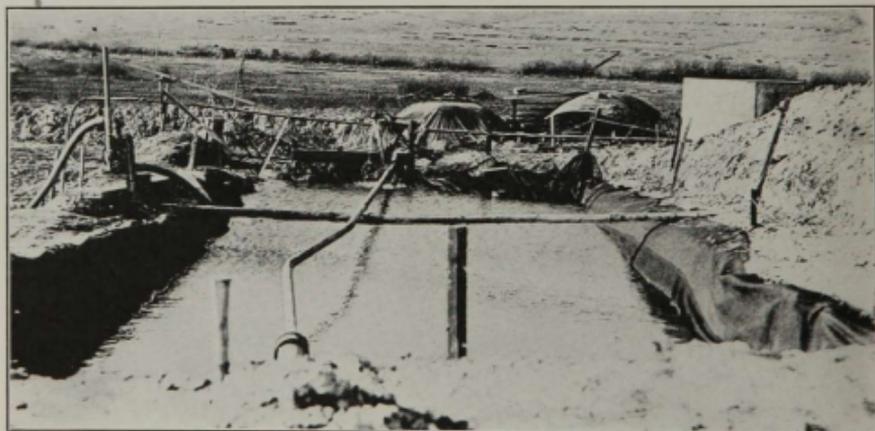


FIG. 58.—American canvas tank reservoir

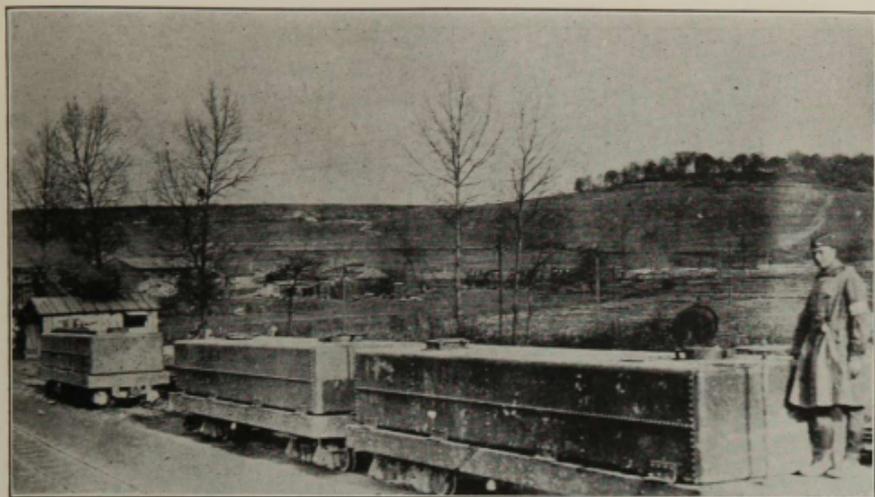


FIG. 59.—Light railway water-tank car, American Expeditionary Forces



FIG. 60.—Horse-drawn water carts



FIG. 61.—Trail-mobile water carts



FIG. 62.—Twelve-hundred gallon tank trucks, American Expeditionary Forces

at the rate of one cart for each company.⁶ They were mounted on two wheels, and were drawn by one animal. Motorized organizations had mobile kitchens.⁶ Part of the equipment of these kitchens was the trail-mobile, a water tank mounted on four rubber-tired wheels. The water carried in these containers was used for cooking purposes, and for filling sterilized water bags whence enlisted men obtained drinking water. Canteen fillers were provided at each filling station.⁷ Here, also, enlisted men obtained water for their canteens. Canteen fillers at filling stations in the American Expeditionary Forces were usually makeshift affairs due to a serious shortage of small valves. A fairly satisfactory filler was sometimes made at the front by having $\frac{1}{4}$ -inch holes, spread 12 inches apart, in a 1-inch pipe suspended over a trough. Men filling their canteens from such a filler were required to line up in squads; valve control of the water was placed in the hands of the noncommissioned officer in charge of the water point.⁷

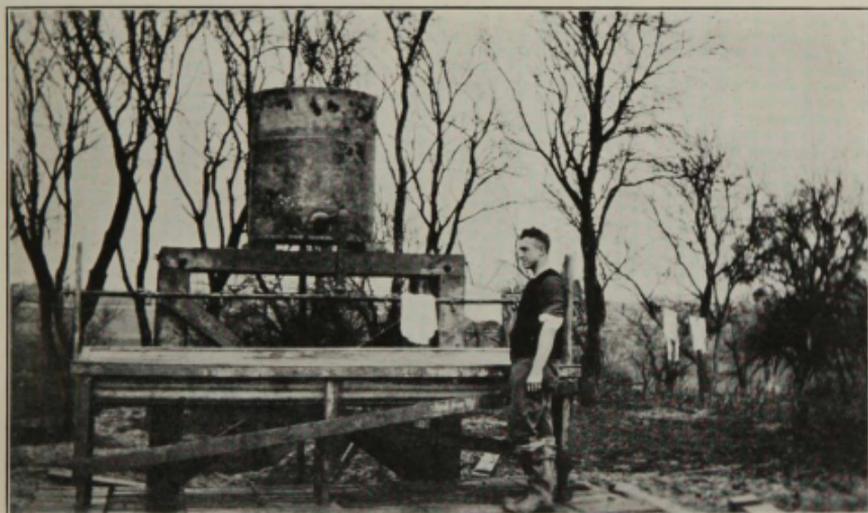


FIG. 63.—American bottle filler, or lavoir, with corrugated-iron trough

WATER SUPPLY FOR TROOP TRAINS

In France the ordinary facilities at the railroad stations where our troop trains regularly stopped consisted of from one to four faucets delivering water of an unknown quality under low pressure.⁸ At some of the more important stations the French had established coffee stops, and arrangements were made with the French authorities whereby our troops en route by railroad were served hot coffee.⁸ In addition, the American Red Cross had established canteens and rest stations at several other important points. These points were, for the most part, wisely selected; however, until June, 1918, no systematic attempt had been made to insure an adequate supply of potable water for our troops at regular intervals along the whole route they must take from port to front, or vice versa.

On March 20, 1918, orders were issued from headquarters, Services of Supply,⁹ providing for a board of officers to investigate the railroad route between Tours and Dijon. The board was instructed to "proceed along this route for the purpose of locating rest stations and preparing estimates for labor and material for the construction of same." The proceedings of this board, reported April 10 and May 13, 1918, included only a very superficial investigation with the water situation.¹⁰ However, in July, 1918, a concerted effort was made looking toward systematically supplying potable water to troops on troop trains, when a conference of representatives of the Engineer and Medical Departments was held, at which it was decided to take definite action. As an outcome of the conference an officer of the Sanitary Corps was detailed to make a special study of our troop movements in France and was instructed to make recommendations to provide for supplies of adequate and satisfactory water at certain intervals along the routes.¹⁰ Our troop trains were routed by

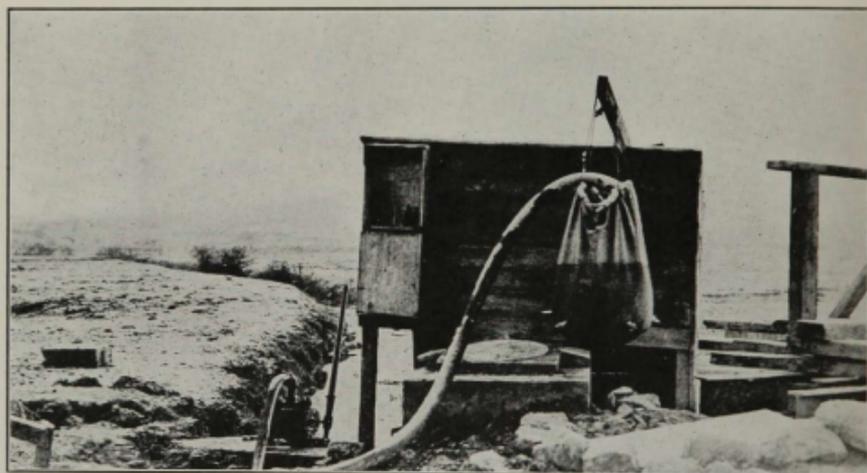


FIG. 64.—Water-sterilizing bag. Typical installation

the French, and though the trains so routed were not always run on schedule time the same points were ordinarily utilized as regular stops. This latter fact reduced the problem, primarily, to a study of the routes commonly used by our troop trains, and, secondarily, of the quality and quantity of the water supplies and of the facilities existing at those stations where troop trains regularly stopped for a period of 10 minutes or more. Some stations were immediately eliminated from consideration because of the limited supply of water, or because the railroad track yard was so large as to make it difficult to select a suitable point for the installation of accessible water supply facilities, or because of some other local condition which might render it inexpedient or dangerous to encourage detraining entire trainloads of troops.⁸

The preliminary investigation consisted of a study of main troop routes with an estimation of future troop movements; a study of troop train schedules as followed under ordinary conditions; a selection of important railroad stations

for a more detailed survey.⁸ This detailed survey of individual stations included information concerning (1) the frequency and size of passing troop trains in order to estimate the facilities necessary to meet a varying demand; (2) the ordinary length of time of stop; (3) the quantity and quality—including analysis—of existing water supplies; (4) the layout and the size of the track yard; (5) the construction necessary to install adequate facilities; (6) information as to whether or not the requisite authorization for such construction might be readily obtained from the French.

Then, according to the normal troop-train schedule, the most feasible points along the routes were selected in order to permit troops to fill their canteens at intervals of six or eight hours.⁸ If the sanitary survey showed the water to be of an approved quality and of adequate quantity, it was necessary only to install the requisite number of faucets to permit a whole trainload of troops to fill canteens within a reasonable time. With an ordinary pressure of 30 pounds per square inch in a 2-inch supply pipe a trainload of 1,200 troops⁸ should be able to fill canteens in about 15 minutes from 20 faucets.

At the average railroad station, however, the water was found to be unsafe for drinking without there having been some treatment for purification.⁸ It was possible, as an emergency measure, to install a sufficient number of sterilizing water bags in which such water might be treated, but the use of sterilizing water bags for this purpose was found not to be satisfactory: First, because of the number of sterilizing bags required and of the labor required. Assuming that two troop trains followed each other closely, at least 25 bags, with the necessary detail of enlisted men for filling and treating the water, would be required. Second, the difficulty of providing adequate supervision to secure uniform purification treatment. Third, the irregular and spasmodic requirements for troops in transit over many of the routes.⁸

The most satisfactory installation was an adaptation of the British method of furnishing water at regular railroad stops.⁸ This consisted of treating the water in two rectangular tanks each having a capacity of 400 gallons and fitted with suitable faucets located along the side of the tanks, or another to a pipe leading from each of the tanks. The tanks were connected, the connecting pipe being fitted with a valve to permit alternate use so that while one tank was in use the contents of the other could be undergoing treatment. Where water was piped to the tanks this installation was readily and satisfactorily taken care of by one trained enlisted man.

The water supplies at railroad stations, which were surveyed by our water service, were labeled.⁸ For this purpose an effort was made to get a standard set of water signs for posting. However, because several standards for water labels were evolved it was difficult, when traveling from one section of the American Expeditionary Forces to another, for supervising officers to determine that all signs had been posted by our water service. Also, it was difficult to placard at places like railroad stations, water supplies which were for civilian consumption as well as for our troops.

The development of adequate water points at railroad stations, to include the main routes followed by our troops, was well under way at the time of the signing of the armistice.⁸

The next step contemplated, and which would have been carried out had hostilities continued, was to place in the hands of the various troop movement bureaus at the base ports and forwarding camps all available information on the quality of the water supplies and facilities that existed at the railroad stations our troops would pass.⁸ Then a list of stations where safe drinking water could be supplied troops en route could have been given to the train commanders concerned at the beginning of a trip, together with instructions to prohibit troops from securing drinking water at unauthorized places. It frequently happened that after a troop train had been on the road for several hours a train commander would permit his troops to get water from unauthorized sources, not knowing, perhaps, that facilities existed at the next station for filling canteens with approved water.⁸

The relatively small number of men on our average freight train in France permitted the crews to carry containers filled from approved sources with water sufficient to last two or three days.⁸ Our main freight routes were somewhat different from the routes ordinarily followed by our troop-train movement, and no special precautions were necessary.⁸

Our hospital trains had a tank capacity sufficient for about three days' supply.⁸ In addition, they were equipped with apparatus to sterilize water for drinking purposes, so that it was necessary only to survey and label such supplies of water as the hospital trains might have occasion to use. As in other cases, water supplies not so surveyed and labeled by our water service were considered as suspicious and consequently were treated for purification.⁸

SANITARY CONTROL OF WATER SUPPLIES

Mention has been made of the divided responsibility for the sanitary control of water supplies in the American Expeditionary Forces, and of the various orders which were promulgated by General Headquarters, A. E. F., fixing this responsibility. In order to carry out these orders, officers of the Engineer and Sanitary Corps, experienced in water-supply control, were detailed for service in the water analysis laboratories.¹⁹

THE DUTIES OF A DIVISION SANITARY INSPECTOR OF WATER

The officer of the Sanitary Corps assigned to the duties of water inspector in each of our divisions overseas was under the control of the division sanitary inspector. He aided the division sanitary inspector in the discharge of the responsibilities placed upon the Medical Department with reference to the quality of water supplies. His functions included giving advice or instruction relating to the purity of water supplies, and the taking of such steps found necessary to provide water of good quality in so far as this was not covered by the water-supply service, A. E. F.⁵

In areas occupied by our divisions, whether within or without the army zones, the division sanitary inspector of water was charged with carrying out the above-mentioned responsibilities. In all other areas of the American Expeditionary Forces these responsibilities rested upon the local Medical Department authorities.⁵

STATIONARY LABORATORIES FOR WATER ANALYSIS

Plans were made for the establishment of laboratories, as they might be required, in the base sections, intermediate and advance sections of the Services of Supply, and facilities were provided for water analysis in the central Medical Department laboratory, Dijon, and in the Army Laboratory No. 1, Neufchateau. The first few of the laboratories were organized during January and February, 1918.¹⁰ By December 31, 1918, laboratories for the analysis of water had been established as follows:¹⁰ Water analysis laboratory, Paris; water analysis section, base laboratory, Base Section No. 1, St. Nazaire; central Medical Department laboratory, Dijon; Army Laboratory No. 1, Neufchateau; water laboratory, Division Construction and Forestry, Tours; water analysis section, base laboratory, Base Section No. 5, Brest; water analysis laboratory, Base Section No. 7, La Rochelle; water analysis section, base laboratory, Base Section No. 2, Bordeaux; water analysis laboratory, Base Section No. 3, Winchester, England; water analysis laboratory, intermediate section, Nevers; water analysis laboratory, American Embarkation Center, Le Mans.

The laboratories at Neufchateau, at Dijon, and at Brest were not established as water-supply laboratories, nor were the personnel which operated them a part of the water-supply service. On the contrary, these units had been organized in the United States for general Medical Department work, including water analysis, and they continued to exercise that function, cooperating with the water-supply service in the analysis of water.¹⁰

FIELD LABORATORIES FOR WATER ANALYSIS

Three types of field laboratories were used in the American Expeditionary Forces. These are the mobile laboratories, the transportable laboratories, and the laboratories of the water-purification trucks, known as "sterilabs."¹⁰

MOBILE LABORATORIES

The equipment of the mobile laboratories was contained in an inclosed body provided with doors and windows, and mounted on a 1½-ton White chassis. The apparatus supplied to these laboratories was quite complete, including autoclave, hot-air sterilizer, and incubator, together with apparatus and chemicals necessary for the bacteriological examination of waters, and such chemical and toxicological determinations as were advisable.¹⁰

In addition to the mobile laboratories especially designed for water-supply work, the larger, more complete mobile laboratories, equipped for general laboratory work in the American Expeditionary Forces, were employed in making surveys of the water supplies of some districts in addition to their other duties.¹⁰ The mobile laboratory attached to United States Army Laboratory No. 1, Neufchateau, was utilized in this manner. The car had an English-made body mounted on a Peerless truck chassis. The equipment included two oil-burning incubators, an autoclave, an inspissator, a hand centrifuge, a chemical balance, and a microscope as well as stains and the material necessary for the preparation of culture media. Surveys were

made in the divisional training areas north of Langres. The work was done by going to the town occupied by the American zone major, locating there, and from that point making trips by motorcycle with side car for the collection of the water samples and the making of the sanitary surveys. The motorcycle with side car was provided by the division surgeon occupying the area at the time. This method of procedure permitted receiving all samples and starting the bacteriological examination within two to five hours after the collection of the water samples.¹⁰

One of the regular type mobile laboratories was used in the intermediate section, west, A. E. F. This laboratory was very useful when surveys were being made of areas at a distance from the water analysis laboratory, office of the director of construction and forestry, A. E. F., at Tours, for it was possible to set up the mobile laboratory and to make analyses of samples a few hours after collection. If the same work had been carried out in analyzing the samples at the Tours laboratory it often would have been two or three days before the analysis could have been started after the sample had been



FIG. 65.—Interior of mobile laboratory

collected. The mobile laboratory afterwards was moved to the water analysis laboratory, intermediate section, east, at Nevers, and was used in the same way.¹⁰

TRANSPORTABLE LABORATORIES

Transportable laboratories were provided to take care of the work that was beyond the capacity of the mobile laboratory used for water analysis during the Meuse-Argonne operation. One of the two transportable laboratories was attached to Company D and the other to Company E of the 26th Engineers, the mobile laboratory already having been attached to Company F of that organization.¹⁰

The equipment of the two transportable laboratories consisted in each case of four wooden chests containing the necessary equipment for bacteriological water examination, and a certain amount of chemical work, including some toxicological determinations. When it was desired to operate it the

apparatus was removed from the wrappings and packing material and set up in any available space; however, a certain amount of protection was found to be necessary in order that the incubator might be kept within the required range of temperature.¹⁰

These transportable laboratories were made up in the American Expeditionary Forces, utilizing for the purpose the chests of apparatus described in the Manual for the Medical Department, paragraphs 930, 931, and 939, supplementing these by supplies drawn from the general Medical Department supplies. To carry the additional apparatus, another chest was used. After these laboratories had been in use some time this equipment was increased by the addition to each of a small autoclave taken from the laboratories on two of the sterilabs. The personnel of one of the laboratories was able to increase its stock of chemicals and apparatus by salvaging suitable material from a pharmacist's shop in one of the reoccupied towns. The list of apparatus and chemicals originally placed in these laboratories follows:¹⁰

Articles	Quantity	Articles	Quantity
Box No. 1		Box No. 3	
Oven, sterilizing	1	Incubator (complete)	1
Can sodium carbonate	1	Test tubes, boxes	3
10 c. c. pipettes	20	Casseroles	2
1 c. c. pipette	20	100 c. c. graduate	1
Pipette sterilizing box	1	Spatula	1
Wire baskets, including tubes	9	Rubber stoppers, pounds	1/2
Copper media bucket	1	Spoon	1
Petri-dish holders	2	Gummed labels, boxes	4
Petri dishes	24	Tweezers, pairs	1
Sheets filter paper	6	File	1
Rubber tubing, feet	6	Burette clamp	1
Towels	12	Filter paper, packages	2
Matches, cartons	2	Kerosene burner	1
Record cards	100	Gasoline torches	2
Packages filter paper	3	Assorted corks	2
Tubes litmus paper	2	Muslin, pounds	2
Bunch of tags	1	Ladle	1
Pinch cocks	2	Gauze, 5-yard packages	1
Test tube brushes	2		
Pencils	4	Box No. 4	
Gummed tubing, 6-inch pieces	2	Arnold sterilizer	1
Soap, boxes	1	Absorbent cotton, package	2
Record book	1	Alcohol, cans	1
Test tubes, 60 by 9 mm., box	1	Graduate, 250 c. c.	1
Test-tube racks	6	Agate funnels	2
Ring stand (complete)	1	Shears	1
Oven thermometer	1	Thermometer, 100° C.	1
Thermometer, 110° C.	1	Burettes	2
Glass tubing	1	Heavy twine, balls	2
Ni-chrome wire	1	Ni-chrome wire	1
Squares asbestos	2	Rubber stoppers, pounds	1/2
Crucible tongs, pairs	1	Gasoline can (empty)	1
		Glass funnel (small)	1
Box No. 2		Balance	1
Galvanized buckets	2	Glass funnel	1
Lantern	1	Colony counter	1
200 bottles	24	Harvard scale and weights	1
Heavy paper	1	Tripod	1
Agar-agar	1	Twine (light), balls	1
Beef extract	1	Petri dishes	36
Bottles	8		
Solution bottles	8		
Balls string	3		

At the time the transportable laboratories were equipped for use in the advance area, a sufficient number of Medical Department chests (pars. 930, 931, and 939, M. M. D.) were obtained to form the nucleus for several other transportable laboratories; also, at the same time, several toxicological laboratories were obtained in two chests from the French Army¹⁰ A combination

of the Medical Department chests and the French laboratories was used for the nucleus for permanent laboratories in Base Section No. 7, at La Rochelle and intermediate section, east, at Nevers. A similar assortment of chests was sent to supplement the apparatus in the laboratories in Base Section No. 1, Base Section No. 2, and intermediate section, west. In some of these laboratories the chests afterwards were used in equipping transportable laboratories which were used for the same purpose that the mobile laboratory was used in intermediate section, west and east.¹⁰

LABORATORY OF THE STERILAB

Very little use was made of the laboratories of the sterilabs, one reason being that they further increased the load of an already overloaded truck; also, the officers in charge of them were of the opinion that the laboratories were not a necessary part of the equipment of the sterilabs, as the determination of the presence of free chlorine in the clarified water after a short length of time was a sufficient indication of the adequacy of the treatment.¹⁰

METHODS OF WATER ANALYSIS

To eliminate possible conflict of opinion, it was arranged that all water analysis laboratories of the American Expeditionary Forces use the same methods of analysis, and form judgments concerning the quality of water according to the same standards of purity.¹⁰ Standards of purity and methods of analysis were incorporated in a bulletin issued from the Central Medical Department Laboratory, Dijon, in August, 1918.¹⁰ The standard of purity adopted was practically the same as that adopted by the United States Public Health Service for waters in use on common carriers in interstate commerce in the United States. The methods were those in standard methods of analysis published by the American Public Health Association and the American Chemical Society, except that in many instances they were modified so as to save time or to make possible the use of simpler apparatus.¹⁰

CHLORINATION OF WATER SUPPLIES

The water-supply service required all water used for drinking purposes by the members of the American Expeditionary Forces to be sterilized when the water was found not to be potable by a series of bacteriological examinations. This policy was put into official form in General Orders, No. 131, G. H. Q., A. E. F., August 7, 1918, which read in part as follows: "All water to be used by American troops shall be considered of doubtful quality and, when required for human consumption, shall be treated, unless proven good, by a succession of satisfactory examinations and laboratory tests."

About 85 per cent of the supplies examined were found to be unsafe according to the standards of the Treasury Department for interstate carriers; hence sterilization was necessary, and the method universally employed was that of the use of liquid chlorine or the compounds of chlorine.¹⁰

LIQUID CHLORINE

The senior officer of the water-analysis laboratories in collaboration with representatives of the Museum Histoire Naturelle, Paris, made studies of the treatment with liquid chlorine of raw water from the Seine River, afterwards dechlorinated with sulphur dioxide.¹⁰ The results of these experiments were published in a small pamphlet entitled *La Chloration*. This pamphlet, published in French, proved of great help when it was necessary to obtain the permission and cooperation of the French for the installation of purification plants, for it explained and illustrated the use of liquid chlorine in the purification of water, a process which, at that time, was not generally known in France.¹⁰

In the advance, intermediate, and base sections of the Services of Supply and in the District of Paris, machines for treatment with liquid chlorine were installed in a number of cities and towns, in permanent camps, and at base hospitals, where the number of troops concerned warranted such an installation.¹¹ As a general rule, however, such an installation was not made for less than 1,000 troops.

The machines used in these permanent installations were of the Wallace and Tiernan type, both direct and solution feed treatment being used. From May 1, 1918, until May 1, 1919, 80 such chlorinating machines were installed at points in the sections of the Services of Supply.¹¹

The following data show the amount of liquid chlorine used and the effectiveness of the treatment of the water of the Cher River at Tours, France. The water was pumped by the French city plant. These data cover a period of 129 days, from October 1, 1918, to February 28, 1919:¹¹

Average number of gallons pumped in 24 hours.....	3, 500, 000
Amount of liquid chlorine added, in parts per million:	
Maximum.....	3. 12
Average.....	1. 87
Minimum.....	0. 98

	Days safe	Days unsafe *	Total count at 37° C. (median value)
Untreated water.....	0	129	146
Treated water.....	116	13	33

* The word "unsafe" here means the presence of *B. coli* in 30 c. c. portions.

At Dijon, France, the city water supply was treated with an average of 0.1 part per million of liquid chlorine. The treated supply was consistently safe, conforming with the Treasury Department standards for interstate carriers.

At the hospital center, Langres, France, filtered water from the Marne River was treated with liquid chlorine at the average rate of 0.5 part per million.¹¹ The treated effluent was consistently safe, conforming with the Treasury Department standards for interstate carriers.

MOBILE PURIFICATION TRUCKS

It was recognized at an early date that special water-purification trucks could be advantageously used as temporary water points to furnish supplies of good water at various points throughout the Army areas at such time and place as the use of the motorized facilities would take the place of a temporary pumping and sterilizing plant, or where it might not otherwise be feasible to provide any water point at all.³

It was not always possible to construct waterworks at the front by the time troops would need them. Under these conditions the special water-purification trucks were of great value. They were used in fixed positions as emergency water points, to be replaced by more permanent works when condi-

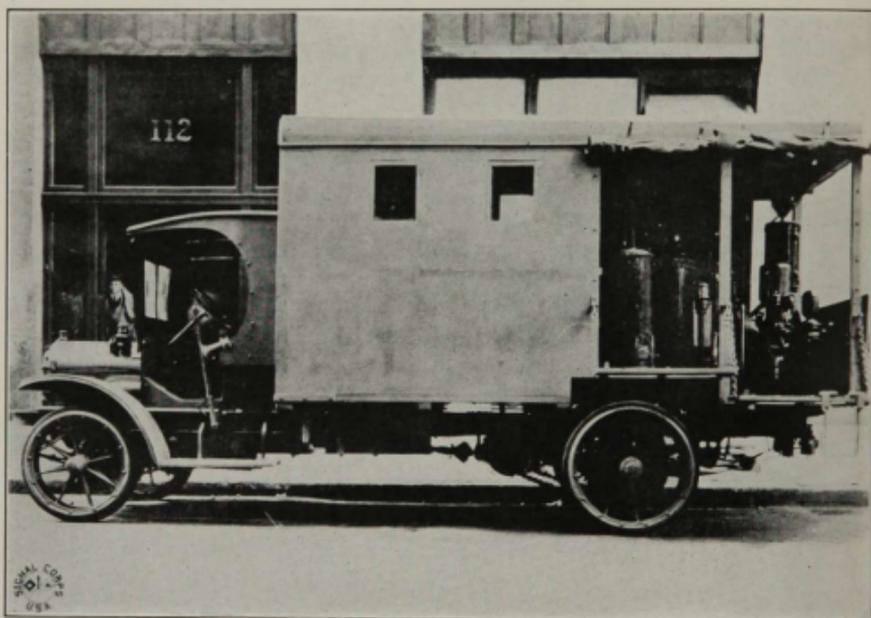


FIG. 66.—Sterilab. Water-purification truck. General view

tions justified it, and as quickly as such works could be built. When equipment was being purchased in the United States for the water-supply service of the American Expeditionary Forces in the summer of 1917, the advantage of having mobile purification trucks for emergency use in the field was foreseen, and designs were developed, a number of such purification trucks being purchased.³

STERILABS

Sterilabs were mobile purification trucks with whose equipment water was pumped, filtered, treated with liquid chlorine, dechlorinated (if necessary), and forced into an elevated storage tank, or directly into water carts or truck tanks.¹⁰ The essential equipment of a sterilab comprised a reciprocating pump

driven by a directly connected gasoline engine, the capacity of which was 25 gallons per minute; a rapid sand pressure filter with an alum-dosage device; a liquid chlorine apparatus of the Wallace & Tiernan solution-feed type; a contact tank to provide time for purification, a dechlorinating apparatus for removing with sodium thiosulphate any unpalatable excess of chlorine which had been employed in sterilization; a well-equipped laboratory for the bacteriological and chemical control of the chlorination. The whole of this equipment was mounted on a 3-ton truck chassis. Normally the water to be purified was drawn through a rubber suction hose and was discharged through a rubber pressure hose directly into water carts or into tank trucks. These sterilabs proved to be extremely valuable in that water of almost any character could be converted by them into a palatable and safe drinking water. Because of their mobility they could move forward, draw up alongside a stream or other source of supply, and begin delivering water within a very few minutes after their arrival.¹⁰

CHLORO-PUMPS

Chloro-pumps also were mobile purification trucks, differing from the sterilabs in that they were smaller, and were not provided with filtering equipment.¹⁰ With their equipment water was pumped, treated with liquid chlorine, dechlorinated (if desired), and forced into an elevated storage tank or directly into water carts or tank trucks. The chloro-pump consisted essentially of a reciprocating pump, driven by a directly connected gasoline engine, having a capacity of 30 to 35 gallons per minute; a Wallace & Tiernan solution-feed type liquid chlorine apparatus, contact tanks; equipment for dechlorination. A very small laboratory was provided for the chemical control of the purification treatment (using starch iodide or orthotolidine). The whole equipment was mounted on 1½-ton truck chassis. Like the sterilab, the chloro-pump was readily moved from place to place; however, as it was not provided with a filter, it could not deliver a satisfactory water unless it pumped from a relatively clear source of supply. This advantage rendered the chloro-pump much less useful than was the sterilab, and led to the experiment, just before the armistice was signed, of substituting for the chloro-pump an apparatus comprising a pump and chlorinator unit mounted on a 1-ton truck fitted with pneumatic tires.¹⁰

STATIONARY PUMPING INSTALLATION

In stationary pumping installations water was pumped to an elevated delivery tank, sometimes after having been chlorinated by means of a liquid chlorine apparatus or by means of Javelle water. These stationary pumping installations were especially valuable where large quantities of potable water were required, such as at filling points for water-tank trains or railway tank cars.¹⁰

STATIONARY PURIFICATION PLANTS

In some places purification plants were constructed to purify water from streams. These plants consisted of settling basins, equipment for adding alum when necessary, for sedimentation, mechanical filters, storage reservoirs for filtered water, liquid chlorine apparatus, and pumping equipment.¹⁰

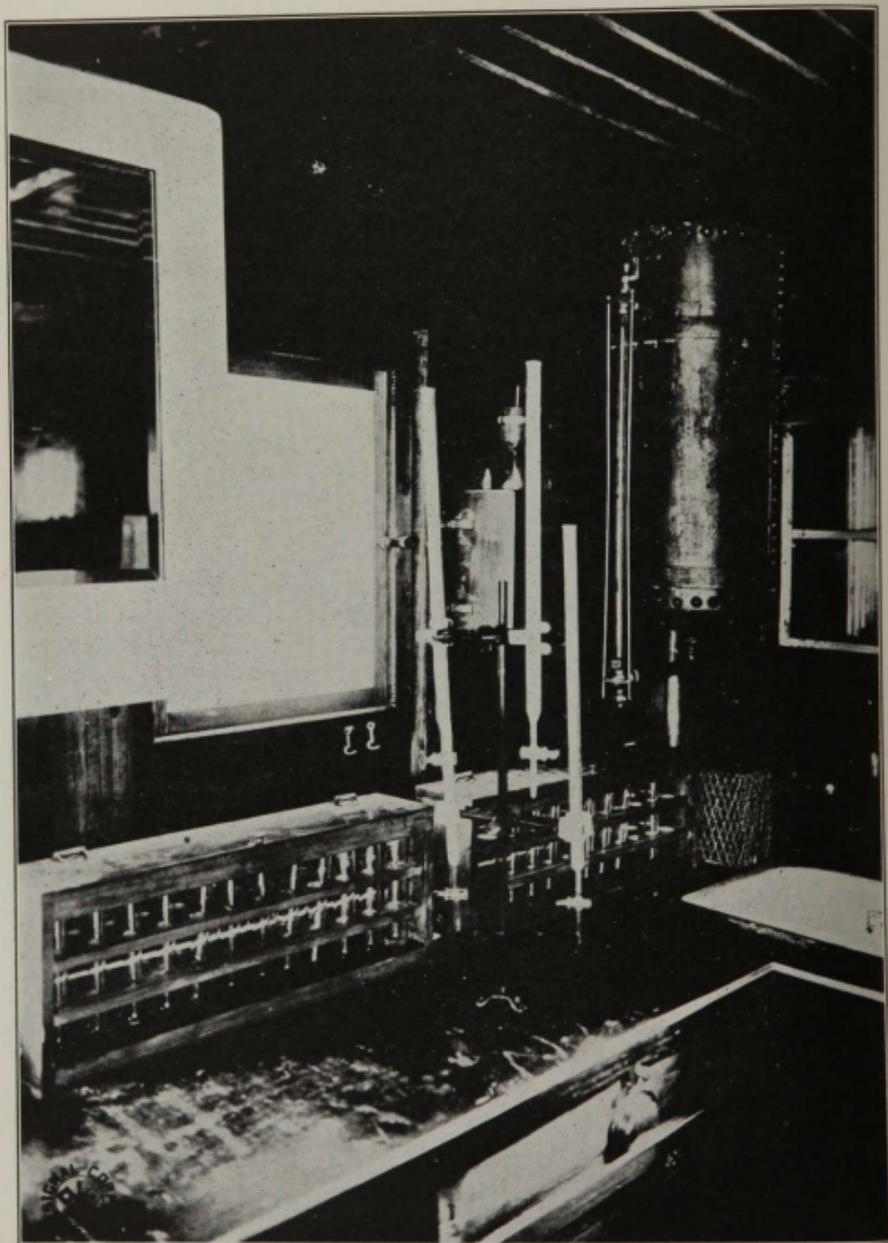


FIG. 67.—Sterilab. Water-purification truck, showing one end of laboratory with chemical cupboard, water tank, and apparatus

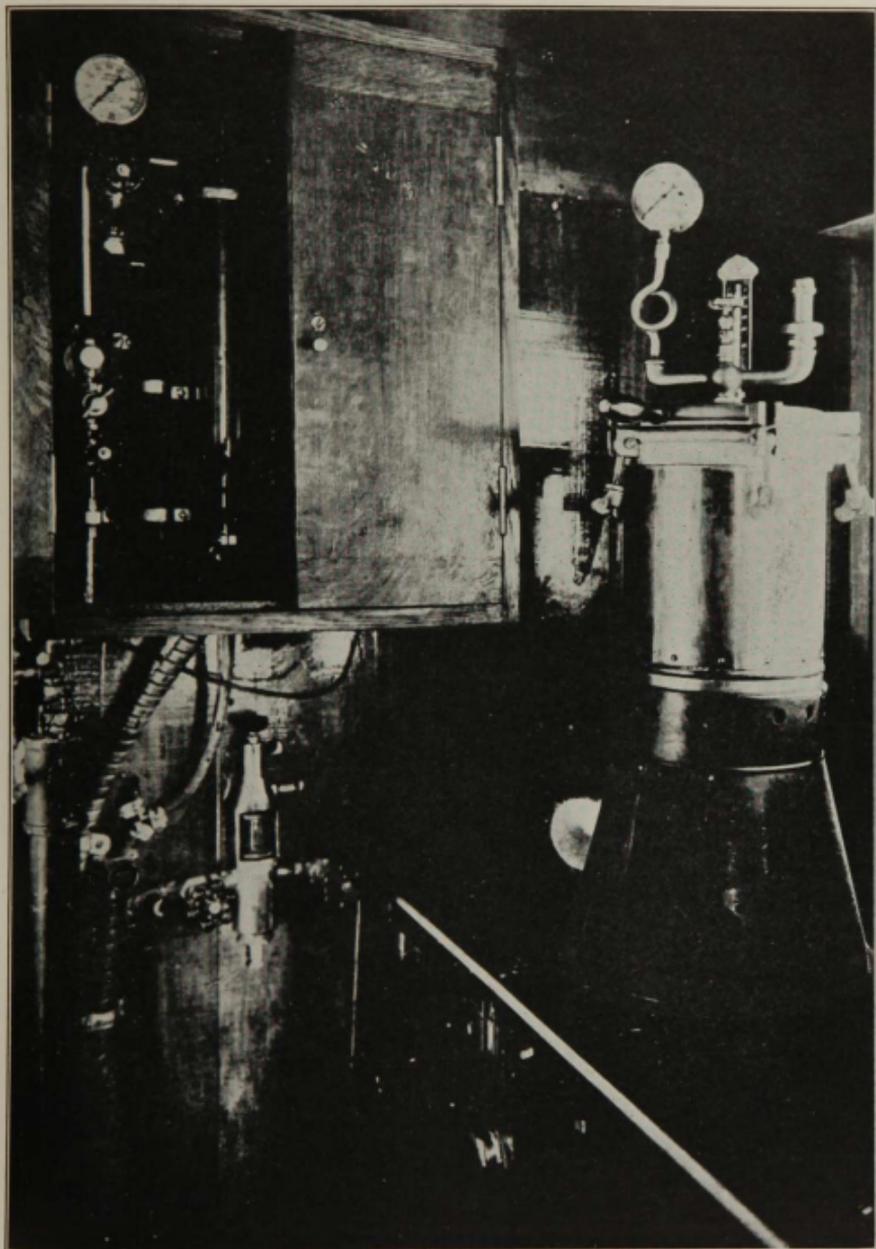


FIG. 68.—Sterilab. Water-purification truck showing one end of laboratory with autoclave and liquid chlorine apparatus

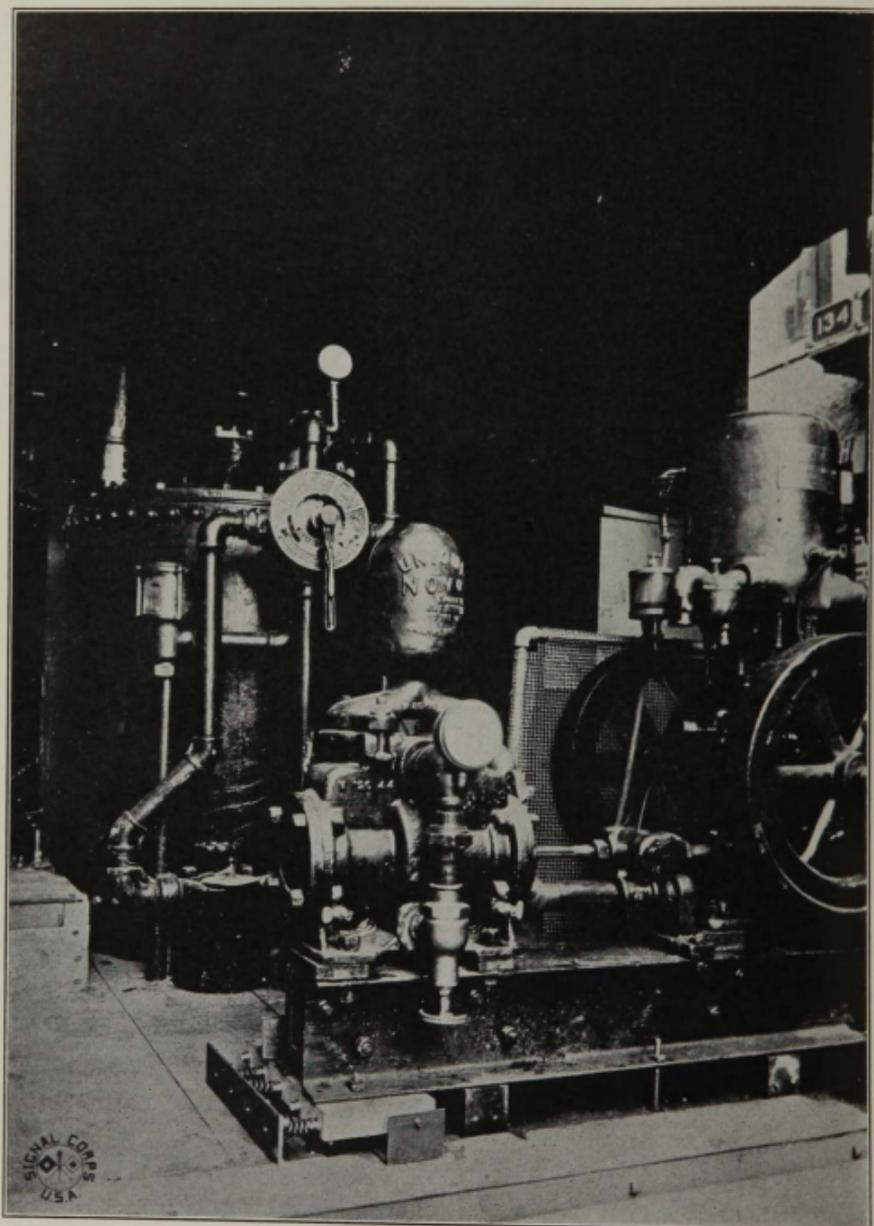


FIG. 69.—Sterilab. Water-purification truck, showing pumps and filter

CHLORINATED LIME IN SMALL CONTAINERS

Water sterilizing bags and water carts or tanks were used in all places where water was not treated in a central chlorinating plant, such as in the case of troops located in French villages in billeting areas and small organizations or detachments at a permanent station. Chlorination in these containers was accomplished by the use of chlorinated lime put in 1-gram portions in glass ampules. The supply for treatment was obtained in general from springs and wells belonging to the French inhabitants.¹¹

The official method of treatment with chlorinated lime in 1-gram tubes is described as follows in section (a) of paragraph 9, Memoranda 5 and 7 (revised), office of the chief surgeon, American Expeditionary Forces, division of laboratories and infectious diseases, dated August 14, 1918:

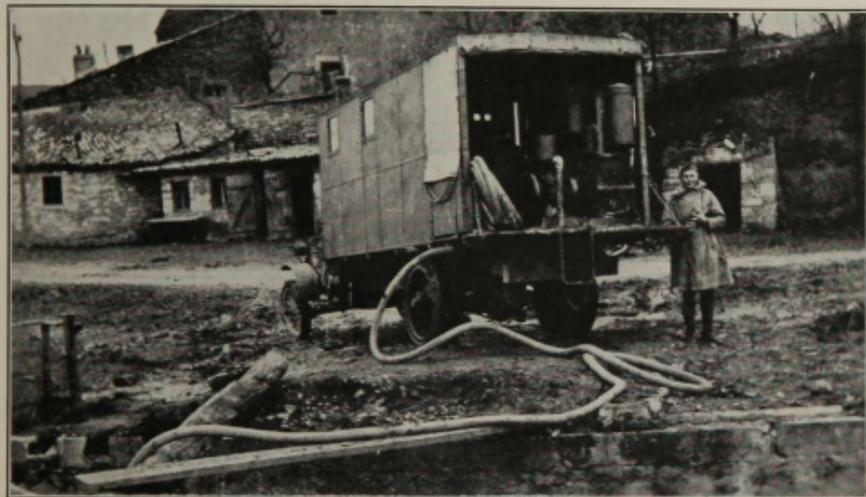


FIG. 70.—Sterilab in operation

(a) The official method of sterilizing water is by means of calcium hypochlorite. The powder is issued in 1-gram tubes. One tube is usually sufficient to sterilize one Lyster bag full of water. Break a tube of calcium hypochlorite into a clean ordnance cup, moisten the powder with a few drops of water, and mix into a smooth paste. Now fill the cup with water to within 1 inch of the top and mix thoroughly by stirring with a clean spoon. Add this solution to a Lyster bag filled with clear water, stir thoroughly, and allow to stand 30 minutes before using. After 30 minutes, test a cupful by adding 10 drops of a solution containing 10 per cent potassium iodide and 1 per cent soluble starch (supplied in laboratory equipment). The appearance of a blue color is indication that sufficient chlorine has been added to the water. If no color appears the water is highly polluted and should be reported immediately to the medical officer having water supplies under his supervision.

Difficulty was experienced in the American Expeditionary Forces in obtaining a supply of tubes of a uniform character.¹¹ The chief defects were the imperfect sealing of tubes; cracking and breakage in transit; use of chlorinated lime of an inferior quality; some tubes contained less than 1 gram of the powder. These defective tubes were eliminated to a great extent, in the case

of tubes in storage, by inspections. Defective tubes were classified as follows: (a) Those with one or both ends broken; (b) those with cracks of any size; (c) those in which the powder is moist; (d) those with pinholes in the end, being a sign of improper sealing; and (e) those which are only one-half the size of the average tubes.

Some inspections were made in warehouses at the base ports, but in order to avoid issuing tubes which had been broken in transit or whose contents had deteriorated from long standing in a warehouse after the first inspection, it proved advisable to inspect the supplies as near the time of issue to organizations as possible. In the case of divisional supplies, for example, inspections were made under the direction of the divisional water-supply officer.¹¹

Since many tubes were improperly sealed, or contained a chlorinated lime inferior in quality and in weight, recommendations were made asking that Government inspectors be placed in factories where tubes were prepared to see that specifications were complied with.¹¹

WATER PURIFICATION BY JAVELLE WATER

In many instances in our zone of the armies, instead of treating the water with liquid chlorine, each water cart, truck, tank car, or other container was treated by hand with a sufficient dosage of Javelle water to accomplish the required sterilization.¹⁰ Operators experienced in this work were supplied from the water-supply companies and from attached Sanitary Corps personnel. The treatment of water by Javelle water required very little equipment—a few measuring glasses, test tubes, starch-iodide solution, and Javelle water. For use in the First Army these materials usually were secured from the French *Service de Santé* and the glassware was calibrated and the necessary solutions were prepared or standardized in our mobile laboratories. The Javelle water, obtained from the French, contained from 40 to 65 grams of available chlorine per liter.¹⁰ A stock solution of 50 grams per liter was used in javellization, and the first supplies of varying strength were adjusted to this standard. For javellization of relatively small quantities of water, a weaker solution was prepared on the ground as needed, 1 c. c. of which would give a dosage of 1 part per 1,000,000 of chlorine to 1 gallon of water. The glassware used in javellization ordinarily was calibrated directly in the number of cubic centimeters corresponding to the number of gallons in the commonly used water containers, such as water carts and sterilizing water bags. This method provided a dosage of 1 part chlorine per 1,000,000 of water, a readjustment being made whenever necessary. For hand javellization of large quantities of water, such as railroad tank cars, the strong stock Javelle solution was employed. The hand-dosing system could be put into operation in less time than could a liquid chlorine apparatus, and an operation with a hand javellization apparatus could accompany advance parties under circumstances when the use of a mobile purification truck was utterly impracticable.

The general plan in an advance was to send mobile purification units and hand javellization operators with equipment as far forward and as rapidly as possible.¹⁰ These means were replaced with stationary chlorinators used in connection with pumping units whenever it was advisable and possible to do so.

AVOIDANCE OF STRONG TASTE FROM THE USE OF LIQUID CHLORINE OR COMPOUNDS OF CHLORINE

To most persons the presence of 0.6 part per 1,000,000 of excess chlorine in a water gives a slight but not disagreeable taste. Above this limit the taste becomes disagreeable, but with smaller amounts, for example, 0.2 to 0.4 part per 1,000,000, the taste is rarely noticeable. The avoidance of this taste of chlorine is accomplished by the adjustment of the dosage, by dechlorination by sodium thiosulphate, or by allowing the water to stand until most of the chlorine has been used in the oxidation of organic matter.¹¹

In a chlorinating plant, or in the use of a mobile purification unit in the American Expeditionary Forces, the operator could adjust the dosage to the rate of flow and thus not overdose a water, but the adjustment of dosage in the use of water sterilizing bags or water carts was not so simple a matter.¹¹ A 1-gram tube of powder of good quality, containing 28 to 33 per cent of available chlorine, will give 2 parts per 1,000,000 or more of free chlorine to a 36-gallon water sterilizing bag of water. With most waters in the American Expeditionary Forces a 1-gram tube of powder of this quality gave too large an excess of free chlorine.¹¹

By using the "cup-titration" method for 1-gram portions of chlorinated lime, described above, on page 797, the fraction of the content of a tube necessary for sterilization of a given water could be determined.¹¹ The use of the fraction of a tube, determined by this method, reduced the dosage sufficiently to prevent a disagreeable taste being imparted to the water and at the same time allowed a margin of safety for any variation in the quality of the chlorinated lime used.

The following data from experiments carried out at the Central Medical Department Laboratory, Dijon, France, show the efficiency of chlorination in a water sterilizing bag, and, in addition, the results of the purification treatment of water with a fraction of a tube. Titration of water from the Ouche River, by the cup-titration method, showed that one-half of a tube of chlorinated lime which contained 1.035 grains of powder, possessing 22.9 per cent available chlorine, was sufficient to sterilize this water without imparting to it a disagreeable taste. The bags were hung in the laboratory building at a temperature of 18° to 20° C. The table following gives the results of the treatment.¹¹

TABLE 42.—Showing the results of treating water in water sterilizing bags with calcium hypochlorite

[Period of time: February 3, 1919, to February 8, 1919]

Source, water from River Ouche, at Dijon	Time elapsed since treated, hours	Total count on agar	Bacteria		Chlorine, parts per million, added	Chlorine, parts per million, found (excess)	
			Number of 10 c. c. tubes positive out of 5	<i>B. coli</i> in			
				1.0			0.1
Feb. 3, 1919							
Untreated.....	660	5					
Feb. 4, 1919							
Water sterilizing bag, untreated.....		700	5				
Water sterilizing bag, treated.....		110	0		1.30		
Do.....	1 ³ / ₂	80	0				
Do.....	1 ³ / ₈	54	0				
Do.....	1 ³ / ₂	20	0			0.60	
Do.....	1	18	0				
Do.....	2	23	0				
Do.....	3	22	0				
Do.....	4	11	0			.60	
Do.....	6	12	0			.60	
Do.....	7	6	0				
Do.....	23	12	0			.60	
Do.....	25	14	0			.25	
Do.....	28	6	0			.17	
Do.....	31	9	0				
Do.....	36	100	0				
Do.....	47	260	0			.10	
Do.....	50	100	0			Trace.	
Do.....	52	350	0				
Do.....	56	81	0				
Do.....	71	500	0				
Do.....	75	200	0				
Do.....	77	3,000	0				
Do.....	96	5,000	0				

A number of water sterilizing bags in use where troops were billeted in French villages, under field conditions, and using different sources of water supply, were treated with one-half tube (0.5 gram) amounts of chlorinated lime.¹¹ Of samples taken from 56 of these bags, all showing positive tests for free chlorine, only 2 were classified as nonpotable by a bacteriological examination (Treasury Department standards). Both of these samples were taken 24 hours after treatment. One was reported nonpotable on account of a high total count, but no *B. coli* were present in a 50 c. c. portion, while the other showed a high count and 80 *B. coli* per liter. Water treated with this reduced dosage did not have a disagreeable taste, and a sterile supply was obtained.¹¹

CONTROL OF CHLORINATION

In the case of central chlorinating plants, control of treatment was maintained by bacteriological examinations and by use of indicators, such as starch-potassium iodide or orthotolidine, in testing for the presence of free chlorine. Control of treatment in water sterilizing bags and water carts and of the effluent from sterilabs and chloro-pumps usually was maintained by the use of the indicators just mentioned. Bacteriological analyses were made from time to time to check the efficiency of the control with indicators, but only in very rare cases were samples of water which gave a positive test of free chlorine found to be nonpotable.¹¹

WATER PURIFICATION AT THE FRONT, FIRST ARMY WATER SUPPLY SERVICE

QUALITY STANDARD

The general policy in the First Army, A. E. F., was to consider all water without treatment as unfit for human consumption until proved to the contrary by reported analysis. Methods of analysis and the standard for judging the quality of water were in common with those adopted for the American Expeditionary Forces as a whole.¹⁰

METHODS OF TREATMENT

Various combinations of purification methods were used in the First Army, dependent upon the character of the available water. In all instances some form of chlorine was used as the disinfecting agent.¹⁰

WATER SUPPLY AND PURIFICATION, ST. MIHIEL OPERATION

PURIFICATION UNITS

Prior to the St. Mihiel operation, which began September 12, 1918, 11 mobile purification units (7 sterilabs and 4 chloropumps) were located at the following points, where for the greater part they furnished water for troop concentrations, and whence they could be moved forward as the advance warranted:¹⁰ Etang-la-Moses, Manonville, Etang Neuf de Mandres, Etang Rome, Leoval, Lagny (3), Griscourt, Liverdon, Mouilly.

After the advance the mobile purification units were moved forward to the following places: Essey (2), Pannes, Euvezin, Thiaucourt (later Bouillonville), St. Baussant, Mouilly, (later, St. Mihiel), Bouconville (later Bois de Creve), Leoval (later Pannes), Manonville (later St. Baussant), Minorville (later Euvezin).¹⁰

HAND JAVELLIZATION

To supply troops with water as they advanced into areas where previously it had been impossible to develop water supplies, narrow-gauge railway tank cars were filled with water at conveniently located water points in the immediate rear.¹⁰ This water was treated with Javelle water, after which it was carried forward to small reservoirs, which served as advanced filling points for water carts, etc. Immediately after the advance, a scarcity of water in the vicinity of the Grand Tranchee was relieved by using motor trucks, loaded with tanks and casks of water, treated by javellization. These trucks made regular trips over established routes, or what formerly had been "No Man's Land," supplying organizations along the routes with water.¹⁰

CHLORINATOR INSTALLATIONS

Prior to the advance, stationary pumping water plants, equipped with liquid chlorine apparatus of the Wallace & Tiernan solution-feed type, had been installed at Grosrouvres and Foret de Puvénelle.¹⁰ The equipment at Foret de Puvénelle also included a coagulation and sedimentation basin for clarifying the water. This basin was 60 feet long, 8 feet wide, and had an effective depth

of 5 feet. The water which supplied it flowed from Esche Creek through a wooden conduit having a cross-sectional area of 2 square feet and a length of 15 feet, and entered the basin at one end where it was treated with a solution of aluminium sulphate in a proportionate amount based on the rate of pumping. The effluent from the basin came from the end opposite that of the intake, thus there was allowed a sufficient length of time for coagulation and sedimentation. To prevent seepage the basin was lined with canvas, waterproofed by means of a mixture of pitch and tar.

Soon after the advance of our troops was made stationary pumping plants, equipped with Wallace & Tiernan solution liquid chlorine apparatus, were installed at the following places forward:¹⁰ Monsard Woods, Lahayville, Essey, Euvezin (German system with extensive piping), Euvezin, Bouillonville, St. Benoit (Etang de Vigneulles), Maizerais.

WATER SUPPLY AND PURIFICATION DURING THE MEUSE-ARGONNE OPERATION

USE OF MOBILE PURIFICATION TRUCKS

Just prior to the beginning of the Meuse-Argonne operation, September 26, 1918, 10 mobile purification trucks and 1 mobile laboratory were moved from the St. Mihiel region to the Meuse-Argonne area. Five purification trucks were placed in operation for supplying water to troop concentrations at the following points:¹⁰ La Chalade, Recicourt, Longbut, Vienne le Chateau, and at a point on the road between Clermont and Les Islettes. The other five purification trucks were placed at points from which they could be readily moved to advanced positions as the operations warranted.

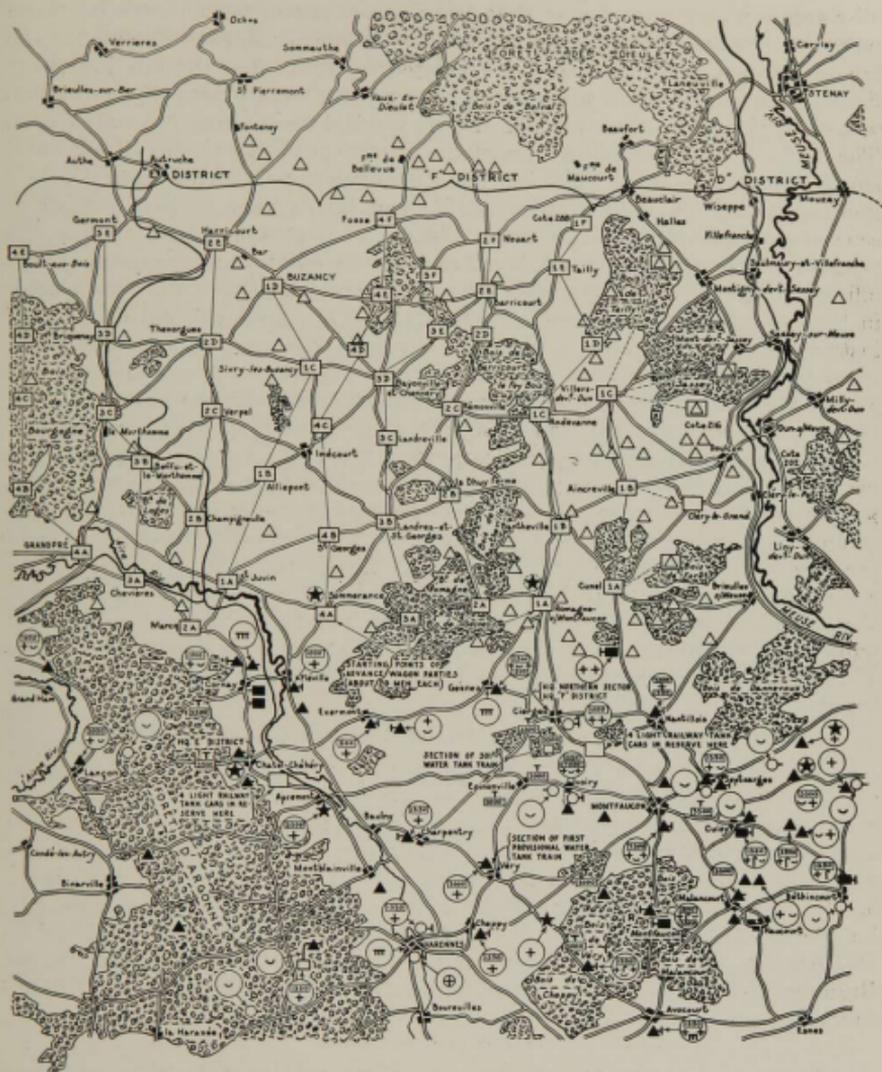
As the advance progressed, the purification trucks were pushed as far forward as was practicable and were placed in active operation. The following tabulation shows the locations of the mobile purification trucks at 10-day intervals from October 1 to November 10, 1918:

October 10	October 20	November 1	November 10
Recicourt.	Recicourt.	Recicourt.	Recicourt.
Charpentry.	Fleville.	Fleville.	Fleville.
Brabant.	Brabant.	Bras.	Bras.
Varennes.	Cheppy.	Cheppy.	Buzancy.
La Harazee.	Haucourt.	Bois des Septsarges.	Nouart.
Cheppy.	Guercourt—Cuisy road.	Guercourt—Cuisy road.	Barriecourt.
Lancon.	Lancon.	Lancon.	Vaux-en-Dieulet.
Bethincourt.	Apremont.	Apremont.	Brabant.
Malancourt.	Sagmoneaux.	Brabant.	Dun-sur-Meuse.
Very—Avocourt road.	Very—Avocourt road.	Very—Avocourt road.	Le Champy Haut

STATIONARY LIQUID CHLORINATORS

As the mobile purification trucks were moved forward, following the advancing troops, they were in many cases replaced by stationary pumps with attached liquid chlorine apparatus. Sometimes hand javellization was resorted to. Liquid chlorine apparatus was installed at the following places:¹⁰ Aubreville, La Chalade, Varennes, Bethincourt, Avocourt, Ivoiry, Moulin de Raffecourt, Apremont.

About the 1st of October, 1918, after the first phase of the Meuse-Argonne operation, it was decided by the water-supply officer of the First Army that



EXPLANATION OF SYMBOLS

- | | |
|--|---|
| <p>☐ RESERVOIR OR TANK (NUMBER INDICATED CAPACITY IN GALLONS)</p> <p>— PIPE LINE WITH RESERVOIR</p> <p>⊕ FACILITY FOR FILLING WATER CARTS OR TANK TRUCKS</p> <p>⊕ HYDRANT FOR FILLING LOCOMOTIVES OR TANK CARS</p> <p>⊕ HYDRANT FOR FILLING CANTEENS AND OTHER SMALL CONTAINERS</p> <p>⊕ WATER TROUGH FOR ANIMALS</p> <p>⊕ SHOWER BATH</p> <p>★ STERILISER (MOBILE PURIFICATION TRUCK)</p> <p>★ CHLOROPUMP (MOBILE PURIFICATION TRUCK)</p> | <p>⊕ WATER POINT SUPPLIED BY LIGHT RAILWAY TANK CARS</p> <p>⊕ WATER POINT SUPPLIED BY WATER TANK TRAINS (MOTOR)</p> <p>△ PROBABLE LOCATIONS OF SPRINGS</p> <p>▲ SPRING</p> <p>▲ HAND PUMP AT SPRING</p> <p>▲ POWER PUMP AT SPRING</p> <p>▲ HAND PUMP AT WELL</p> <p>▲ POWER PUMP AT WELL</p> <p>○ HAND PUMP AT STREAM OR LOCATED AWAY FROM SOURCE OF SUPPLY</p> <p>○ POWER PUMP AT STREAM OR LOCATED AWAY FROM SOURCE OF SUPPLY</p> |
|--|---|

SCALE 0 1 2 3 4 5 10 15 20 KILOMETERS

FIG. 71.—Schematic plan for advance water supply in the Meuse-Argonne operation, October 30, 1918

all water supplied to troops of that army and obtained from developed water points in the area occupied by it should be made potable.¹⁰ Experience and laboratory examinations had demonstrated by that time that in the entire fissured limestone region west of the Meuse there were practically no natural water supplies whose bacteriological purity could be counted on consistently. The decision taken, therefore, meant the treatment of practically all the water supplied to troops of the First Army in the northern part of the area. Only 10 mobile purification units were available and but a very limited number of separate chlorinators for use in connection with pumping plants. For the remaining water points hand javellization was employed. Sanitary Corps officers, attached to water supply companies, trained men of these companies in the operation of hand javellization, and used the most efficient of them as instructors. To economize in men, water guards were used as operators of the hand javellization method of purification whenever it was practicable. Water guards were left at every water point of importance to direct water-cart circulation, to prevent wastage, and to supervise the sanitary policing of the place. An important phase in hand javellization was the sending of men equipped with materials for this work along with advance working parties sent forward from the water-supply companies. These advance parties—usually four from each company—carried tools, pipe, etc., in wagons, and followed immediately upon the advance of the Infantry. In this way it was possible to chlorinate the water as it became available, and this as a rule was much more rapid than if the arrival of the mobile purification trucks had to be awaited. Also in a number of instances the use of the trucks would have been impossible because of the inability to approximate closely the trucks to the source of the water supply.¹⁰

HAND JAVELLIZATION IN THE FIRST ARMY, MEUSE-ARGONNE OPERATION

Water was treated with Javelle water by hand dosing at the following places:¹⁰ Cuisy, Septsarges, Consenvoye—Brabant road, Brabant—Samognoux road, Samognoux, Ivoiry, Montfauçon—Avocourt road, Geoveau pumping station south of Montfauçon, Cheppy, Vraincourt, Ville sur Consarces, Gesnes, Ferme de Madeleine, Mantillois, Apremont, Buzancy, 1 km. (0.6 mile) north of Montfauçon, 1 km. north of Exermont, 1 km. north of Cornay, Romague, La Dery Ferme, Auzeville, Gercourt, Vaux-ca-Dieulet, Abri de Choquet, Charpentry, Chatel-Chehery, Exermont, Lancon, Le Clair, Fleville, Fosse, Grandpre, Marcq, Sevry-sur-Meuse, Sommath, Jubecourt, Dombasle, Drillancourt.

CANTEEN FILLING POINTS

At practically every water point in the northern part of the Meuse-Argonne area, controlled by our troops, provision was made for filling canteens with chlorinated water for troops on the march.¹⁰ This provision ordinarily was made by means of water sterilizing bags, which had the advantages of being easily transportable, when empty, and of having several taps from which canteens could be filled.

WATER CONSUMPTION OF ARMIES

The following extract from the report of the officer in charge of the water-supply section, American Expeditionary Forces, on the activities of the section is of interest in connection with the consumption of water by armies:³

In Appendix 20 there is given a compilation of data on the quantities of water taken under various conditions by men and animals. The first impression derived from these figures is that they vary widely and do not seem to afford any consistent basis for fixing unit quantities of water that ought to be provided.

The figures can at best be taken only as a general guide. Under field conditions it is not often easy to get dependable measurements of water. It is in many cases difficult to fix the number of men and animals to which any figures of water quantities should apply. It might be natural to consider that the lower of these figures could be taken as extreme minimums, but this would not be a logical deduction. The amount of data is small and it is known that large masses of men and animals have under stress of necessity carried campaigns to a successful termination with much smaller quantities of water than these.

It is, of course, necessary to have some figures set as a guide to an engineering force in the field to serve as a basis for design where time and the exigencies of field service permit such consideration to be given. In many situations this can not be done. The quantities that can be made available will frequently be limited by the meagerness of local natural resources, by the shortage of time during hurried preparations for an attack, by limitations of equipment or materials, by imperfect information as to the number of troops or animals to provide for, or by various other conditions incident to the military situation. They may thus bear no relation to the unit quantities considered as desirable.

The commander in chief, in a communication dated November 15, set a limit for water to be supplied at semipermanent cantonments and billets at 10 gallons per man per day and for hospital use 25 gallons per man per day. The data relating to water consumption at British hospitals given in Appendix 20 indicates clearly that 25 gallons is an unnecessarily large allowance for all hospitals. For extensive hospitals of the barrack type, such as the 1,000-bed units and the 300-bed units adopted as standard by our Medical Department, 10 gallons per man per day for the maximum population of the hospital, including patients and staff, should be sufficient.

A consideration of the data given, together with all of our field experience, indicates that for water-supply construction work with the armies in the field an allowance of 2 gallons per capita per day for men and 10 gallons for animals, with proper consideration for special conditions such as the filling of water tank trucks, light railway cars, etc., will assure quantities which will enable the troops to pursue their activities without suffering for want of water.

TABLE 43.—Compiled data on water consumption of armies ³

Army	Conditions of service	Water to be provided (United States gallons)		Remarks
		Per man	Per animal	
British Third Army.....	Field army area.....	1.2	10	Restrictions as to washing in warm weather.
Third and Fourth Armies.	Troops on move; 3 days or less.....	.4	2.4	
	Troops halted; over 3 days.....	1.2	3.6	
Third Army.....	Inactive periods.....	2.4	12	
	Horse watering point; frosty weather.....		6.3	Actual census for 1 week.
	Type water point.....		9.6	Estimated demand.
French.....	Field.....		12	Basis for design.
	In garrison.....	7.9		For a mule.
	In campaign.....	9.2	10.5	Not mounted.
Third Army.....	do.....	1.3		In summer.
	Attack periods.....	.8		
Second Army.....	Rest periods.....	2.6		
		0.5	5.3-6.3	
French.....	Concentration, Verdun sector, 1915.....	2.6-13.2		Including washing, shower baths, cleaning, ambulances, hospitals, etc.
	Veterinary hospital.....		5.3	Large artillery horses.
			3.7	Arabian horses.
	Champagne campaign.....		8.75	
American.....	On march.....		8.3	Census of 1 week in February, all uses.
	In camp.....	.7	8	Estimated.
American.....	On march or in camp.....	1		Animals watered in streams; cooking water carried.
	Semipermanent camp.....	5		
	Cantonments and billets.....		6-10	
	Hospitals.....	25-30	10-15	Water piped to kitchens, bath-houses, etc.
	In field army area.....	10		Suitable basis for design of structures.

WATER-SUPPLY SURVEYS, DIVISIONAL TRAINING AREAS

In the sanitary water surveys that were made in the training areas of the advance section, Services of Supply, the information desired was printed on forms that were filled out in the field. A copy of one of these forms filled out is given below to show the extent of the information obtained:¹²

Training Area No. 17.

Town: Laferte-sur-Amance, Haute Marne.

Date of survey: November 14, 1918.

Survey by: ————, 1st Lieut. San.

Billeting capacity: 740 troops, 122 horses.

Corps.

Civilian population: 370.

Sickness traceable to water supply during the past year reported by—

(a) French authorities: no report. (b) U. S. Army: None.

Topography: Main part of village on hilltop. Another section at station in valley.

Water supply

Type: Spring feeding hydrants. Dug wells.

Location of hydrants: 1 opposite billet 18, Rue St. Bernard; 2 at billet 16, Grande Rue; 3 opposite billet 43, Grand Rue; 4 at billet 2, Rue de Prieur; fountain at center of town.

Location of principal supplies: Spring 1, 4 kilometers north of village; well 6 at billet 21, Grande Rue; well 7 at fountain at center of village; a number of large wells are located at sides of streets in different parts of village.

General surroundings: Spring 1 is located in a woods; no houses or barns in vicinity. The reservoir is located at side of road entering village from Bourbonne-les-Bains; a few houses are near the reservoir. Wells are located at sides of roads, and in yards, close to houses and barns.

Dimensions: Capacity of reservoir, 300 cubic meters (81,000 U. S. gallons); average depth of wells, 30 feet.

Construction: Spring 1 and reservoir are lined with mortared stone and are covered. Water passes from spring to reservoir through concrete mains, from reservoir to four hydrants and one fountain through iron mains. Wells have loose stone linings. A few curbsings are satisfactory. Very few covers provided.

Quality: Sanitary survey—Spring 1, very good; wells bad.

Laboratory examination: Bacteriological examination at central Medical Department laboratory, November 18, 1918, potable; November 29, 1918, nonpotable. Sample of November 29, 1918, was taken after rains. All water used for drinking purposes must be boiled or chlorinated.

Quantity requirements: Troops at 5 gals. per head per day, 3,700 gals.; horses at 8 gals. per head per day, 960 gals.

Supply: Sufficient. Does not fail in summer.

Placarding: Principal supplies and towns to be placarded with warning signs; supplies in vicinity of mess barracks to be placarded "Take Water Here for Lyster Bags or Water Carts."

Remarks: Supply for small section of village at station is obtained from a few private wells of very poor quality. All water taken from these wells must be treated.

Reports similar to the one given above were prepared for each billeting town in Training Area No. 17 as well as all the others, and three copies of the combined report were given to the zone major in the area.¹³ Upon their arrival in the area, the division surgeon and the division sanitary inspector of water were given copies of such reports, and by means of the data on the report the division sanitary inspector of water was able to concentrate his attention at once on water supplies which had shown the greatest contamination. If the division surgeon and division sanitary inspector of water left an area with troops, they were requested to return their reports to the zone major of the

area for file until new troops arrived. In addition to the separate reports for each town in an area, there was prepared a summary report of all the towns. The summary report for Training Area No. 10 is given below to indicate what seemed most important as a general résumé of the water-supply situation for that area:¹⁴

SUMMARY REPORT OF THE WATER-SUPPLY SURVEY IN THE 10TH TRAINING AREA

ADVANCE SECTION, SERVICES OF SUPPLY

Training area.—The area comprises approximately 400 square miles, and contains some 78 villages. The area is about 25 miles across at its greatest width. The zone major's office is at Prauthoy, which is about 65-70 km. from Dijon on the route from Dijon to Langres. An assistant zone major is located at Champlitte.

Date of survey.—The survey was made during the period from November 25 to December 18, 1918. The period between December 19 and December 27 was devoted to the collection of samples and completion of reports. During the entire time from November 25 to December 27, 1918, nine days were lost from lack of transportation.

Billeting capacity.—35,000 troops; 6,500-7,000 animals.

Civilian population.—There are some 78 billeting towns in the area, with a total population of approximately 25,000 people. The population is distributed as follows:

	Villages	Per cent
100 and under.....	15	19
100 to 200.....	29	37
200 to 300.....	18	23
300 to 400.....	9	12
400 to 500.....	3	4
500 to 1,000.....	2	3
1,000 to 2,250.....	2	3

Thus practically 80 per cent of the villages in the area are under 300 population, while 15 per cent of the entire population of the area live in the two largest villages. Outside of a few minor, unimportant industries at Champlitte, the only industry of note is located at Farincourt. Here there is a fair-sized foundry. The basket makers at Bussieres and surrounding villages may be classed with the agricultural workers. Thus practically the whole area is devoted to agriculture and the production of wine.

Sickness reported during the past year which might be due to water supply:

French authorities.—No sickness which might be traced to water supply reported by any of the French authorities in any case.

American reports.—Reports are rather difficult to procure from the troops formerly in the field. The commanding officer of the sanitary squad reports dysentery among the 304 engineers at Maatz during September, 1918. Dysentery also occurred among the French civilian population at Ocey during the period elapsing between the departure of the 79th Division and the arrival of the 82d. The supply at Coublanc seems to be in rather ill repute also. None of these cases have been proven against the water supply, but great care should be exercised in handling these supplies, and they should be checked up carefully and frequently.

Topography.—The whole area is situated in the Plateau de Langres. The altitude is from 1,100 to 1,500 feet. The area is very hilly for the most part; the eastern and south-eastern portions in particular are very hilly. Along the Marne-Saone Canal it is more level. A few of the villages are located in the valley bottoms, but most of them are close to the hillsides.

Water supply.—The supplies may be listed under the following heads:

	Villages
Cisterns and springs.....	3
Wells only.....	7
Springs only (those are usually springs in place).....	11
Cisterns only.....	1
Wells and cisterns.....	1
Cisterns and river water.....	2
Wells, cisterns, and springs.....	52
Total.....	77
Springs and wells, 52	

NOTE.—The greater part of the springs listed under “springs and wells” are central supplies, piped in from the hills near the village.

General surroundings.—The smaller villages are in the poorer condition as regards manure piles in the court yards, muddy streets, and illy kept houses. The villages with a water supply from wells only are for the most part invariably illy kept, and the wells are invariably located near a manure pile. In villages where the natives have endeavored to construct a water system during the past 20 years, the surroundings are usually much better. In villages where American troops were billeted several months ago, the results of the American occupation of the villages are still in evidence.

Ground formation.—Apparently two strata of limestone and sandstone meet in the area. In the northern and northwestern part one finds considerable sandstone. The strata are very uneven and crop out here and there. The formation in the southern and western parts is mostly limestone. There is considerable clay in the area.

Dimensions.—The wells vary from 20 to 50 feet in depth and from 3 to 6 feet in diameter. The volume of water varies with the location of the well, the surface of the water being all the way from 4 feet to 30 feet from the surface of the ground. The cisterns are usually the same as the room above. Most of them are located under the houses.

Construction.—The wells are for the most part loosely walled, uncemented, and uncovered dip wells. A very few of them are equipped with pumps. Most of them are provided with chain and windlass. Very few of them are covered. The cisterns are said to be cemented. They are fed by water from the roofs, which are almost invariably of tile. They are supplied with chain and windlass. Many villages are supplied by springs in place. In such cases the water is generally conducted through iron or stone pipes into reservoirs, which are usually covered at the top and on three sides, with one side open. Most of the central supplies are fed by springs, which are caught in reservoirs. These reservoirs are for the most part walled with stone and cement masonry. They are covered and either locked or sealed. Iron pipes are used almost entirely to carry the supply to the fountains and hydrants. In a few cases tile or stone conduits are used. The village of Heuilley le Grand has perhaps the best construction of any of the small villages. In only a few cases is a pump used to force the supply to the fountains. In most cases the waste from the fountains supplies the lavoir and abreuvoir. In several cases the waste from the fountains supplies the abreuvoir and the waste from the abreuvoir supplies the lavoir. The waste from the lavoir then takes off down the street.

Quality.—Sanitary survey: Villages classified as having a good supply, 31; villages classified as having a fair supply, 12; villages classified as having a doubtful supply, 12; villages classified as having a bad supply, 23; total, 78.

Laboratory examination.—The laboratory examination has shown many supplies to be nonpotable which passed a good sanitary examination. Others which failed to pass the sanitary inspection have shown up pretty good in the laboratory. In no case was the water from the wells examined. Additional work upon some of the better wells might prove of value. * * * It is further believed that the water carts are in some cases polluted by insufficient cleansing. These will be checked up and the results attached to this report at a later date.

Quantity requirements.—Thirty-five thousand troops, at 5 gallons per man per day, 175,000 gallons; 6,500–7,000 animals, at 8 gallons per animal per day, 58,000 gallons; total daily requirements, 231,000 gallons.

Supply.—Sufficient for all purposes, 62 villages; possibly insufficient in summer months, 14 villages; insufficient in summer months, 2 villages.

Bathing facilities.—American Expeditionary Forces, bathhouses in 35 villages; no facilities in 34 villages; unlisted, 9 villages.

NOTE.—The Engineers are at present installing additional showers in various places. This list was obtained from the zone major's office at Prauthoy.

Placarding.—In these reports the following system was used to designate the type of placard to be used in the village: Type I, "Take Water Here for Lyster Bags and Water Carts"; Type II, "Do Not Drink from Wells or Springs. Use Water from Lyster Bags and Water Carts"; Type III, "Water Good to Drink"; Type IV, "Do Not Drink from This Source."

Remarks.—The area has been well placarded by former troops. For the most part the water is being treated.

Recommendation.—The supplies that have shown up to be potable without chlorination should be reexamined repeatedly. The villages of Oceey, Maatz, and Coublanc should be watched very carefully. With the outbreak of a water-borne disease, these villages may cause trouble. The Lyster bags and water carts should be checked up to insure proper chlorination. In cases where the sanitary survey showed up well and the laboratory investigation showed the supply to be nonpotable without chlorination, it would be well to make a second and more thorough examination to discover if possible the source and nature of pollution.

The information given in the summary report enabled the zone major concerned to appreciate at a glance what the general situation in the area was as regards the volume of water available, and it gave to the division surgeon and the division sanitary inspector of water an idea of the types of supplies from which the water had to be obtained for the troops to drink.¹³

Reports similar to the one mentioned above were prepared for 10 of the training areas in the advance section, Services of Supply, between October 1 and November 11, 1918, and there were approximately 300,000 men within these areas.¹³

The general rule followed in making the surveys of the training areas was to require all water to be treated unless the sanitary survey was excellent and the bacterial analyses favorable.¹³ For example, if the source of a supply was a spring, located in a wooded hillside several kilometers from the town, and no inhabitants resided near the source, the water was recommended for use without treatment, providing, however, that the bacterial results were within the standard used for interpreting the analysis.¹³ A complete description of the standard used is given below under bacteriological examination of water.

As a general rule, all wells examined were found to be contaminated, or else subject to such great chances of contamination that they had forthwith to be condemned.¹³ Water from some few artesian wells or driven wells of 100 feet or more in depth was found to be safe to drink without treatment, but the number of such wells was very small compared to the total number of wells examined. This type of supply in France has not differed in any sense from similar types in the United States.¹³

Maps were prepared during the first surveys that were made in the American Expeditionary Forces training areas. On these maps the different types of water supplies were indicated by special marks, and the kind of signs that were to be posted on the supply was indicated.¹³ On account of the amount of work required to prepare the maps, and the limited personnel available, maps were not prepared for the later report, but especial attention was given to exact locations and the descriptions of the supplies for each billeting town.¹³

Practically the only sources of information regarding the existence of water-borne diseases in towns occupied by the American Expeditionary Forces were the officials of the civil government, the priests, and the civil population of the towns.¹³ In practically all of the towns included in the training areas where surveys were made, the information obtained showed that typhoid fever and dysentery did not exist at the time, and it was uncommon to get reports of the previous existence of these diseases in the towns. The fact, however, that all the information available indicated no water-borne diseases existed in the towns had no bearing on the recommendations regarding the quality of the water. If the supplies were from wells located within the corporate limits, which was usually the case, and the sewage from the troops would naturally drain into the ground water underlying the town, then the wells were posted as unsafe to use without treatment, and especial attention was directed toward securing strict water discipline. It is no doubt true that the absence of water-borne diseases in many of the small towns with well-water supplies was due to the fact that a large part of the surface drainage, including the sewage, drained away from the town before entering the subsurface water, and the pathogenic bacteria that entered the ground water died before reaching the water-bearing strata supplying the wells or springs. If this were not true, there certainly would have been more water-borne diseases, as all the supplies of water from wells in the towns showed the presence of intestinal forms of bacteria.¹³ The addition of the sewage from the troops, which was often several times that of the local population, to the surface of the ground no doubt would have affected the quality of the water in the wells, and the time when this would occur would depend upon the nature of the soil and the depth of the well.

In many of the towns where our troops were billeted the only available water supply was from cisterns.¹³ Samples collected from these sources invariably showed contamination; their volume was never sufficient for the normal population and troops except during the rainy season. As a rule the walls were well constructed, but the covering was generally defective. Most of the cisterns had not been cleaned for a year or more, and as a result there was a large accumulation of organic matter on the bottom. Most of this material consisted of dead leaves, dust, and other organic matter, including bird manure, that had been washed from the roofs of the houses. There was also some material that had been washed in from the ground surface through the covering of the cistern. Privy vaults frequently were found adjacent to the cisterns, and in some instances at a higher elevation than the top. The contents of one tube of calcium hypochlorite was sufficient to sterilize 36 gallons of water taken from wells or springs or even clear river water, but cistern water invariably required two tubes, and in one instance three tubes were necessary.¹³

POSTING AND REPORTING WATER SUPPLIES IN TRAINING AND REST AREAS

The methods adopted by the water-supply service for the collection of information pertaining to water supplies have been described above. It is the purpose here to outline the manner in which this information was made available to medical officers and by them brought to the attention of the enlisted men of the commands to which they belonged. In this connection the measures found suitable for putting into effect recommendations destined to improve the quality of water supplies in training or rest areas will also be considered.

In practically all instances it was possible to make a sanitary survey of the water supplies of new training and rest areas before the arrival of troops thereat.¹⁵ During the survey field notes were made on standard forms. Reports were worked up from these forms on returning to the laboratory concerned with the survey. Water points were placarded by the water-survey officer before leaving the area, in accordance with the findings of the sanitary survey or the results of bacteriological examinations, a record being kept of the number, location, and character of the placards for inclusion in the report. The standard form of report was found quite satisfactory both for field notes and for finished reports. It was sufficiently elastic to meet all conditions encountered, for by expanding the headings it could be used for large towns or cities, though in most instances it was possible to present in a one-page report all the essential data pertaining to the water supplies of a town. For convenience the water-supply reports on a given area were arranged alphabetically and with them a short summary was included. Three copies of these combined reports were furnished the zone major or billeting officer of the area concerned.¹⁵ One copy was to be circulated among the various towns under his jurisdiction; a second copy was to be placed in the hands of the division surgeon whenever a division moved into the area; the third copy was to be retained by him for file and for the information of advance parties. Thus, on the arrival of troops in an area, all necessary information concerning the water supplies was immediately available. The placard furnished the enlisted men an official statement as to the quality of the water supplies during the first few days after their arrival, and before routine methods of control or inspection could be established.

It might appear that these measures were quite sufficient; in practice, however, they constituted but a small part of the work involved. It was necessary to supplement the written reports by a personal contact with the medical officers; furthermore, to insure that the recommendations made in the reports were carried out, it was necessary in many instances to give personal instructions and practical demonstrations to the enlisted personnel.¹⁵

As soon, therefore, as it could be ascertained that a division was moving into an area, the officer who had made the preliminary survey reported to the division surgeon for duty in connection with the examination of water supplies. On this second visit it proved desirable to call upon the division for an assistant rather than to take along an enlisted man from the laboratory. Copies of the water-supply reports were placed in the hands of the division sanitary inspector, the division sanitary inspector of water, and the officer in charge of the sanitary squad operating in the division area. Sections of the area deserving special attention were pointed out; the criteria on which waters had been passed as good or bad were explained; attention was directed to the placarding, the time devoted to the survey and other features of interest. After permission to cooperate with the division sanitary inspector of water in improving water supplies had been obtained and suitable transportation had been provided, conferences were held with the medical officers of each town in the area or unit in the division.¹⁵

On these secondary inspections or constructive survey tours the reports on the towns in question were gone over carefully with the local senior medical

officer, and the water points in actual use were surveyed for a second time, wherever possible. Generally, water points were chosen by troops because of their convenience. Unforeseen factors of pollution, such as improperly placed latrines, or special local problems, such as a scarcity of water in a particular locality, were often met on this inspection.¹⁵ Under such circumstances rearrangements in the location of kitchens, or water sterilizing bags, often solved the problem, though frequently it was necessary to condemn certain water supplies for use for all purposes. Generally, when rain-water cisterns constituted the chief source of supply, arrangements were made whereby the levying of water could be distributed over several water points. The condition, number, and location of the water sterilizing bags were noted. Often bags were hung too low, thus being readily splashed with mud, or within the reach of dogs and other small animals; on the other hand, bags that were hung too high frequently contained unpalatable water due to incomplete filling with water and then adding the contents of a hypochlorite tube intended for a full bag, or to failure to empty stale water. Upright spigots of the water sterilizing bags denoted that water was being obtained by applying the lips directly to the spigots. When such a condition occurred the attention of officers concerned was directed to it. Where water supplies had been passed as safe without treatment, it was explained that this did not apply if the water had to be handled in any way; canteens were to be filled directly from the tap. Where chlorination had been recommended in the water-survey report, tests were made to determine the efficiency of the treatment with a special outfit provided for the purpose. Testing outfits and material were left with medical officers for distribution or for checking the efficiency of water chlorination in their towns. Instructions in the chlorination of water, in the care of water sterilizing bags, and in testing chlorinated water were given to water details. Type-written copies of these instructions were left with the medical officer in charge; in some instances these instructions were framed and placed near water sterilizing bags for reference. Practical demonstrations were given on the inspection of hypochlorite tubes, and the rules governing the rejection of defective tubes were stated. The importance of permanent water details was emphasized, and medical officers were appraised to this by circular from the division surgeon's office. With the possible exception of lack of transportation on the part of the division sanitary inspector of water, the greatest source of difficulty in the way of securing properly chlorinated water was the ever-changing personnel of the water details. When a division sanitary inspector of water had suitable transportation and testing material at his disposal, and permanent water details were established, the failure properly to chlorinate water easily could be made a matter of discipline inasmuch as responsibility then could be fixed definitely.¹⁵

During these secondary inspections by water-survey officers, particular attention was paid to the condition of the water placarding.¹⁵ As stated above, placards indicating the location or the quality of the water at water points had been displayed during the preliminary survey. In few instances did it appear that the signs had been taken down by the civilians prior to the arrival of the troops, though, rarely, the too liberal use of wire in attaching a

sign may have proved a temptation, or else an easily translated sign such as "Dangerous" or "Condemned" may have been removed by the owners of the well or spring. Every effort was made to use signs of the same general appearance, and signs left by divisions that had occupied the area at an earlier date were seldom left in place. These signs invariably were removed by an incoming division, and more or less promptly were replaced by signs adorned with the cherished geometrical design or forest denizen. The signs put up by the water survey personnel of the Central Medical Department Laboratory, A. E. F., did not bear any distinctive emblem, and seemingly fared better for the omission. The free use of signs proved the most direct way of conveying to the enlisted men desirable information concerning their water supplies and of keeping that information fresh in their memory. The wording, general appearance, and authority for the signs, therefore, are matters of importance. These signs were placed in mess halls, recreation rooms, orderly rooms, and infirmaries, along the main streets, and, of course, on the water points themselves.¹⁵

The size of the water signs was 10 by 20 inches for the larger signs and 5 by 20 inches for the smaller ones. Salvaged tins furnished the material for them. After being thoroughly cleaned, the tins were cut to size and were given a coating of white paint, following which they were properly labeled. A list of the conventional wordings used is given below. Many of these signs were too long. Impromptu signs that sometimes were seen, such as "DON'T DRINK," represented more nearly the average enlisted man's idea of a sign.¹⁵

AMERICAN EXPEDITIONARY
FORCES
SAFE
DRINKING WATER
By order of Commanding General

AMERICAN EXPEDITIONARY FORCES
DO NOT DRINK
THIS WATER
By order of Commanding Officer

WATER
GOOD TO DRINK
By order of

WARNING!
U. S. TROOPS, AMER. E. F.
Drinking water from all sources in this town
must be sterilized
By order of

SOURCE OF WATER SUPPLY
KEEP IT CLEAN

WATER
NOT GOOD TO DRINK
WITHOUT TREATMENT

TO WATER POINT
for
Animals, carts, and men

WARNING!
Do not drink from wells or springs
Use water from Lyster bags or water
carts

TAKE WATER HERE
FOR LYSER BAGS
AND WATER CARTS

WARNING!
THIS WATER IS CONDEMNED
FOR ALL PURPOSES
By order of

The contents of water carts in many instances were not chlorinated, the usual reason for not doing so being the tastes imparted to tea, coffee, soup, and rice whenever overchlorinated water was used.¹⁵ Water carts that were placarded generally had the sign reading "DO NOT DRINK THIS WATER."

When properly instructed and permanent water details were in operation, and the water points had been abundantly placarded, the use of water from unauthorized sources or the presence of unchlorinated water in water-sterilizing bags made it necessary occasionally to pass from the realm of the Medical Department and request appropriate action to remedy the indicated laxity in the matter of water discipline.¹⁵ In isolated cases this meant a request for disciplinary action against the offending party or a request that a guard be placed over a particularly dangerous water supply. In one instance it was requested that guards be placed over the water supplies of an entire area, comprising fifty-odd towns and approximately 1,000 water points. The following memorandum is reproduced as a model;¹⁵ the results were highly satisfactory;

HEADQUARTERS, —TH DIVISION,
AMERICAN EXPEDITIONARY FORCES,
January 6, 1919.

Memorandum No. —.

Subject: Health of the command.

1. The spread of typhoid is increasing instead of diminishing. The situation has become serious and threatens to hold this division in its present area until conditions improve.

2. In the opinion of the division surgeon, this infection of typhoid is due entirely to the lack of discipline in the use of drinking water. Stringent orders have been issued from these headquarters prescribing the precautions to be taken as regards the use of drinking water by members of this command. These orders and regulations are being willfully disregarded by members of certain organizations, due primarily to gross neglect on the part of organization commanders concerned in not enforcing standing orders.

3. (a) Regimental and separate organizations will place a guard on all points at which water may be obtained; this guard will be instructed to prevent the use of such water for drinking purposes.

(b) Company commanders and commanders of similar units will be held personally responsible (1) that a suitable number of serviceable Lyster bags are located conveniently for the use of the men; (2) that men found drinking water from any source other than the company Lyster bag be promptly court-martialed for disobedience of orders; (3) the company commanders, in person, will supervise the chlorinating of all drinking water for their commands and will make daily report to this battalion or next higher commander to this effect.

4. Brigade commanders will be held strictly responsible for the enforcement of this order throughout the organization of their command. This duty will not be considered as properly discharged by the mere issuance of orders on this subject. Personal inspections must be made daily by brigade commanders, in addition to inspections by officers of their staff, which they may direct.

5. The commanding officers of companies and similar units will read this order, in person, to their respective commands, at the first retreat formation after receipt thereof, and at each successive retreat formation to include January 21.

By command of Major General.

The second water survey, therefore, constituted a check upon the accuracy of the preliminary survey and, while it was intended as a means to place the information gathered directly before the divisional authorities concerned, it offered splendid opportunities for personal conferences on how the recom-

mendations made in the report could best be put into effect.¹⁵ Placarding campaigns were instituted; permanent water details were established and instructed in their duties; uniform methods for the chlorination of water were inaugurated. The tests made on water-sterilizing bags gave the particular medical officers concrete evidence as to the efficiency of their water details. The inspections, instructions, and water-sterilizing tests were made generally in the presence of the medical officer in charge; also reports and recommendations were made to him directly. Regimental surgeons were kept informed as to conditions in the various towns under their supervision, and daily reports on the progress of the work were made to the division surgeon through the division sanitary inspector.¹⁵

BACTERIOLOGIC EXAMINATION OF WATER

The interrelation of the water survey and the bacterial test are not adequately appreciated by many men called upon to pass on the potability of a water. For complete safety, both the sanitary survey and the bacterial examination should be above suspicion; if either test is derogatory to the character of the water, the supply should not be used without treatment. A supply which, from a sanitary survey, is seen to be subject to pollution is not safe, irrespective of what the bacteriologic or other examinations may disclose. An analysis which shows a water to be good, coupled with a sanitary survey which shows that the water supply is subject to pollution, merely indicates that the water is safe at the time of sampling, but may become polluted under different weather conditions; therefore, such a water is potentially dangerous.¹⁶

A sanitary survey which shows the water to be good, on the other hand, is not sufficient evidence upon which to declare a water potable; pollution may be entering from some relatively distant or invisible source. The bacteriologic examination will aid materially in detecting such pollution. A single favorable analysis is not sufficient to declare water "potable without treatment"; the examination must be repeated under various weather conditions. Samples should be taken for bacteriologic analysis particularly after heavy rainfall to detect pollution not apparent from the sanitary survey. Of 31 spring supplies in the American Expeditionary Forces, which by the sanitary survey were classified as good or very good, only 17 (54.8 per cent) passed the bacteriologic standard for potability.¹⁶ All of these supplies were resampled (by the same officer who made the sanitary surveys and collected the first samples) after two days of heavy rainfall. Only 7 (22.5 per cent) of the supplies passed this second laboratory test. This incident illustrates very strikingly (1) the value of the bacteriologic test as a check on the sanitary survey, and (2) the necessity for sampling under varying weather conditions before a supply, with a good sanitary survey, may safely be passed as "potable without treatment."¹⁶

Where water is being treated at a central plant, and distributed throughout an area, it is imperative that the treatment be checked by a routine daily bacteriologic analysis; interruptions in the treatment for only a few hours may often be detected by this test. Two such instances occurred in the American Expeditionary Forces' water supply at Dijon, France.¹⁶ The water supply of Dijon

was being treated with 0.07 to 0.1 parts per 1,000,000 chlorine, while American troops were in the vicinity. *B. coli* was uniformly absent from 50 c. c. until October 26, 1918, when one out of five 10 c. c. portions was confirmed for *B. coli*. On the following day four out of five 10 c. c. samples were positive for *B. coli*, and on the 28th only one was confirmed. Although on the 26th the water was potable, as only one tube showed *B. coli* and the bacterial count was very low (less than 10), it was considered desirable to notify the authorities of the finding. On the inquiry it was learned that there was a break in the chlorinator. Again, on April 17, 1919, a routine analysis of the tap sample showed two out of five 10 c. c. samples to contain *B. coli*. This was traced to an interruption in the operation of the chlorinator for only a few hours.¹⁶

THE BACTERIAL STANDARD OF POTABILITY

The bacterial count.—It is generally accepted that a water containing less than 100 bacteria per cubic centimeter is probably safe (if *B. coli* is absent); whereas the presence of many more than 100 bacteria per cubic centimeter renders the water open to suspicion. For the purpose of passing on the potability of a water, therefore, a very reliable count may be obtained by plating two 1 c. c. and one $\frac{1}{10}$ c. c. portions of the sample in question. Incubation should be at 37° C. for 24 hours.¹⁶

B. coli content.—The British and American bacteriologists place much emphasis on the presence, and particularly the number, of *B. coli*.¹⁶ If *B. coli* be present in 1 c. c. or less, it is agreed that the water is not potable. Prescott and Winslow state that *B. coli* should be absent from a majority of 1 c. c. samples.¹⁷ This standard appears much too lenient for ground waters, but there does not seem to be any general agreement among water experts as to the significance *B. coli* other than what has been referred to above.¹⁶ The United States Treasury Department has adopted a standard for waters on interstate common carriers which stipulates that not more than one out of five 10 c. c. samples shall contain *B. coli* as determined by at least a partially confirmed test.¹⁶ This is a rather severe standard, although applicable to the type of waters for which it was presumably proposed, it may be undesirable for untreated well and spring supplies. It was felt in the American Expeditionary Forces that a water with a very low bacterial count (less than 10) but with two out of five 10 c. c. portions showing *B. coli*, might be considered potable if the sanitary survey was good and the bacterial analysis remained quite constant under varying weather conditions.¹⁶ Likewise, it was felt that water with a constant low bacterial count (less than 10) and two tubes showing *B. coli* was probably as safe as a water with only one tube showing *B. coli* but having a bacterial count of 80 to 100. The standards for potability employed were therefore those of the United States Treasury Department, with this modification: Waters from supplies which showed good sanitary surveys and which on repeated tests had low bacterial counts, were passed if not more than two out of five 10 c. c. portions contained *B. coli*, or its close allies.¹⁶

METHODS OF BACTERIOLOGIC EXAMINATION OF WATER

With slight modifications, necessitated by the conditions and the materials in the laboratory, the standard methods of the American Public Health Association for 1917 were adhered to.¹⁶ The simplified eosin-methylene-blue agar was substituted for Endo agar in the confirmatory tests. The bacterial count was determined as recommended by the American Public Health Association. For *B. coli* determinations, five 10 c. c., two 1 c. c., and one $\frac{1}{10}$ c. c. portions were placed in lactose broth and incubated at 37° C.¹⁶ After 24 hours, the amount of gas present in each tube was recorded. Tubes showing no gas were replaced in the incubator for another 24 hours. At least 1 tube showing 10 per cent or more gas was streaked on eosin-methylene-blue agar for confirmation, and one or more tubes showing less than 10 per cent were similarly confirmed. Tubes streaked out were then discarded to save incubation space. The agar plates were incubated at the body temperature overnight and then recorded as follows: *B. coli*, where typical colonies of *B. coli* were present; *B. aerogenes*, when the colonies resembled *B. aerogenes* rather than *B. coli*; eosin-methylene-blue, when growth on the agar resembled neither *B. coli* nor *B. aerogenes*. A colony or two from such a plate was "fished" into lactose broth and incubated for 24 hours at 37° C. If no gas was formed, the record "colon group absent" was made. If gas was produced, the record "colon group present" was reported; "no growth," when no growth developed on the eosin-methylene-blue agar, the gas was regarded as probably due to an anaerobe and not a member of the colon group, and the record "anaerobe" was reported.

THE PRESUMPTIVE TEST FOR *B. COLI*

In dealing with untreated waters, the production of 10 per cent or more gas after 24 hours in lactose broth is recognized by water analysts as a very reliable index of the probable presence of *B. coli* or its close allies.¹⁶ A slower rate of gas production, however (less than 10 per cent in 24 hours or more than 10 per cent in 48 hours), is regarded as an inconclusive and doubtful test. For chlorinated waters the presumptive test is not to be relied upon at all; confirmation must be carried out.¹⁶

These limitations of the reliability and applicability of the presumptive test were not appreciated properly by many officers likely to be called upon to examine and report on water specimens.¹⁶ It was the rather prevalent opinion that a small amount of gas in 24 hours was of little significance, whereas the production of 10 per cent or more gas in 48 hours was regarded as a good index of the probable presence of *B. coli*. As the presumptive test is often the only one available under campaign or field conditions, the observations on this reaction at the central Medical Department laboratory, A. E. F., based upon the examination of 1,559 specimens during the six-month period from October 1, 1918, to April 1, 1919, and comprising waters from both treated and untreated supplies from various sources, is of value.¹⁶

The presumptive test with untreated waters.—Confirmations were attempted on 1,186 tubes showing gas from untreated supplies.¹⁶ Of these, 877 contained gas after 24 hours, while 309 were not positive for gas production until 48 hours' incubation. The relation of the rate of gas production to successful confirmation is indicated graphically below.¹⁶

Correlation of gas production in lactose broth in 24 and in 48 hours to successful confirmation
[Untreated specimens]

Gas in 24 hours	Confirmation *		Gas in 48 hours	Confirmation *	
	Positive	Negative		Positive	Negative
Less than 10 per cent.....	176 (91.2)	17 (8.8)	Less than 10 per cent.....	15 (45.5)	18 (54.5)
10 per cent or more.....	668 (97.7)	16 (2.3)	10 per cent or more.....	201 (73.2)	75 (26.8)

* Figures indicate number of tubes tested. Figures in parentheses show per cent.

Considering the 877 tubes which showed gas in 24 hours, the above table indicates that of 684 true presumptive tests (10 per cent or more gas in 24 hours), 668 (97.7 per cent) were confirmed, whereas of the 193 doubtful presumptive tests (few showed as much as 5 per cent gas), 176 (91.2 per cent) were confirmed for *B. coli* or other members of the colon aerogenes group.¹⁶

Gas was absent in 24 hours, but present in 48 hours in 309 tubes. Of these, 276 had 10 per cent or more gas with 201 (73.2 per cent) confirmed. Among the 33 tubes showing only a small amount of gas in 48 hours, 15 (45.5 per cent) were positive for coli-like forms.¹⁶

Thus a small amount of gas in 24 hours is seemingly a more reliable index of the probable presence of *B. coli* than is 10 per cent or more gas in 48 hours. The rate of gas production appears to be more significant than the quantity of gas produced.¹⁶

The presumptive test with chlorinated waters.—Confirmations were attempted on 87 gas tubes from water sterilizing bag specimens which had been treated with about 0.3 part per 1,000,000 excess chlorine, and upon 167 tubes from routine tap samples which had been treated with very small quantities of chlorine (0.07 to 0.1 part per 1,000,000).¹⁶

The relation of the rate of gas production to successful confirmation among the 254 gas tubes from chlorinated water specimens is indicated below.¹⁶

Correlation of gas production in lactose broth in 24 and 48 hours to successful confirmation
[Chlorinated specimens]

Gas in 24 hours	Confirmation *		Gas in 48 hours	Confirmation *	
	Positive	Negative		Positive	Negative
Less than 10 per cent.....	3 (20)	12 (80)	Less than 10 per cent.....	0 (0)	26 (100)
10 per cent or more.....	25 (44)	32 (56)	10 per cent or more.....	10 (6.4)	146 (93.6)

* Figures indicate number of tubes tested. Figures in parentheses show per cent.

Of the 57 tubes which were positive for the presumptive test, only 25 (44 per cent) were confirmed, and among the 15 tubes which showed only a small quantity of gas in 24 hours, but 3 (20 per cent) contained coli-like organisms.¹⁶

Gas production in 48 hours (24 hours negative) is extremely unreliable, almost negligible, as an index of *B. coli* with chlorinated waters.¹⁶ None of 26 tubes which had a small amount of gas were confirmed, while among 156 instances where 10 per cent or more gas was present only 10 (6.4 per cent) were found to contain *B. coli* or similar forms on further tests.

Experience with the presumptive test in the central Medical Department laboratory, A. E. F., may be summarized as follows:¹⁶ 1. The positive presumptive test (10 per cent or more gas in 24 hours) is a very reliable index of the probable presence of *B. coli* when examining untreated waters, but it is not to be depended upon in testing chlorinated waters. Of samples of untreated water, 97.7 per cent, and of chlorinated samples 44 per cent, showing gas were confirmed. 2. The doubtful presumptive test (less than 10 per cent in 24 hours or more than 10 per cent in 48 hours when 24 hours is negative) is a fair index of the probable presence of *B. coli* in untreated waters, but is practically negligible as concerning chlorinated samples. Seventy-five and nine-tenths per cent of tubes from untreated and only 7.6 per cent of those from chlorinated specimens giving a doubtful presumptive test were successfully confirmed. 3. A small amount of gas in 24 hours is a more reliable index of the probable presence of *B. coli* than 10 per cent or more gas in 48 hours (24 hours negative). With untreated specimens, 91.2 per cent of the former, and 73.2 per cent of the latter, were confirmed. The rate of gas formation is more significant than the total volume of gas produced, as a presumptive test.

THE PARTIALLY CONFIRMED TEST

For confirming the presumptive test, the simplified eosin-methylene-blue agar was employed in the central Medical Department laboratory, A. E. F., in place of Endo agar because of its ease of preparation and its greater stability.¹⁶ This medium also differentiates *B. coli* from *B. aerogenes* in a large proportion of strains.¹⁶

To determine the reliability of the presumptive differentiation of *B. coli* from *B. aerogenes* on the eosin-methylene-blue agar, 153 colonies were transplanted from routine confirmatory plates. These were designated provisionally as *B. coli* or *B. aerogenes* and later identified more completely. Of 87 supposedly *B. coli*, 82 (94.2 per cent) were confirmed; of 55 designated as *B. aerogenes*, 47 (85.5 per cent) were such; and of all strains regarded as questionable, but probably *B. aerogenes*, 8 (72.7 per cent) were correctly recorded.¹⁶

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- (2) Memorandum from the chief surgeon, A. E. F., June 21, 1917, to the commanding general, A. E. F. Subject: Service of water for the American command. On file, A. G. O., World War Division, Medical Records Section, 671.
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- (4) G. O. No. 131, G. H. Q., A. E. F., August 7, 1918.
- (5) Bulletin No. 55, G. H. Q., A. E. F., August 8, 1918.
- (6) Tables of Organization and Equipment, 1918.
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- (10) Report of the activities of the water analysis laboratories, A. E. F., to January, 1919, by Lieut. Col. Edward Bartow, Sanitary Corps, officer in charge, water analysis laboratories, A. E. F. On file, Historical Division, S. G. O.
- (11) Report of the chlorination of water supplies, A. E. F., from Capt. Walter C. Russell, San. Corps, undated, to the director of laboratories, A. E. F. On file, Historical Division, S. G. O.
- (12) Report of water survey, Training Area No. 17, A. E. F., November 14, 1918, by 1st Lieut. W. C. Russell, San. Corps. On file, Historical Division, S. G. O.
- (13) Report on water-supply surveys, A. E. F., from Maj. M. B. Hommon, San. Corps, undated, to the director of laboratories, A. E. F. On file, Historical Division, S. G. O.
- (14) Report on water-supply survey, Training Area No. 10, A. E. F., November 25 to December 19, 1918, by 1st Lieut. M. J. Blew, San. Corps. On file, Historical Division, S. G. O.
- (15) Report on posting and reporting water supplies in training and rest areas, A. E. F., from Capt. Emery J. Theriault, San. Corps, undated, to the director of laboratories, A. E. F. On file, Historical Division, S. G. O.
- (16) Report on the bacteriologic examination of water, A. E. F., from Capt. Max Levine, San. Corps, undated, to the director of laboratories, A. E. F. On file, Historical Division, S. G. O.

CHAPTER VIII

DISPOSAL OF WASTES

For purposes of description, the disposal of wastes in the American Expeditionary Forces will be considered under two general headings: Solids and liquids.

DISPOSAL OF SOLIDS

EXCRETA

PIT LATRINES

From the time of the epochal investigation of the medical board, consisting of Reed, Vaughan, and Shakespeare,¹ appointed to determine the causes of the typhoid fever epidemics which decimated our camps in 1898, the necessity for the effectual disposal of excreta to avoid the enteric group of diseases in our permanent and semipermanent camps has been thoroughly appreciated. During the time which intervened between the publication of the report of this board, in 1904, and our entrance into the World War, investigations were conducted by members of the Medical Department whose purpose was to devise methods of effective excreta disposal, in the absence of an adequate sewerage system. Such methods devised included disposal by a modified water-carriage system—the sanitary trough latrine which was adopted by the War Department in 1908,² and subsequent thereto various methods of disposal by incineration. Though these methods of disposal by modified water carriage and by incineration were satisfactory from a disease prevention viewpoint, their cumbersomeness, which was necessary to their effectiveness, militated against their general use by us. In consequence of the lack of suitable and practicable means (from the Army standpoint) for otherwise disposing of excreta in permanent and semipermanent camps where there was an absence of a sewerage system, the War Department, in 1916, adopted the pit latrine, covered by a fly-proof latrine box, as the standard method of excreta disposal.³

The problem of making pit latrines fly-proof, as well as preventing the propagation of flies within them, was investigated by a number of our medical officers during the decade immediately preceding our entrance into the World War. These investigations looked to the provision of a fly-proof latrine box, and suitable fly repellants for application to the interior of the latrine. Several types of latrine boxes were advocated. With the following desiderata in mind, Havard devised a knock-down latrine box,⁴ which, slightly modified, as will be explained, by other of our medical officers, was adopted by the War Department for standard use.⁵ Latrine boxes should be designed according to uniform standards so that they may readily be constructed wherever needed. They should be light and portable, yet strong and tight-jointed so as to endure rough handling and exclude flies. The seat holes must be provided with self-closing lids so that they may never be left open, and also to prevent men from squatting on the seat instead of sitting down while defecating.

The latrine box devised by Havard and as described by him,⁴ is 10 feet 6 inches long, 16 inches high and 3 feet 8 inches wide at the bottom, thus being adequately wide to cover a pit whose lesser dimension is 3 feet. The front and rear walls of the box have an outward slant of 4 inches from top to bottom, and are locked together by the two end pieces and two traverses. The top of the box, consisting of two longitudinal halves, is simply placed on the walls, being held in place by means of blocks. Each longitudinal half of the top is perforated by three holes whose positions alternate with the holes of the opposite half. Each hole is covered with a strong hinged lid which can be raised to an angle of 60° only, thus making it self-closing and preventing standing on the box. The top was planned to be loosely attached purposely not only to facilitate the knock-down quality of the box but also to permit ready access to and an adequate inspection of the interior of the pit to disinfect its contents.

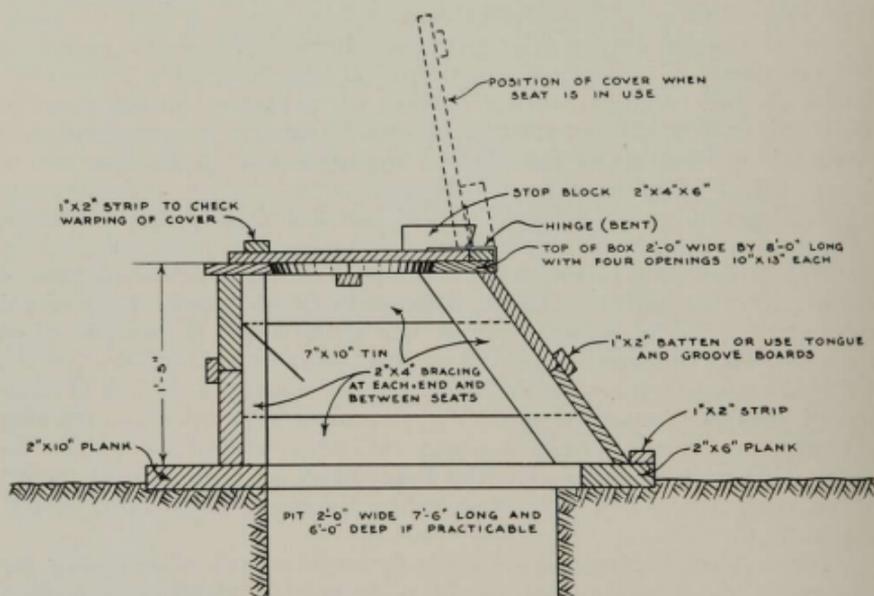


FIG. 72.—Standard United States Army latrine box

This knock-down type of box never has been tested on a sufficient scale to determine what its real merits in the field may be, or how it could be perfected;⁶ on the contrary, the majority of military hygienists seemed to favor a solid, nailed-together box, with a single row of holes. One of this type, devised by Straub,⁷ was used in the San Antonio camps, in 1911, with very satisfactory results.⁶ The box devised by Straub is 10 feet long and contains 5 holes. It is made of tongue-and-groove lumber and is designed to cover a pit 2 feet from front to rear. Instead of having a sloping front like Havard's box, its front is vertical, though its back wall slopes out backward, thus increasing the bottom front-to-rear measurements to 30 inches. The seat holes are circular, having a diameter of 9 inches, and each is covered by a solid lid 12 inches wide, reinforced by 2 battens, 1 by 2 inches, to prevent warping,

and to which the hinges are fastened. To prevent the lids from being raised to a right angle, as well as to cause them to fall back into place automatically, longitudinal strips, 1 by 2 inches, are placed along their rear edges.

Lyster, in 1912, proposed a box which was similar to but differed from the Havard and the Straub box in several particulars, the principal of which was its smaller size for purposes of portability.⁸ It possesses an added feature, however, which is an improvement on the Straub modification of the Havard box: A piece of tin, 8 by 10 inches, is fastened by its upper edge to the inside of the front wall, opposite each seat, and so placed at an angle as to deflect the urine projected against it clear into the pit, thus obviating a urine soakage of the front wall of the box, and likewise its seepage out from beneath the front wall.

In 1916, when the War Department standardized the method of disposal of excreta,³ where a water-carriage system was not feasible, in permanent or semipermanent camps, the use of the Havard box over a pit latrine was directed. However, the latrine box adopted by the Quartermaster Corps, whose responsibility it was to supply the boxes when needed, comprised features common to the separate boxes proposed by Havard, Straub, and Lyster,⁹ as shown in Figure 72.

For the treatment of the interior of pit latrines, daily disinfection by fire was required in our Army until 1917, by means of burning it out with crude oil and hay, the proportion of these being 1 gallon of crude oil and 15 pounds of hay.³ The effectual firing of pit latrines, when their number was large, was found to be costly in time, work, and material; this led to a search for a satisfactory substitute. Such a substitute proved to be mixture of kerosene and lampblack or crude oil and bone black, which, when sprayed on the whole of the interior of the latrine and its box covering, acts as a deterrent to flies.¹⁰ Special Regulations No. 28, promulgated in 1917, required the practice of burning out latrine pits, as described above, or the application of the lampblack or bone-black mixture.

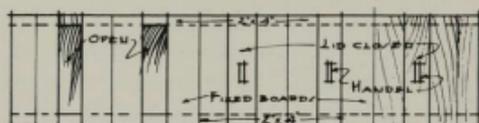
In the American Expeditionary Forces, inasmuch as it was impossible to procure either sufficient lumber to construct Havard boxes or crude oil for spraying or for burning out pit latrines, General Orders, No. 12, H. A. E. F., July 12, 1917, directed the following procedure regarding latrines:

A pit of the usual depth and width will be prepared, the length depending on the number of men expected to use it. A tight-fitting board cover will be constructed resting flush with the surface of the ground. This cover is to have movable sections, 8 inches wide and 2 feet apart, running crosswise with the trench. Each of the openings thus provided is to all intents and purposes a straddle trench. Cresol is obtainable and may be used in a dilution of 1 part to 5 of water to scrub pit covers and to spray the inside of the trench.

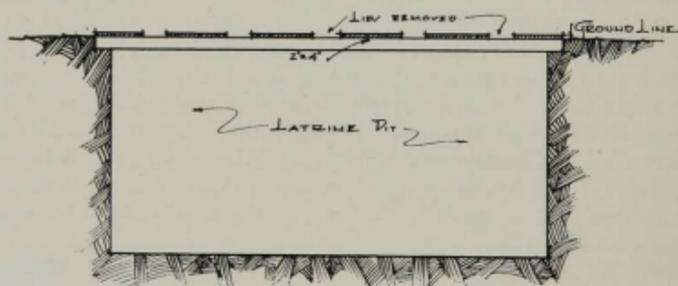
This type of latrine (fig. 73) was found to be generally satisfactory for camp use by our relatively few troops in France in the summer of 1917, and the continuance of its use was directed in general orders.¹¹

There was not an absence of adverse criticism of such a type of latrine however. The division surgeon, 1st Division, reporting on its use in that division on August 16, 1917, stated that converting a trench into a fly-proof pit by boards at right angles to the length of such trench, with a handled loose board for removal, when used as a privy in the squatting position was in practice a failure.¹²

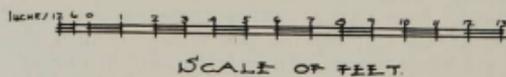
LATRINE COVER



PLAN



SECTION



S.O.U. 4811-30

FIG. 73

These pits are not covered [sheltered] and the boards are swelled by rain and no longer fit in place; for this reason, and through complete disregard of orders to replace the boards after defecation, as well as the losing of the boards by their falling into the pits, these trenches are in practice open to practically all the objections of open pits condemned by every army. But the real danger of contact infections at these privies seems to be as great as from flies. A squatting latrine means sooner or later soiling the edges of the opening, particularly at night, soiling the loose board itself, and even soiling the handle. These handles should be necessarily replaced by upright poles, about 4 or 5 feet long, to avoid soiling the hands on a short handle, for the time being, but the fact remains that the model at present used is extremely dangerous, particularly from the fact that the men's feet get soiled from their companions' fecal soiling. These shoes, soiled and infected as they are, are handled, the hands are thus infected, and food and mouth itself receive dangerous contamination. Aside from the manifest necessity of stimulating the soldiers' sanitary sense by providing him a clean and orderly privy, well protected from rain, and with a broken-stone walk where necessary

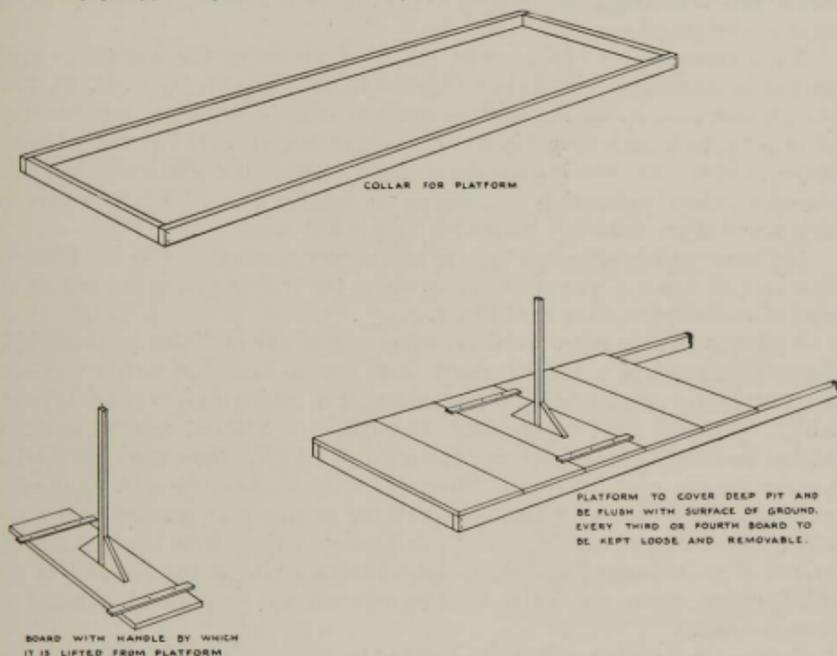


FIG. 74.—Flush latrine cover as used in the 1st Division, A. E. F. In this type of latrine the man removes the loose board by its handle and straddles the opening, later replacing the board

for approach, and a broad cement or stone impacement to avoid tracking an immense amount of mud thereto, the construction of approved and tried latrines, sanctioned by the excellent results obtained therefrom on the Mexican border, is imperative, and is to-day the greatest sanitary necessity in the command.

On the other hand, in his final report of the Medical Department activities, 1st Division, A. E. F., the surgeon of that division stated that the French type covers in pit latrines, when properly cared for, gave satisfaction, and that it possessed several advantages over the Havard box. It was more easily kept clean and was not a source of danger from a vermin or skin disease standpoint; besides, requiring less lumber, it was especially useful where lumber was scarce, as was the case in France.¹³

In April, 1918, the chief surgeon, A. E. F., reported that the type of pit latrine, the use of which was being required, where practicable, by General Orders, No. 12, H. A. E. F., 1917, was highly objectionable and often a disgusting arrangement because of the absence of a suitable latrine box and adequate means of disinfection; also, he recommended to the chief quartermaster, A. E. F., that at all permanent camps, depots, etc., as well as at hospitals, acceptable destructors, such as the Horsfall, be installed, while at temporary camps and at the front improvised incinerators be used.¹⁵

Despite the reported objections to the pit latrine, as it was necessary to use it in the American Expeditionary Forces, main reliance upon it was forced, due to the fact that sewerage systems could not be installed universally, nor could sufficient material be procured to permit the practice of feces destruction, except at certain of our hospitals.¹⁵

To eliminate some of the objectionable features of the somewhat crude model of latrine cover specified in General Orders No. 12, H. A. E. F., 1917, the chief surgeon, A. E. F., advised medical officers to hinge the hole flaps, and to provide a back stop for them,¹⁶ as shown in Figure 75, and whenever sufficient lumber was obtainable, the premise being that a pit latrine had to be resorted to, the construction and use of the latrine box, shown in Figure 76, which was really a modified Havard box, was advised.¹⁷

In the trenches the bucket type of latrine was used largely by the French,¹² whose sectors some of our divisions occupied for training purposes during the period of stabilized warfare in 1917-18.

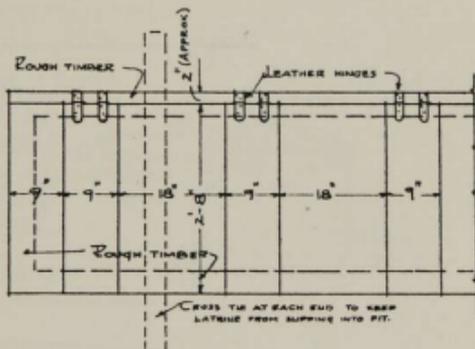
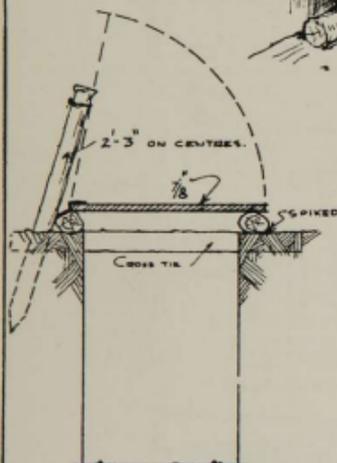
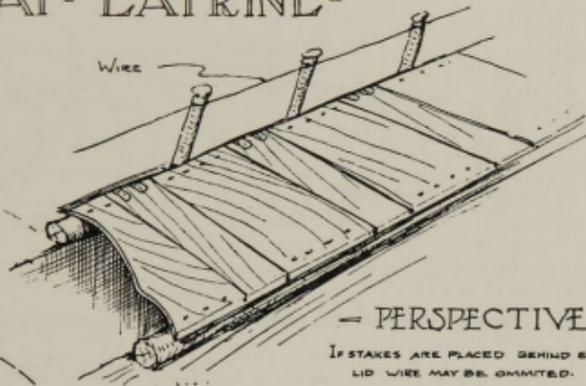
Such was not the case, however, when one of our divisions assumed independent occupancy of a sector formerly held by the French. Latrine buckets, necessarily, were removed by the organization to which they belonged; consequently, when, as for example, the 42d Division relieved the French 28th Division in the Baccarat sector, March 30-31, 1918, there were no latrines whatever for our men, the result being, for a time, the inevitable pollution of communicating trenches or abandoned strong points. To remedy this condition, pits were dug wherever possible, or bucket latrines were constructed, the contents of which were emptied at night into two pits at the rear. Our prescribed system was to use latrine buckets only when deep-pit latrines could not be constructed.¹⁹

Latrines in trenches were to be located in offshoots therefrom, usually not more than 50 meters away, and in a place convenient for the men for whom they were intended. They were not to be located in dugouts, except in very large ones, where special provision had been made for ventilation (see fig. 14); nor were they to be located near points which were likely to draw fire.¹⁹

The board covering, as prescribed in General Orders, No. 12, H. A. E. F., 1917, was the usual form, though, for officers, the Havard box was prescribed (figs. 77 and 78).

Other types of fly-proof pit latrines, the use of which was suggested by the division of sanitation, chief surgeon's office, A. E. F., are shown in Figures 79 and 80, which are self-explanatory.

- SELF-CLOSING - FLY-PROOF -
- SQUAT - LATRINE -



TO BE BUILT IN SIX HOLE SECTIONS.
EACH SECTION 13'-6" LONG.

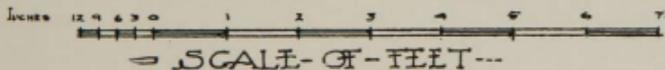


FIG. 75

LATRINE WITH FLY TRAP.

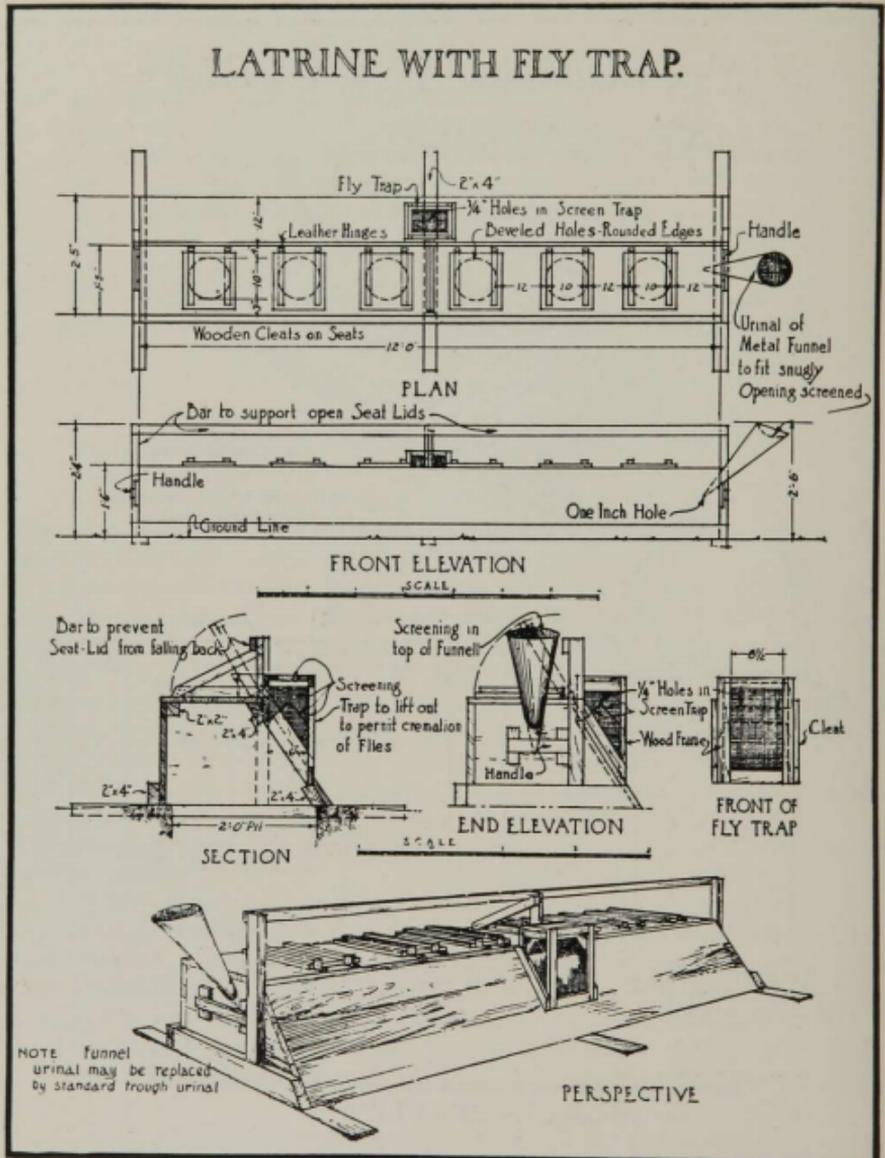


FIG. 76

STRADDLE TRENCHES

Our field service regulations, in effect at the time of our entrance into the World War, required that when troops occupied a camp for one night only, "straddle," or shallow trenches would be used, the excrement at all times to be covered with a layer of earth.²⁰ When crude oil was obtainable the same treatment of the contents of the shallow trenches as for deep trenches was advised;²¹ that is to say, these trenches either were to be burned out or their contents sprayed with crude oil.

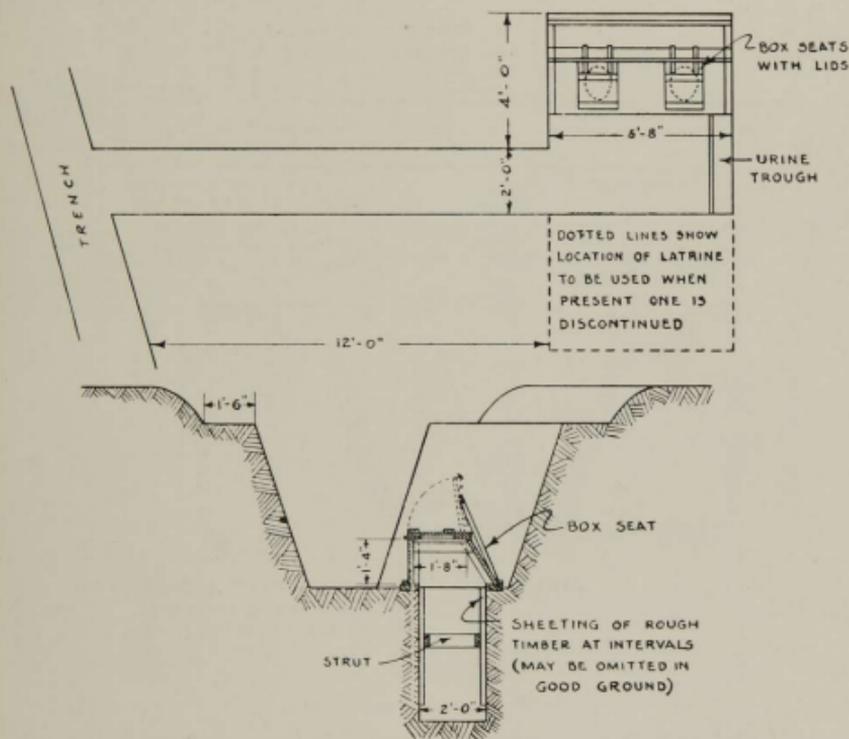


FIG. 77.—Deep latrine, box-seat type

In the American Expeditionary Forces, use of such a trench was made by our combat troops when bivouacking during marches, as in maneuvers, or when changing locations. In so far as marching for the purpose of changing the positions of our combat divisions in the front line is concerned, this was largely not true, since the element of time was so important in nearly all the operations in which our divisions engaged that means for transporting the troops from place to place were used. In theory each soldier was supposed to at least obey the Mosaic law, as to covering his excreta, even at the front, when engaged in open warfare, and where it was impracticable to establish trench latrines for them. This implied, of course, a high degree of discipline on the part of the troops.

Such, however, was not the case among many of our new troops arriving in France in the late spring of 1918, at a time when defaults in sanitary rules potentially would lead to a harvest of sickness and death during the rapidly approaching fly season; nor is the condition to be wondered at.

The division surgeon, 3d Division, A. E. F., in reporting upon the disposal of excreta in that division when it was on the Marne in July, 1918,²² stated that though latrines were provided, men relatively new to the service, and exposed to danger and hardships, would relieve themselves in the near-by woods rather

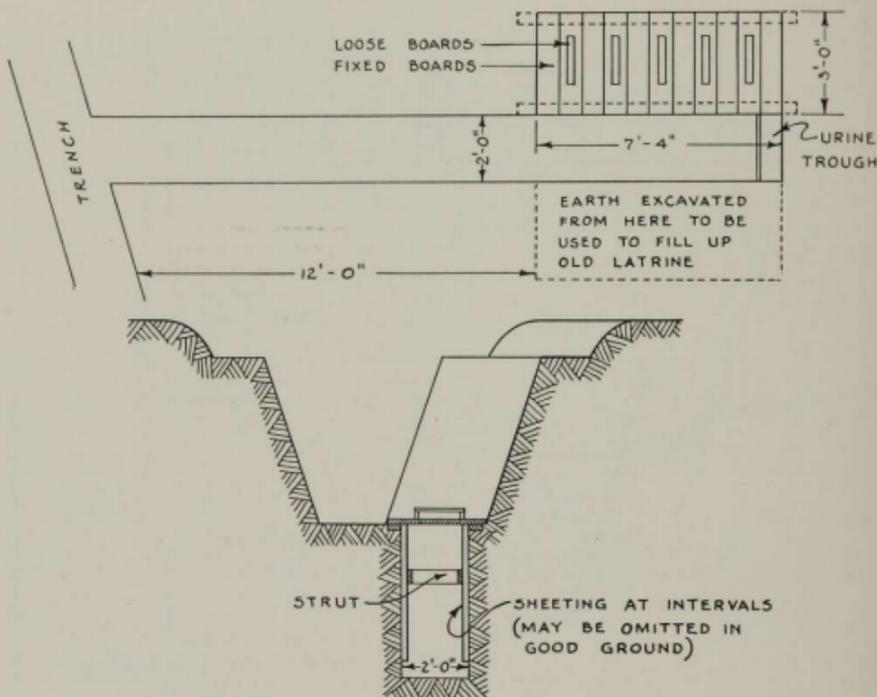


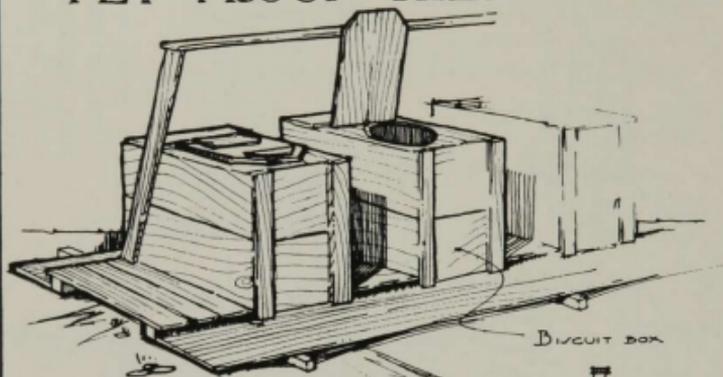
FIG. 78.—Deep latrine, straddle type

than visit a latrine. Besides, latrines in the woods were not easily discoverable by the men at night, when no lights could be used; consequently, there was an inevitable defiling of the ground. Likewise, in the whole of the First Army, A. E. F., on its various fields of combat, a similar situation existed.²³ Sanitary officers of this army refrained from making recommendations as to excreta disposal that common sense declared impractical, and confined themselves to seeing that the combatant line was supplied with good water and hot food; however, they insisted, and with good success, that labor troops and reserves police the areas when this duty did not interfere with the more important one of supply.²³

PAIL SYSTEM

In many places in France the use of deep-pit latrines was impracticable. The ground water was too high, there was danger of polluting the water supply,

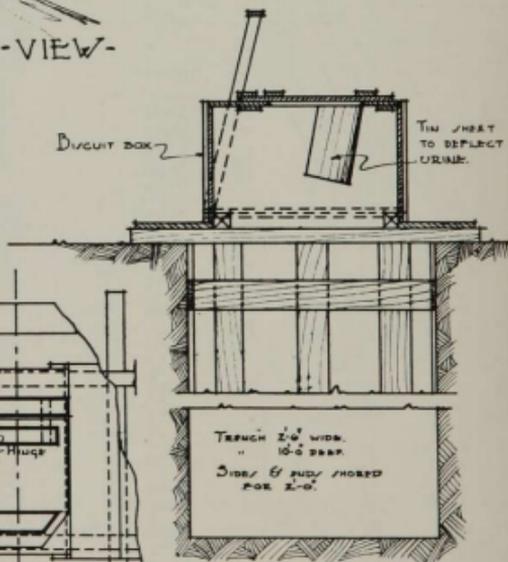
FLY PROOF TRENCH LATRINE



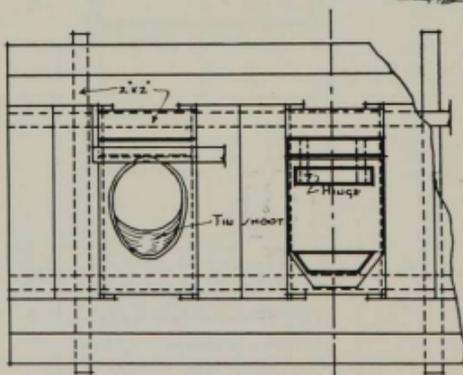
- PERSPECTIVE VIEW -



- DETAIL OF TIN SHEET -



SECTION AA



- PLAN -

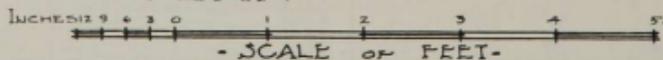


FIG. 80

the subsurface stratum was impervious, or, as when troops were billeted in some towns where there was objection to the construction of pit latrines.²⁴ In the absence of a water-carriage system of excreta disposal, the above conditions necessitated the use of pails, the ultimate disposal of their contents being accomplished either by burial or by incineration.

PAIL SYSTEM IN THE TRENCHES

Mention was made above of the fact that in the trenches the pail system of excreta disposal was used by us to some extent. It was not the purpose, however, to follow this method of excreta disposal in trenches except where pit latrines were impractical in view of the fact that pails were unobtainable in adequate number for the purpose.²⁵

The location of the bucket latrine, when used in the trenches, was the same as for the pit latrine (see p. 826). The buckets were to be placed in an excavation from which they could be removed easily for routine emptying, and were to have a suitable seat cover. Because incineration was obviously impossible, the pail system when used in the trenches necessitated a burial of the pail contents in the rear of the trenches.²⁶

PAIL SYSTEM IN THE SERVICES OF SUPPLY

In the Services of Supply the pail system was extensively used, more especially at hospitals and at other places where pit latrines, for various reasons, could not be constructed. During the winter 1917-18, the ultimate disposal of excreta by this system was highly unsatisfactory. Sanitary reports, especially from base sections, recorded in detail the difficulties in maintaining a semblance of ordinary cleanliness in operating the pail system of disposal of feces in many of our camps.²⁷ The defects in the system at that time were due to the absence of incinerators,²⁸ and to conditions without our control; that is to say, in all instances the emptying of the pails and the ultimate disposal of feces were in the hands of local contractors who would not subscribe to our sanitary standards.²⁷ Subsequently, the pail system was largely discontinued in favor of the pit latrines, except, as has been stated, at places where it was impracticable to make use of pit latrines, and at hospitals which did not have a sewerage system.²⁹

At Camp Pontanezen, Brest, an ingenious and very effective modification of the pail system of feces disposal was devised.³⁰ During 1918-19 Camp Pontanezen developed from a simple rest camp, with a capacity of about 8,000 transient troops, to an embarkation camp sufficiently large to contain 75,000 men. One of the improvements of the larger camp was a narrow-gauge railway which had been constructed so as to connect kitchens and storehouses throughout the camp. In April, 1919, advantage was taken of this railway to use an improvised type of latrine which was designated "the barrel railway type latrine." A building was constructed with its floor sufficiently high to permit extending a track beneath it on which a metal dump car could be rolled. Beneath the latrine seats, barrels were placed so as to revolve on their long axes. From each barrel a segment of staves had been removed, thus making a hopper of it which, in its normal position beneath the latrine seat, would receive

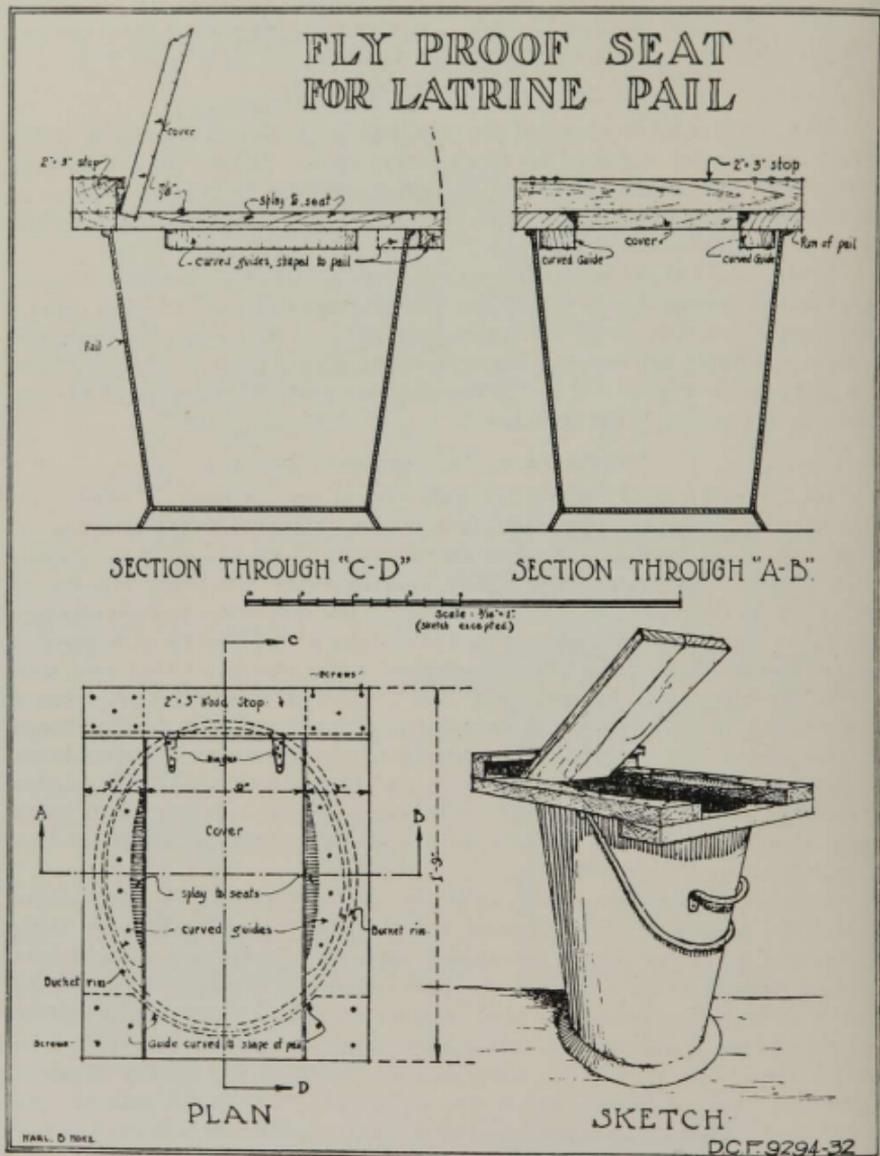
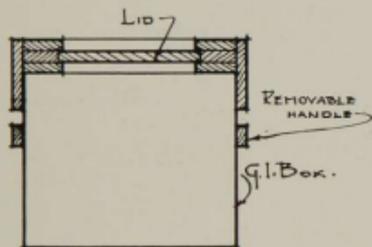
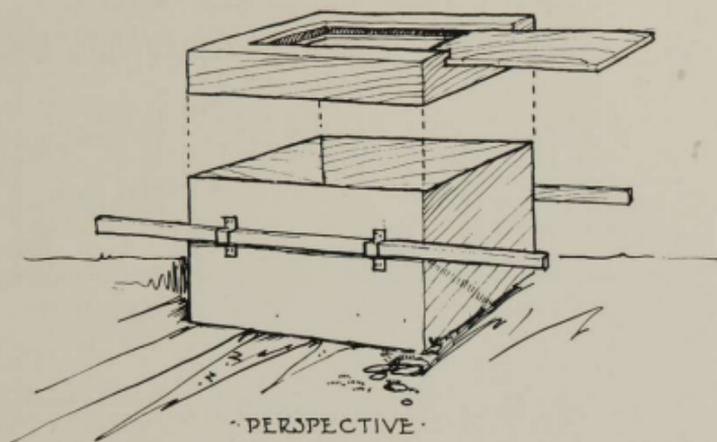
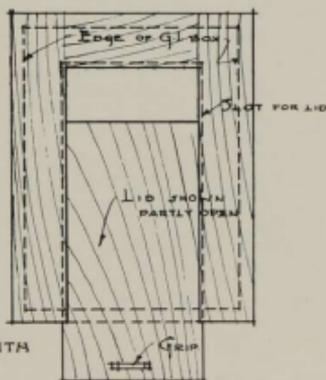


FIG. 81

PORTABLE FLY-PROOF LATRINE

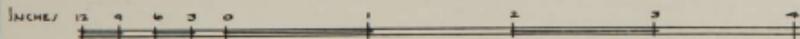


LID MAY BE HINGED WITH SCRAP LEATHER



SECTION

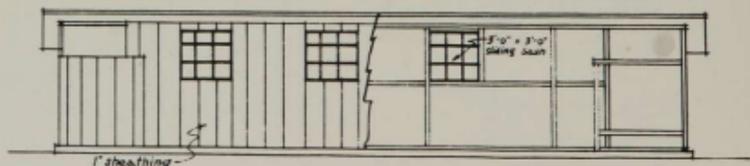
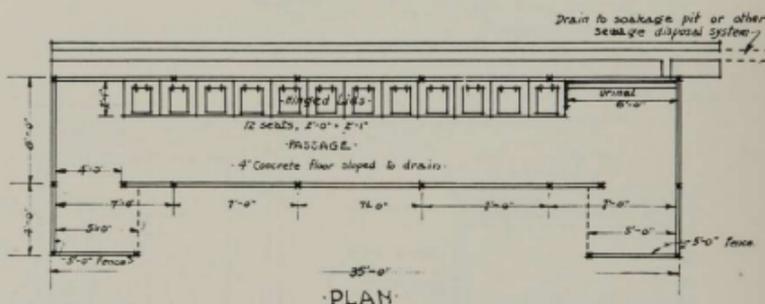
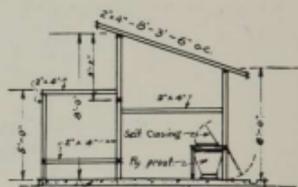
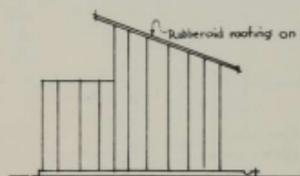
PLAN



50U.6120-32

FIG. 82

'BUCKET LATRINE' 'STANDARD ENCLOSED TYPE'



Scale: $\frac{3}{16}'' = 1'-0''$

FIG. 83

excreta, and when turned over, at the proper time, would empty its contents into the railway car on the track beneath. A permanently detailed group of men cared for these latrines, dumping the contents from the barrels into the railway cars when necessary. The barrels when emptied were sprayed with crude oil and turned back to their proper positions. The contents of the car likewise were sprayed with crude oil, and its cover was securely fastened to insure against spilling the contents while the car was in transit to the place which had been selected for the burial of the excreta in pits. When the car had been emptied it was then thoroughly cleaned by means of live steam. The excreta which had been dumped in the pit was promptly covered with earth.

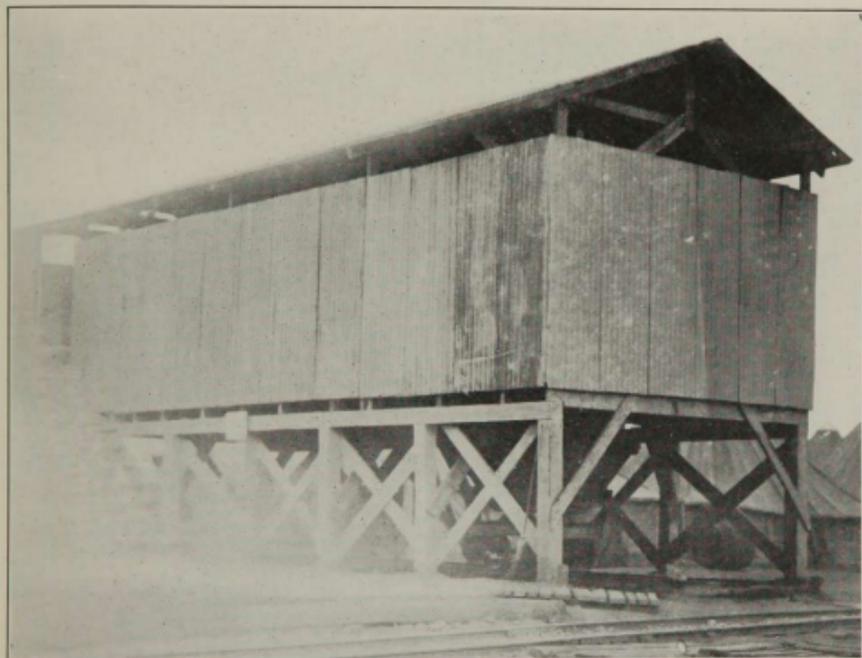


FIG. 84.—Railway-latrine building, Camp Pontanezen, Brest

The complete operation of excreta disposal thus described took place daily between midnight and dawn.

INCINERATION OF EXCRETA

The original plan for all hospitals, both 300-bed and 1,000-bed capacity, in the American Expeditionary Forces provided for sewerage systems.³¹ Since this plan was considered by the Department of Construction and Forestry, A. E. F., as being too elaborate for the hospitals,³² other means of excreta disposal were adopted for them. Early in 1918, the Engineer Department, A. E. F., cooperating with the Medical Department, A. E. F., selected the pail system, for collection of excreta, and the Horsfall incinerator in which the excreta could be destroyed for excreta disposal in hospitals not having a sewerage system.²⁸

This pail system for collection, and in connection therewith the Horsfall destructor, had been used satisfactorily by the British for some time prior to 1917.²⁸ The practice in the British Army was to utilize 10 buckets of 60 pounds capacity each for a battalion whose strength was 1,000 men.³³ Since it was necessary to utilize some material to absorb the fluid portion of each bucket for proper incineration, the ratio of fluids being as 5 is to 1, sawdust, or other absorbent was used in the proportion of 19 pounds to 100 of the fluid. It was found that 330 pounds of fuel were required to incinerate completely the 500 pounds of liquid daily excreted by 1,000 men, and since the normal combustible refuse from an organization of this strength averaged 1,500 pounds per diem, the unit was self-supporting in its incineration.

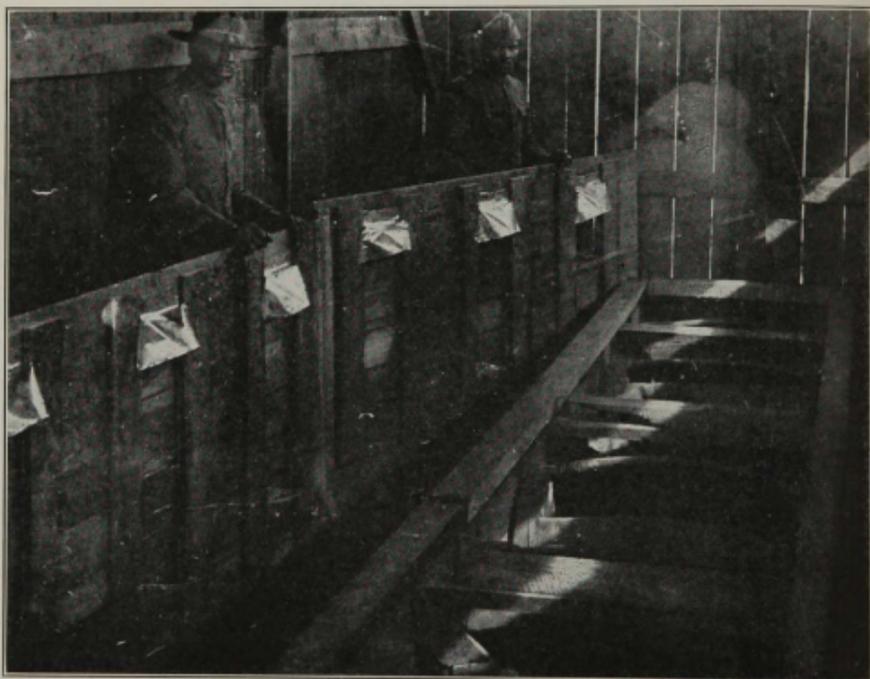


FIG. 85.—Interior of railway latrine, Camp Pontanezen, Brest

Various forms of closed incinerators were made use of in the destruction of excreta. The type selected for the hospitals of the American Expeditionary Forces, however, was the Horsfall destructor.³⁴ This appliance depended for its efficiency upon a baffle plate which was suspended from the juncture of the bottom of the chimney and the furnace proper. With a red-hot fire in operation, the fumes from excreta deposited upon it, impinge upon the baffle plate and are reverberated to the fire, thus being oxidized before escaping inodorously through the bottom of the chimney. Because of an air space of one-half inch between the iron walls and their fire-brick lining, it is possible to attain a temperature well over 500° F., which is the minimum effective flue temperature.³⁵

Since the Horsfall destructors were especially made appliances which it was necessary to purchase in England, the supply of these did not keep pace with hospital construction;³⁴ and to meet the demand improvised incinerators were advised, such as are shown in Figures 88 to 92, pending the installation of the Horsfall type.

A necessary adjunct to the destruction of excreta by incineration was a building where the destructor was placed, the separation of fluid from solid portions of the excreta could be effected, and where the proper mixing of the feces with the combustible material could be made as a preliminary to incineration. Two types of feces destructor buildings were used in our overseas hospitals.³⁶ One, the earlier type, consisted of a shed 12 by 50 feet, in which there were five 7-foot compartments and space at one end for the destructor (fig. 93). In the compartment, or bin, indicated as the separating bin, there were two funnel-shaped separators in which the liquid portion of the excreta was drained from the solid by passing through holes in the bottom of the separator. This type of destructor shed, after being installed in some of the hospitals, was considered needlessly large and subsequent destructors sheds measured only 8 by 18 feet. One end of the smaller shed contained the destructor; the other end, where the separator was located, was open on three sides (fig. 94).

OPERATION OF THE PAIL SYSTEM OF EXCRETA DISPOSAL BY INCINERATION

The bucket type of latrine was required to be made flyproof.³⁶ This was accomplished by making seats with self-closing lids, and by completely inclosing the buckets beneath the seats (fig. 95). The buckets were removed, when necessary, but never less frequently than once daily, through a snugly fitting hinged door at the back of the latrine. Feces, when allowed to become urine soaked in latrine pails are softened, thus increasing the difficulties of separation necessary to incineration, and tending to clog the urine soakage pit. To obviate this, the chief surgeon, A. E. F., advised suspending within the latrine bucket a discarded hand basin or shallow pan which had been perforated by numerous nail holes,³⁶ as shown in Figure 96.

When the buckets were removed from the latrines, and were taken to the destructor shed their contents were emptied, in practicable quantities, into the separator in which previously had been placed loose inflammable camp refuse

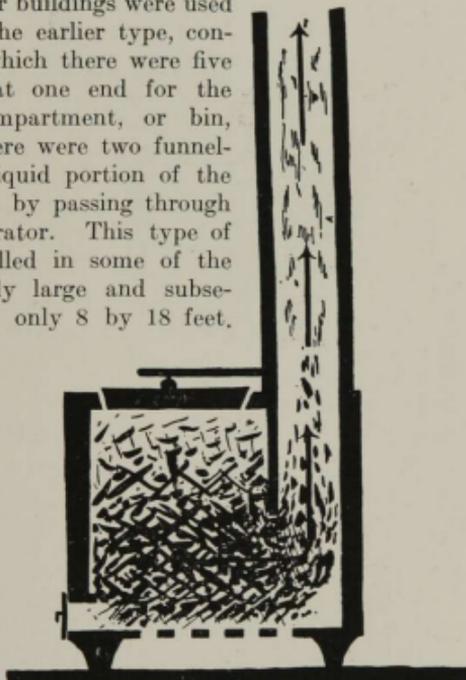


FIG. 86.—Showing principle of Horsfall destructor (Lelean)



FIG. 87.—Horsfall feces destructor, Base Hospital No. 68, December 31, 1918

SMOKELESS-FECES-DESTRUCTOR

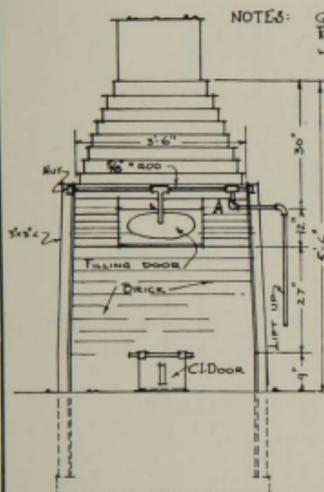
NOTES:

GRATE BARS TO BE $\frac{3}{4}$ " x $\frac{1}{2}$ " AT ENDS AND $\frac{1}{2}$ " DEEP IN CENTRE (13 REQ'D)
 RELIEVING BLOCK TO BE MADE OF ONE 6" LENGTH OF 4" W.I PIPE
 WITH 4 SLOTS CUT IN SIDES AS SHOWN IN DRAWINGS AND COVERED WITH C.I.
 THE SAME TO BE SECURELY BOLTED TO GRATE WITH BOLT RUNNING

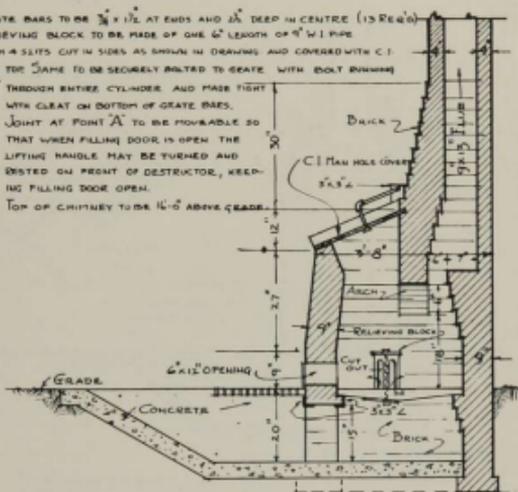
THROUGH ENTIRE CYLINDER AND MADE TIGHT
 WITH CLEAR ON BOTTOM OF GRATE BARS.

JOINT AT POINT 'A' TO BE MOVABLE SO
 THAT WHEN FILLING DOOR IS OPEN THE
 LIFTING HANDLE MAY BE TURNED AND
 DISTED ON FRONT OF DESTRUCTOR, KEEP-
 ING FILLING DOOR OPEN.

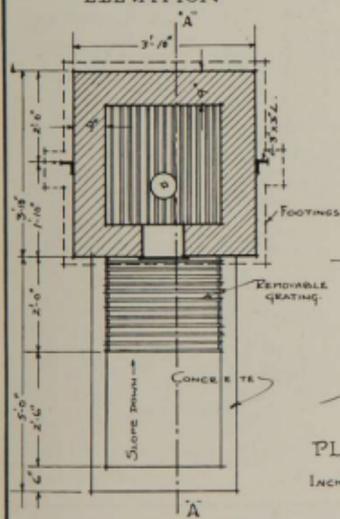
TOP OF CHIMNEY TO BE 14" 0" ABOVE GRADE.



ELEVATION



SECTION A-A



PLAN

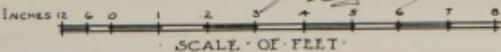


FIG. 88

PERSPECTIVE

SECTION A-A

ELEVATION

NOTES:

GRATE BARS TO BE $\frac{3}{4}$ " x $\frac{1}{2}$ " AT ENDS AND $\frac{1}{2}$ " DEEP IN CENTRE (13 REQ'D)
 RELIEVING BLOCK TO BE MADE OF ONE 6" LENGTH OF 4" W.I PIPE
 WITH 4 SLOTS CUT IN SIDES AS SHOWN IN DRAWINGS AND COVERED WITH C.I.
 THE SAME TO BE SECURELY BOLTED TO GRATE WITH BOLT RUNNING

THROUGH ENTIRE CYLINDER AND MADE TIGHT
 WITH CLEAR ON BOTTOM OF GRATE BARS.

JOINT AT POINT 'A' TO BE MOVABLE SO
 THAT WHEN FILLING DOOR IS OPEN THE
 LIFTING HANDLE MAY BE TURNED AND
 DISTED ON FRONT OF DESTRUCTOR, KEEP-
 ING FILLING DOOR OPEN.

TOP OF CHIMNEY TO BE 14" 0" ABOVE GRADE.

- FECELS - DESTRUCTOR -

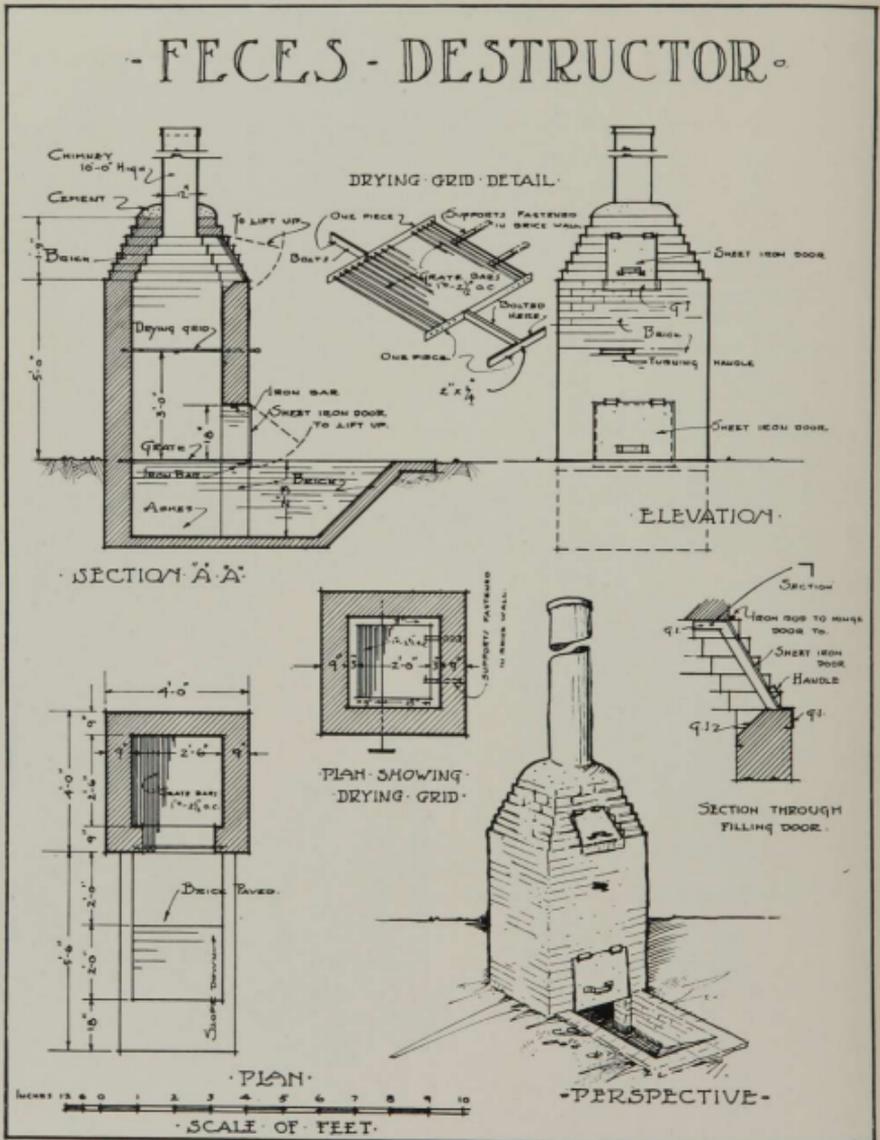


FIG. 89

ENCLOSED BEE-HIVE INCINERATOR WITH TUBULAR DRYING CHAMBER

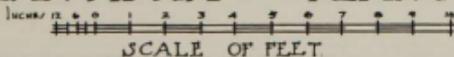
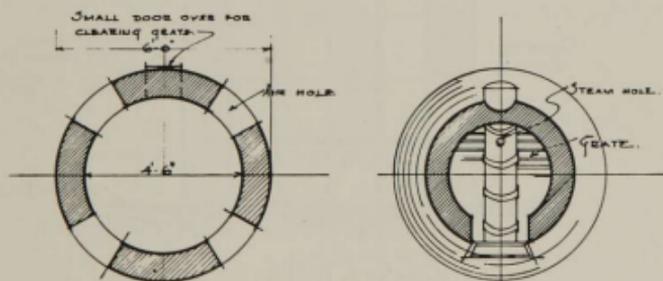
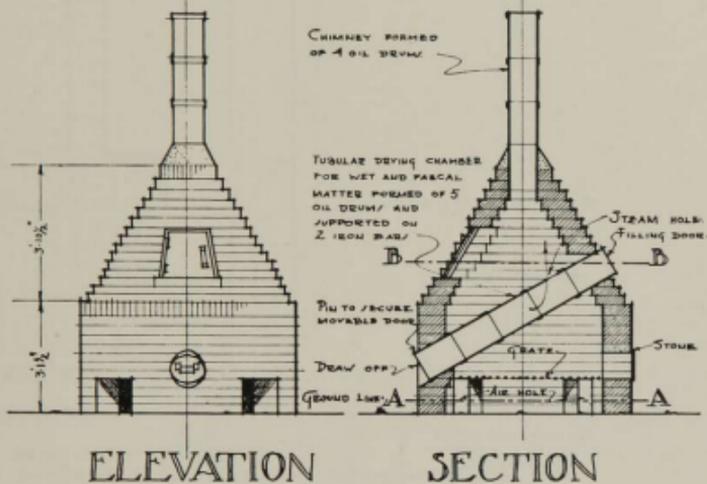


FIG. 90

"BAILLEVL" INCINERATOR WITH BAFFLE

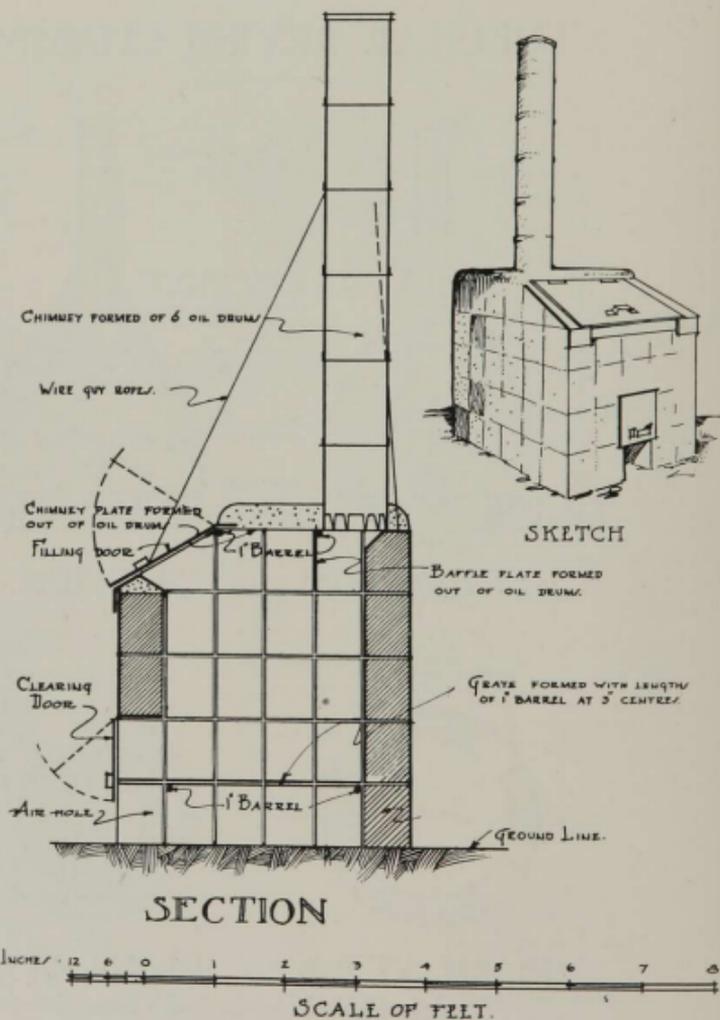


FIG. 91

"BAILLEVL" INCINERATOR WITHOUT BAFFLE

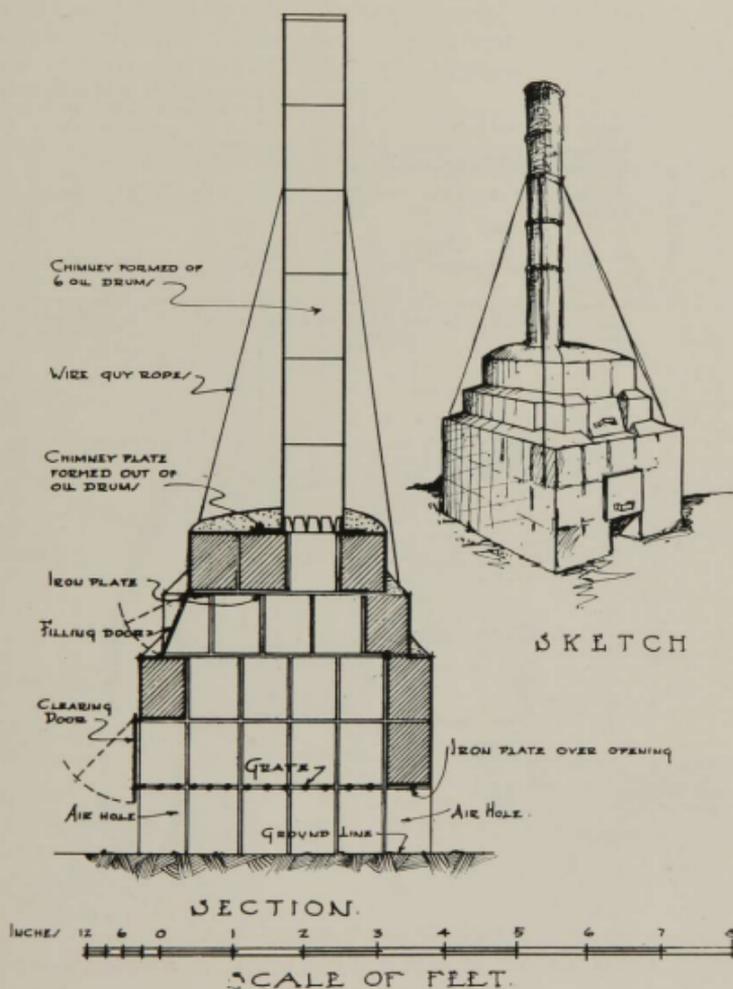


FIG. 92

FECES DESTRUCTOR SHED · OBSOLETE TYPE ·

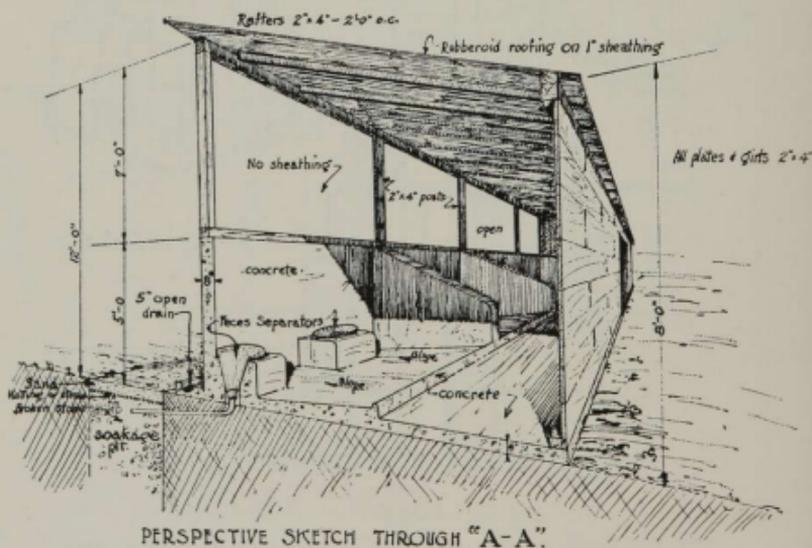
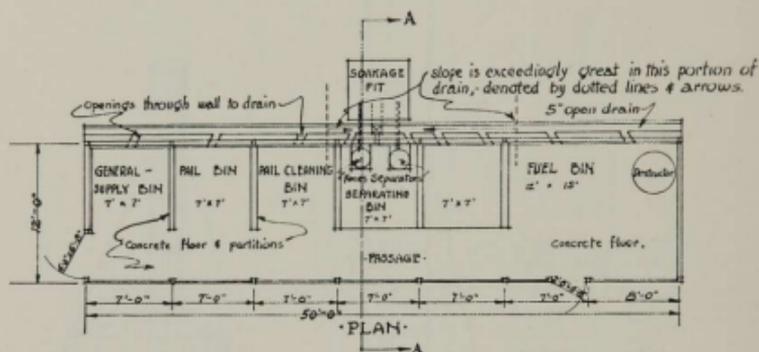


FIG. 93

fine coal, or straw, to facilitate incineration. After the liquid had drained from the excreta the separator was lifted by means of its handles and its contents were dumped into the destructor which previously had been prepared for this, as will be explained shortly.

When buckets were delivered to the destructor more rapidly than their contents could be separated and incinerated, they were to be kept covered until opportunity afforded for treating their contents. After the buckets had been emptied they were to be rinsed and then washed in a tub of 10 per cent cresol solution, a brush on a 2-foot handle being used for the purpose. The outside of the bucket was to be polished with kerosene and sand. Upon its

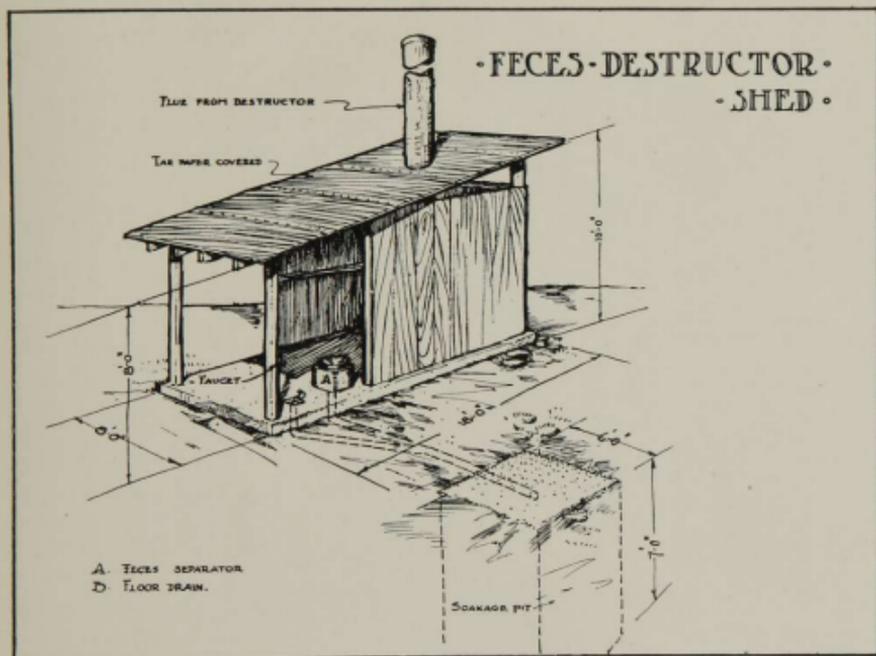


FIG. 94

return to the latrine each bucket was to have placed in it a small quantity of cresol solution.

In the operation of the destructor it was necessary to have a good fire extending to the baffle plates. For this purpose coal was found to be best in the absence of a good quality of camp refuse. Camp refuse was now to be added in small quantities, following which the contents of the separator, prepared as described above, were to be added carefully and slowly. Shortly after the first hopper of excreta had been added to the fire another hopper load was to be added, the interval of time varying with the heat of the fire. Between these charges of separator contents, the fire was to be encouraged by means of camp

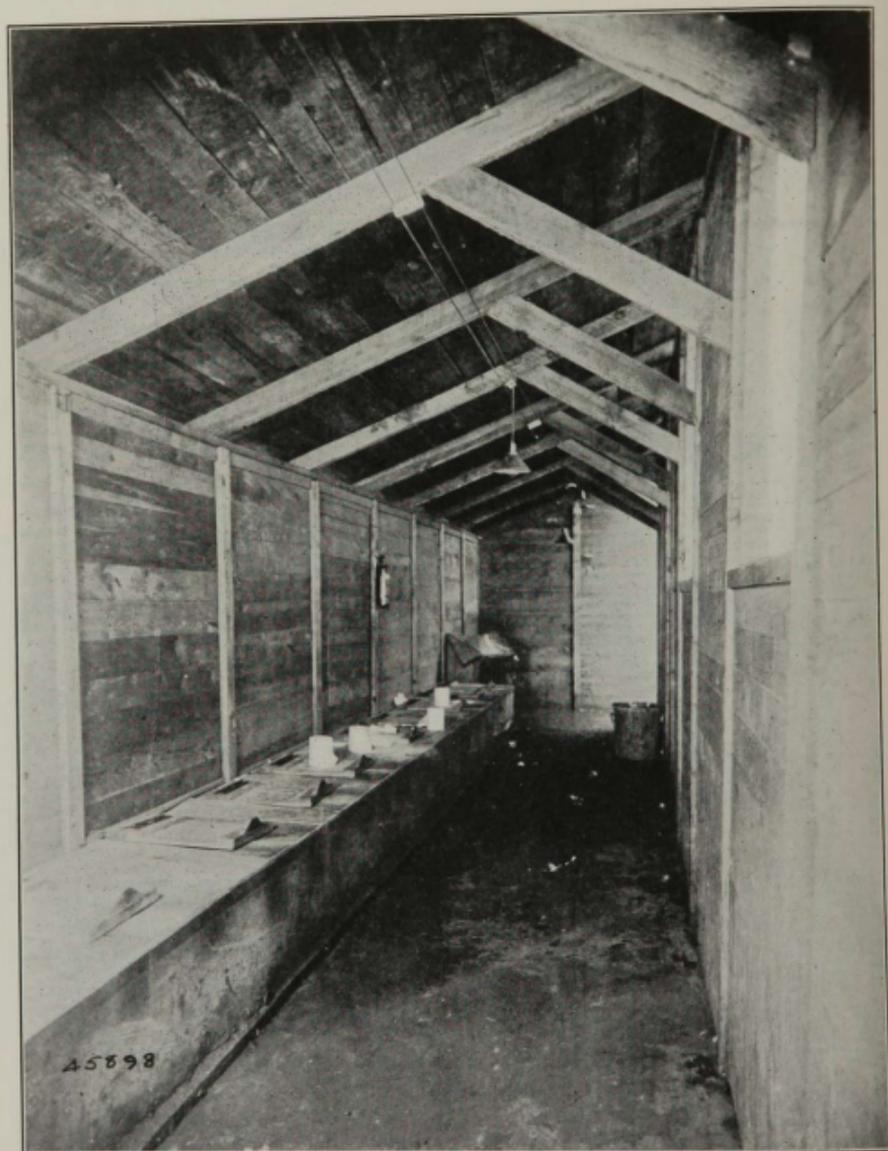


FIG. 95.—Detachment latrine, Base Hospital No. 68, December 31, 1918

refuse, whose purpose also was to maintain the body of the fire. In addition careful stoking was to be observed.

The operation of the smokeless type of feces destructor in the hospitals of the American Expeditionary Forces was not conducted without much difficulty, especially during the first few months following its installation.³⁷ The difficulties met with were not incident to a faultiness of the system, but to inexperience of the sanitary squads detailed to operate the destructors. To overcome such difficulties in operation as it was possible to do, the chief surgeon, A. E. F., sent a member of the Medical Department, who had gained experience in this connection in one of our hospitals serving with the British Expeditionary Forces, from hospital to hospital to demonstrate the practicability of excreta disposal by means of the destructor.³⁷

It would be appropriate here to describe the soakage pit which was so essential a part of the feces destructor plants operated at our hospitals. This, however, will be considered later under the subject of disposal of fluids.

WATER-CLOSET SYSTEM OF DISPOSAL OF EXCRETA

Many permanent buildings in France were used for various purposes of the American Expeditionary Forces. The buildings so used comprised barracks, school buildings, and hotels, which contained toilet facilities presumably adequate for their designed purposes, though obviously these facilities, especially in hotels and schools, never could be sufficient for our needs, especially as regards hospitals. These water-closets obtained in various degrees of satisfaction. Thus in the town of Chatel Guyon there was a very modern septic

tank in which the sewage from the various hotel buildings converted to hospital purposes for Base Hospital No. 20, A. E. F., emptied. With a reconditioning and amplification of the water-closet facilities, the system at this hospital was reported to have operated satisfactorily.³⁸ On the other hand, smaller buildings generally, and this is especially true of the houses used as billets in the smaller towns where there was no general sewerage-disposal system, had cesspools beneath them. In such houses the toilets connected with the cesspools by means of a vertical, untrapped pipe, a plunger usually letting the concave bottom of the toilet fall and coincidentally releasing a trickle of water which inadequately flushed the toilet. With the cup-shaped bottom thus open there was a direct communication possible between the cesspool and the room in which the toilet was located. Frequently, the condition was much more primitive. As described by Lelean, the toilets had no water flush and when full their contents had to be pushed down by means of a stick, a little water being poured in from a can kept near by.³⁹ Emptying the cesspools was a municipal function.⁴⁰ When the cesspool was full the house owner reported

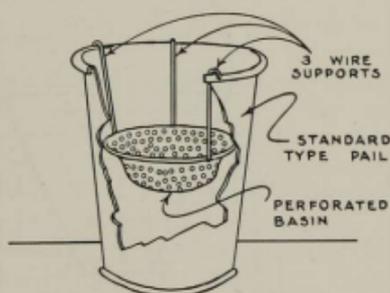
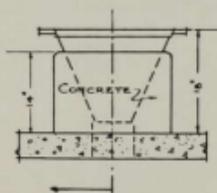
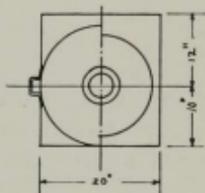


FIG. 96.—Improvised feces separator for latrines. The suspended separator can be made of discarded basin, pan, or sheet of iron, and the perforations made with nail and hammer or with drill.

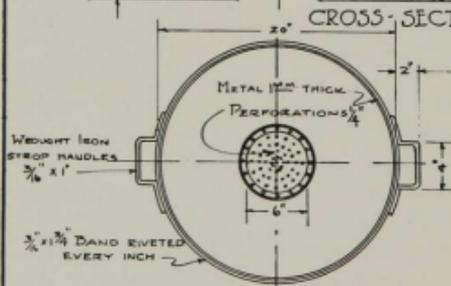
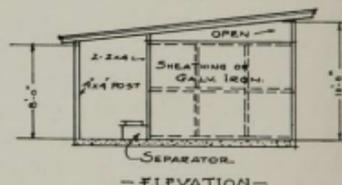
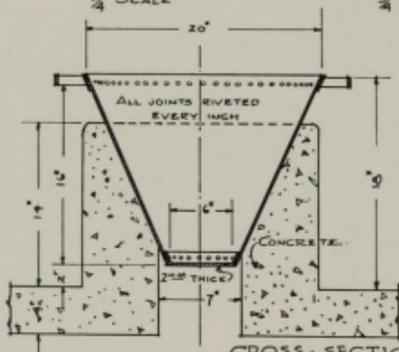
FECES - SEPARATOR & SHED



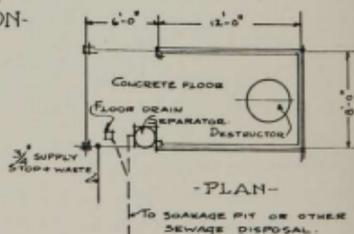
Scale $\frac{3}{4}$



Scale $\frac{3}{4}$



Scale $1\frac{1}{2} = 1-0$



FECES-DESTRUCTOR-SHED
Scale $\frac{1}{2} = 1-0$

FIG. 97

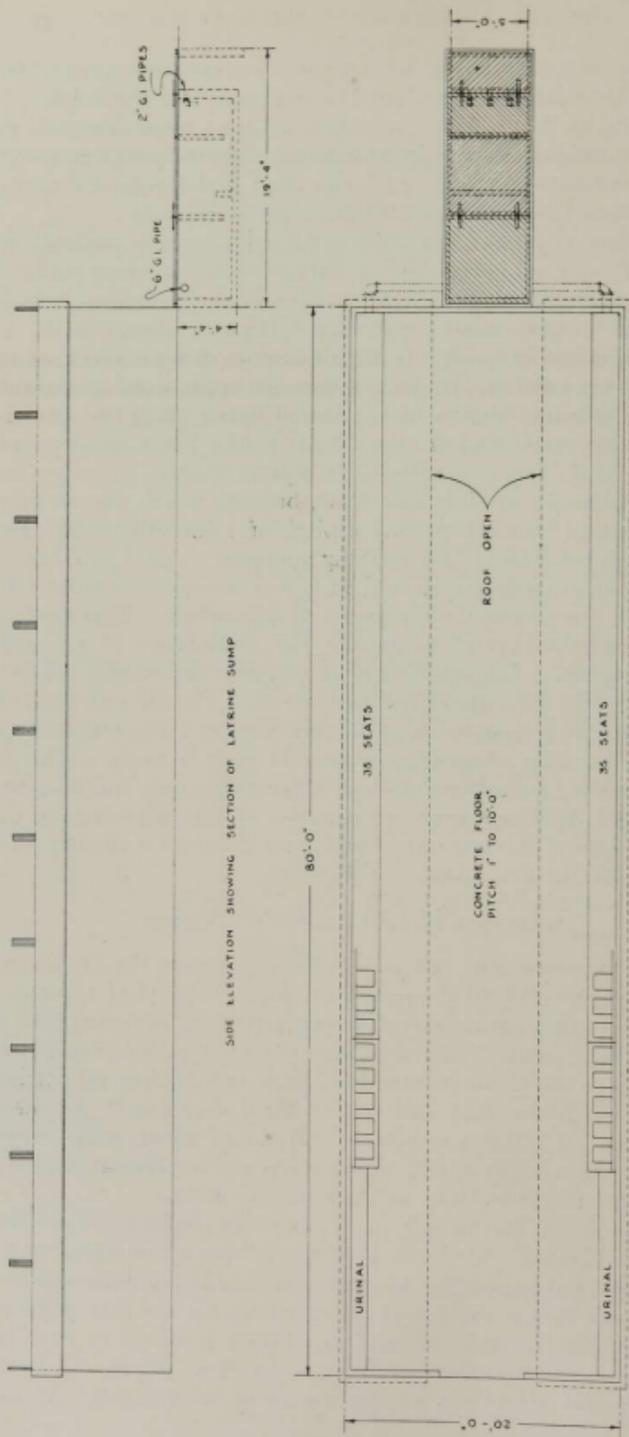
that fact to the city authorities, whereupon an excavating apparatus, as soon as it conveniently could, pumped out the contents. In the height of the war when towns such as Tours were overpopulated, and other demands prevented maintaining sanitary appliances in an adequate number, such removal of cesspool contents necessarily could not be prompt and frequently there was an inevitable overflow before the excavation could be effected.

With the necessity existing for resorting to so many expedients in the disposal of excreta, it is not surprising to find record of use being made of the old Reed trough system in at least one instance in the American Expeditionary Forces. In the area occupied by the First Depot Division, A. E. F., at St. Aignan, because it was impossible to dig pit latrines in the towns in which troops of the division were billeted, cans and buckets generally were used as receptacles for excreta, these being emptied in a selected burial place daily.⁴¹ As an improvement to this crude system, the 116th Supply Train constructed a large latrine measuring 80 feet in length by 20 feet in width. Running lengthwise on each side was a row of 35 latrine seats, beneath which was an iron trough. The concrete floor of the latrine had a pitch of 1 inch to 10 feet; the incline of the iron trough was 2 feet. For flushing purposes, an inlet pipe was connected to the upper end of each trough and at 8 feet distance therefrom floodgates were placed so as to permit the formation of a reservoir. This mechanism did not operate mechanically, consequently the attendance of an orderly was constantly necessary. The contents of the troughs discharged into a concrete septic tank, constructed adjacent to the latrine. The effluent from the septic tank overflowed into a near-by sump whence the fluid was removed from time to time by an odorless excavating wagon of French make. This latrine is reported as affording a sanitary method of feces disposal, and despite the fact that considerable transportation was necessary for disposing of the liquid contents of the sump, the amount of water used was only slightly in excess of the volume under the can method of disposal.

EXCAVATOR WAGONS FOR SEWAGE DISPOSAL

Two principal conditions existed at various places in the American Expeditionary Forces which militated against the local disposal of excreta. One of these was the necessity for constructing pit latrines in a camp whose area was limited but whose population was large, thus preventing the constant redigging of pits. Such a place was Camp Pontanezen, Brest, where large pit latrines, measuring 20 feet long, 7 feet wide, and 12 feet deep, were dug.³⁰ In the spring of 1919, these large pit latrines numbered 224, 71 of which were cement lined. In effect these pits were cesspools whose contents, for reasons already stated, were removed from time to time, as the necessity arose.

One other reason for having to remove the contents of pit latrines or sumps was not because there was inadequate space for replacement of the latrines or sumps, but rather the fact that some of the activities of the American Expeditionary Forces existed at places where the soil was impervious and consequently would not take care of the liquid portions of excreta. Such places were the hospital centers at Beaune⁴² and at Allerey.⁴⁴ Here, it will be recalled, disposal of excreta was by means of incineration. However the



FLOOR PLAN

Fig. 98.—Modified reed trough, First Depot Division, A. E. F.

liquid portions of the excreta pails were drained from the solids prior to incineration. Ordinarily, soakage pits were used for this purpose, but when no soakage would take place the use of excavator wagons was necessitated, the ultimate disposal of the liquid thus removed taking place at a distance.

Several kinds of excavator wagons were utilized. Some had been made especially for the purpose and were purchased in the open market; others were improvised. A manufactured type was used at the 1st Depot Division, St. Aignan, in 1918, which comprised a tank, of 450 gallons capacity, on a horse-drawn vehicle, and a wagon-drawn gasoline engine.⁴⁴ Ready-made excavators were difficult to obtain abroad, consequently improvisations were made by the Engineer Department, A. E. F., as follows:⁴⁵ A 600-gallon water tank was mounted on an escort wagon, the suction portion of the apparatus consisting of a bilge force pump whose suction and discharge openings were 4 inches.

These horse-drawn apparatus when full were found impracticable, however, especially when hauls of any length were to be made,⁴⁴ because of the difficulty in obtaining suitable horses for the purpose, a solution being found in placing the tank on a motor truck.

MANURE

At the time we entered the World War two methods obtained for disposing of manure in our Army camps.⁴⁶ Both methods, however, necessitated the daily removal of manure from picket lines, which were to be kept broom-swept. After its removal from the picket lines and from camps, the manure was to be either destroyed by incineration or otherwise satisfactorily disposed of, as, for example, by sale to civilians for use as fertilizer. In France, manure is so highly prized by the farmers that no difficulty was experienced in the American Expeditionary Forces in getting them to remove it from our camps, when the amount of manure was not excessive and when it was practicable to do so as in the provincial districts in the Services of Supply.⁴⁷ The manure thus taken by farmers was generally not purchased by them; in fact, general orders, G. H. Q., A. E. F., prescribed that manure from our animals, when the troops to which they pertained were billeted in French villages, was to be removed from the picket lines and placed in a suitable locality clear of the villages for the use of the inhabitants.⁴⁸

At some of our camps in the American Expeditionary Forces, for example, Camp Coetquidan,⁴⁹ because of the large number of animals there the manure collected so rapidly as to make its removal from camp by wagons or trucks impracticable. Here the compost system, which had been followed successfully in the Panama Canal Zone, several years previously,⁵⁰ was adopted. The British Expeditionary Forces at Abbeville and at Rouen built piles of manure 30 feet in height, covering several acres of ground.⁵¹ Their main reliance to prevent fly breeding by so piling the manure was on the prompt removal of all manure from picket lines to the dump; neat packing and pounding in place by means of the flat side of a shovel each day's deposit on the pile; the sloping of the sides and top of the pile so as to shed water readily to a marginal gutter leading to a suitable cesspool or natural drainage channel; clearing up the margin of the pile after each day's work. At Rouen, larva traps were used systematically.⁵¹ These traps were made of gasoline tins containing nail holes

in the sides from 1 inch above the bottoms to the tops of the cans. These perforated cans, containing an inch of water, then were sunk level with the manure surface of the recently packed pile. Also, crude screen of burlap bagging were used, stretched on posts that had been driven either into the manure pile or at its sides. The bagging, being wet down several times each day with a solution of arsenite of soda, attracted by its moisture recently hatched flies which thus were killed by the arsenite.

Where it was necessary or desirable to destroy manure by incineration use was made of such improvised incinerators as are shown in Figures 99 and 100.

GARBAGE

In the summer of 1917, prior to the time when the question of tonnage in its relationship to the American Expeditionary Forces reached paramount importance, incineration of garbage was adopted as the standard method to be pursued there.⁵² For the purpose, the use of square brick incinerators whose inside dimensions were approximately 4 feet square, was directed (fig. 101). Such an incinerator was to dispose of the garbage of 1,000 men, the camp litter to provide practically all the fuel required.

Experience proved, however, that incineration of garbage could be practiced consistently only in the more permanent camps. In the combat divisions while in training areas the general practice was either to give garbage away to peasants for hog feed or to bury it.⁴⁷

Various types of incinerators for the disposal of wastes had been improvised overseas, especially in the British Expeditionary Forces, upon whose experience we freely drew. Plans of many of these incinerators were distributed by the chief surgeon's office, A. E. F., in order that a type best suited to local conditions might be selected by a given organization. Some of these, as will be seen by inspecting Figures 102 to 108, had a utilitarian purpose in addition to their garbage-destroying qualities; the heat of the furnace was to be utilized for heating water for bathing or other purposes. The incinerators of the kitchens at Camp Pontanezen, mentioned on page 868, contained water pipes in their brick jackets, thus furnishing adequate hot water for washing all the cooking utensils of the kitchen as well as for similar purposes.³⁰ For hospitals in the American Expeditionary Forces the type of incinerator adopted is shown in Figure 90. Where used, for example, at the hospital center at Mesves, this type of incinerator gave satisfactory results.⁵³

GARBAGE DISPOSAL, CAMP PONTANEZEN, BREST

Experience as to garbage disposal at Camp Pontanezen, Brest, because it extended over a relatively long period of time during which the population of the camp grew to large numbers, necessarily included all the features of garbage disposal met with elsewhere in the American Expeditionary Forces; therefore, because it was typical it has been selected for descriptive purposes. As will be seen, all three methods of garbage disposal were tried from time to time at Camp Pontanezen; that is, disposal by carting it away, by burying it, and by destroying it.³⁰ During the earlier months of the existence of Camp Pontanezen—that is to say, when it was a rest camp for troops debarking

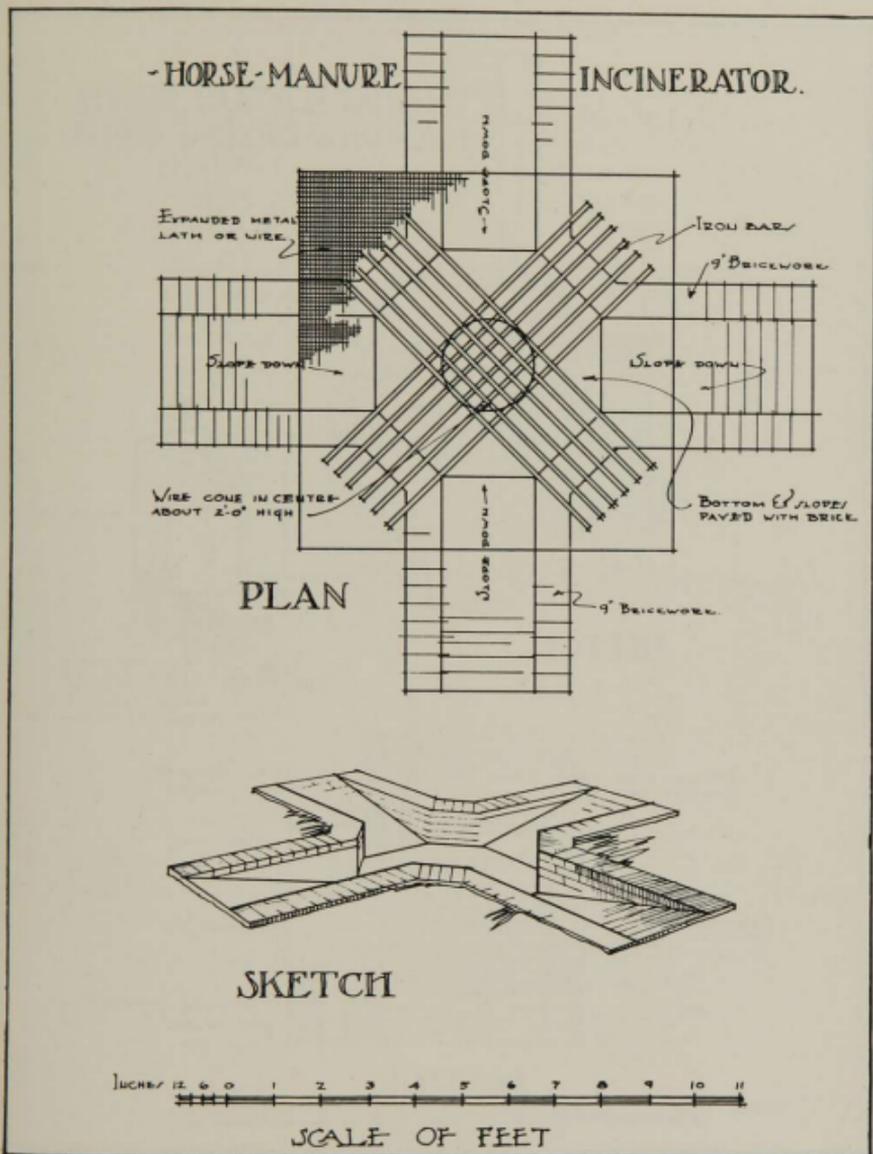


FIG. 96

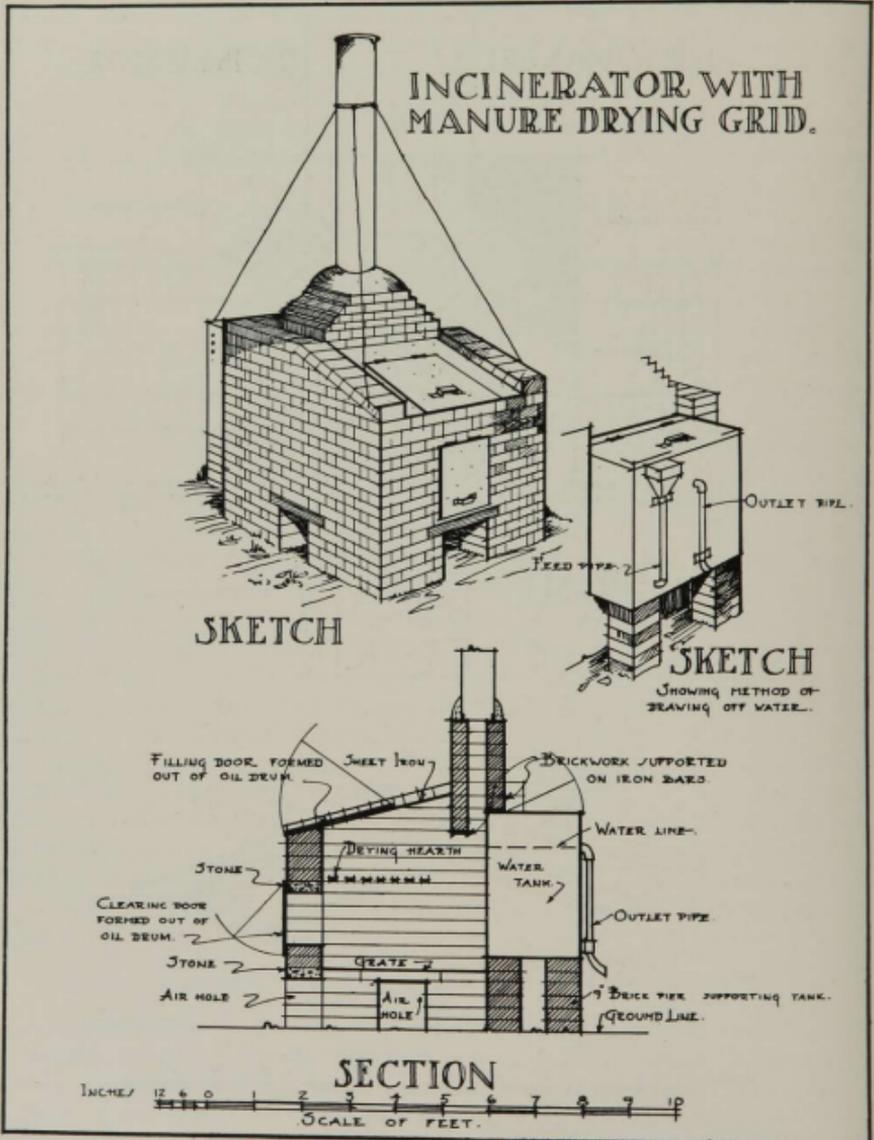


FIG. 100

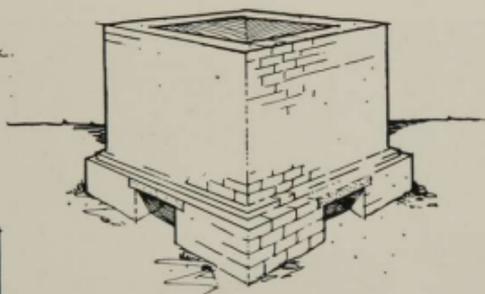
SQUARE INCINERATOR.

MATERIALS REQUIRED

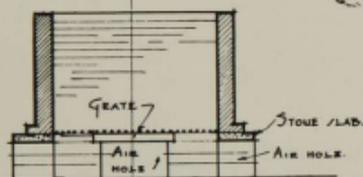
- 1200 BRICKS (APPROX.)
- 4 STONE SLABS.
- 24 IRON BARS.

CONSTRUCTION.

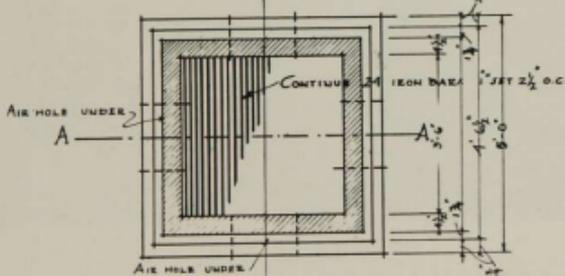
- 1 COURSE 9" BRICKWORK.
- 1 COURSE $6\frac{1}{2}$ " -
- REMAINING - $4\frac{1}{2}$ " -



SKETCH



SECTION A-A.



PLAN.

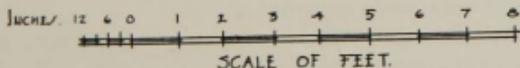


FIG. 101

from the United States and before it had become an embarking camp, in the latter part of 1918, for troops returning home—the bulk of the garbage comprised coffee grounds and wasted bread; the amount of fresh vegetables used in the ration being very small. Ham and bacon were the principal meats of the ration, and all waste therefrom having a large fat content was used to start the various kitchen fires. A part of the edible garbage was collected by French civilians. This method of disposal, however, soon was prohibited in the camp because of the unsatisfactory methods, from a sanitary standpoint, of the civilian collectors.

When, early in 1919, the camp's population had increased markedly, and kitchens with a feeding capacity for 5,000 had been instituted, and, in



FIG. 102.—Square incinerator in operation

addition, the ration had been made more balanced, the garbage necessarily increased markedly, averaging from 60 to 80 large cans daily in each kitchen. Fresh vegetables now were responsible for much of the increase, potato peelings alone filling from 20 to 25 cans daily in each kitchen.³⁰

For a greater part of the time this vast quantity of garbage was hauled from the kitchen of Camp Pontanezen to the camp dump. To do so in a sanitary manner necessitated an organization whose development extended over the period of several months, as follows: During the summer of 1918, when Camp Pontanezen was a rest camp, it embraced an area which in turn included Caserne de Pontanezen and farming land to the north and east of the

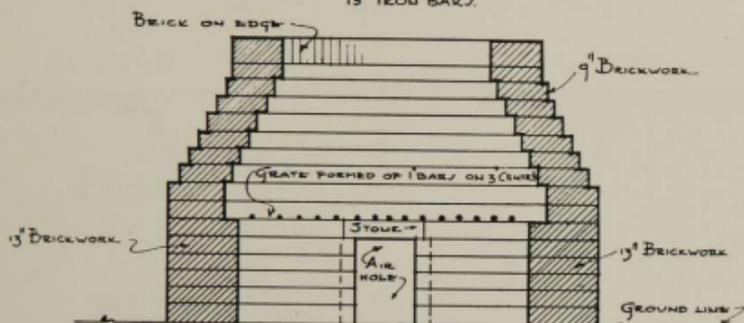
· BEE-HIVE INCINERATOR ·

MATERIALS REQUIRED.

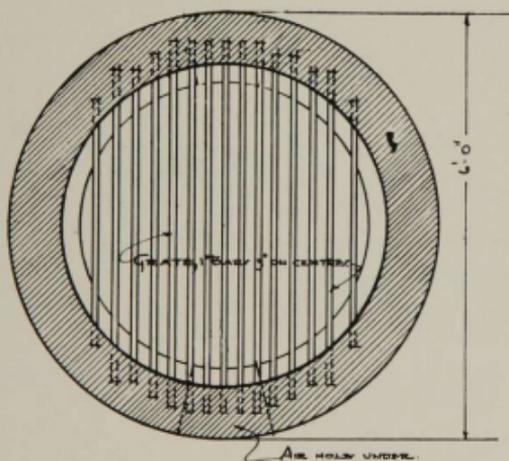
650 BRICKS (APPROX.)

1 STONE SLAB.

15 IRON BARS.



-SECTION-



-PLAN-

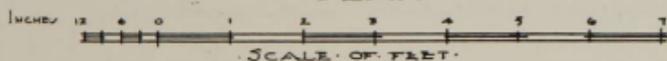


FIG. 103

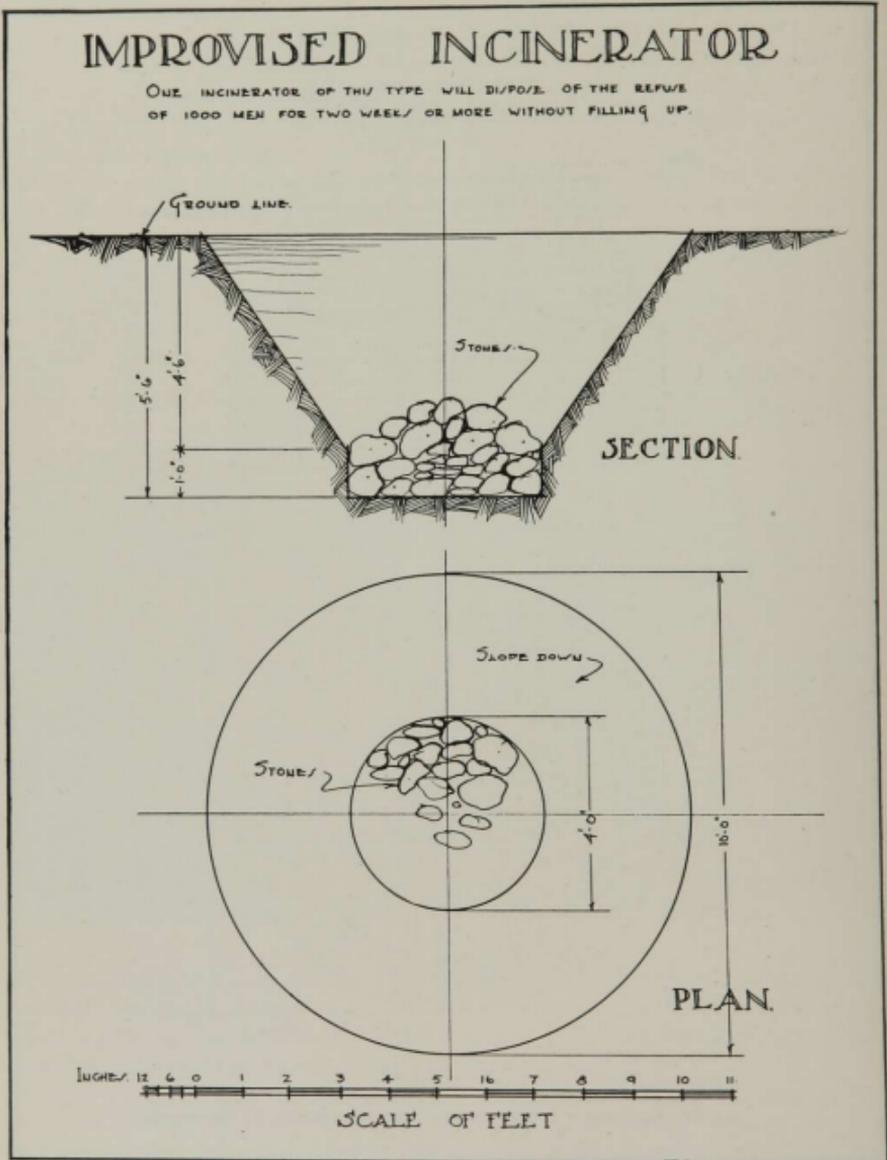
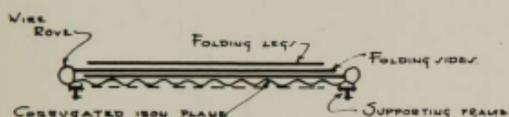
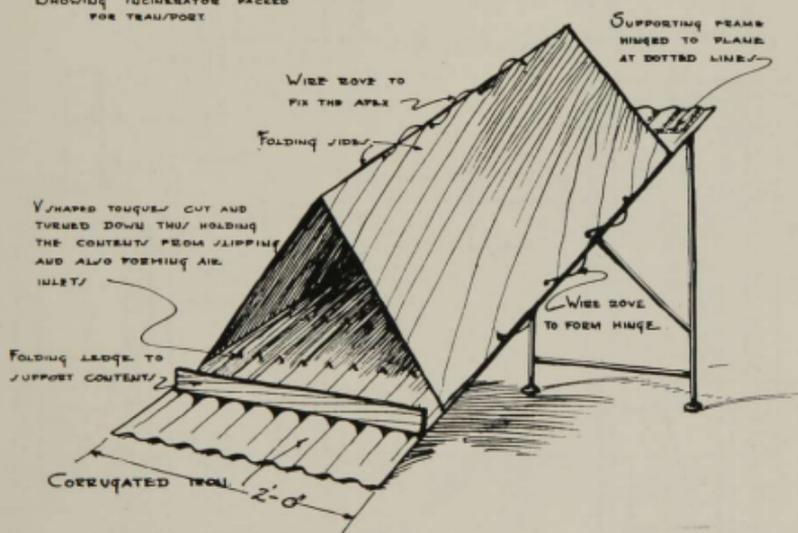


FIG. 104

PORTABLE INCLINED-PLANE INCINERATOR



SECTION
SHOWING INCINERATOR PACKED
FOR TRANSPORT



SKETCH
SHOWING INCINERATOR READY FOR USE

FIG. 105

INCINERATOR & HOT-WATER-HEATER.

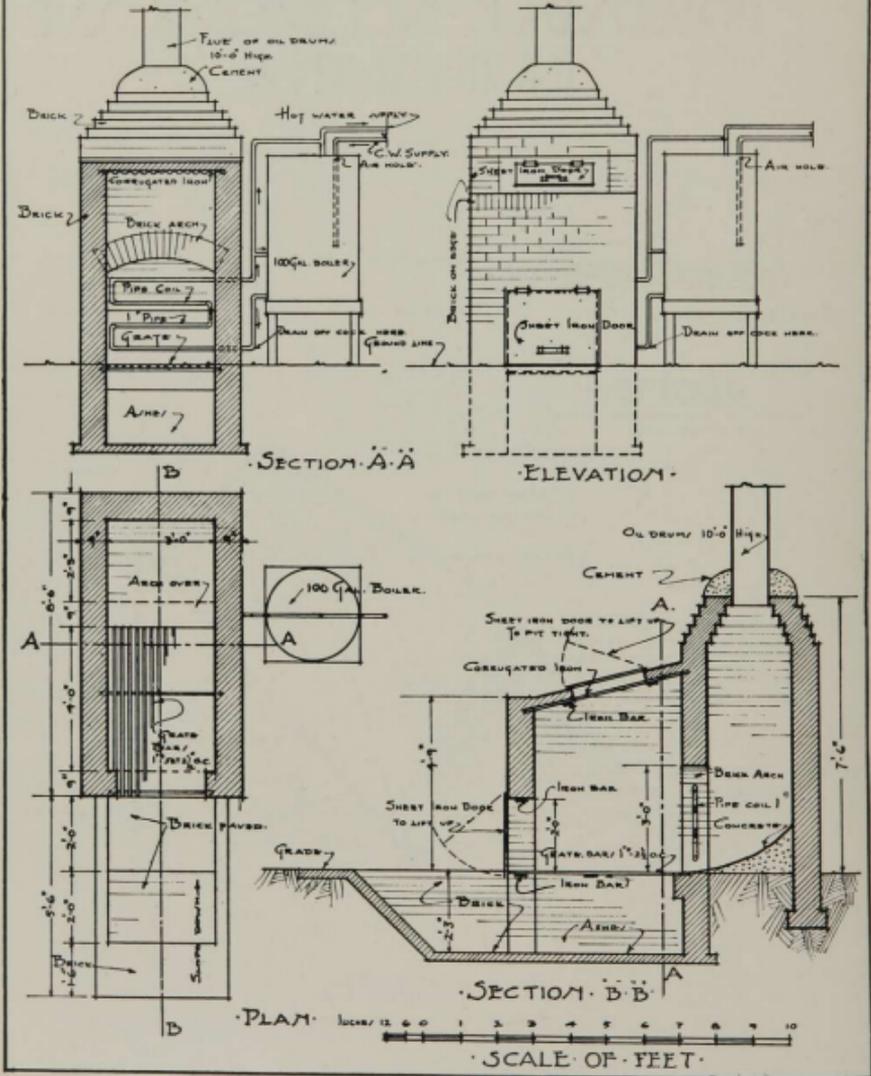
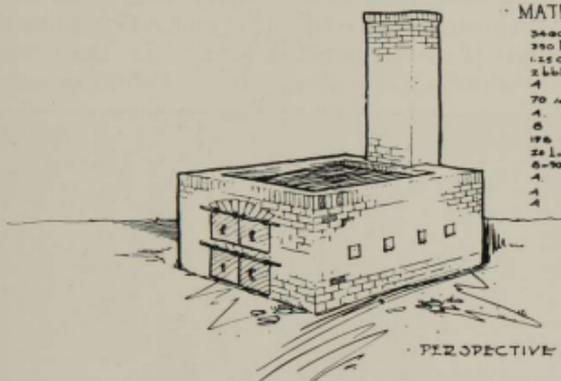


FIG. 106

U.S.A. HOSPITAL-TYPE-A-INCINERATOR



- MATERIALS REQUIRED.
- 3400 BRICKS.
 - 350 lb. LIME.
 - 1.25 cu. yd. SAND.
 - 2 bbl. CEMENT.
 - 4 STEEL TAILS 7'-6" LONG.
 - 70 sq. ft. GALV. IRON CORRUGATED.
 - 1 CAST IRON DOOR.
 - 8 STODER HOLE COVERS.
 - 176 GRATE BARS 4'-4" LONG.
 - 22 1 1/2" PIPE (COOL).
 - 6-10" ELBOWS.
 - 4 CAST IRON SUPPORTS.
 - 4 CONNECTING BOD. 4'-0" LONG.
 - 4 GRATE SUPPORTS (CAST IRON) 6" DIA. X 7'-6" LONG.

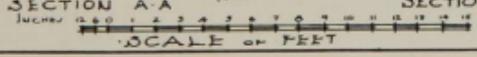
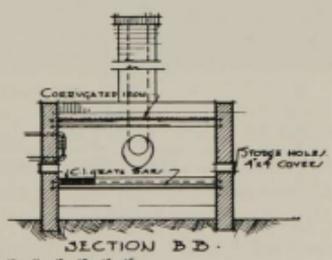
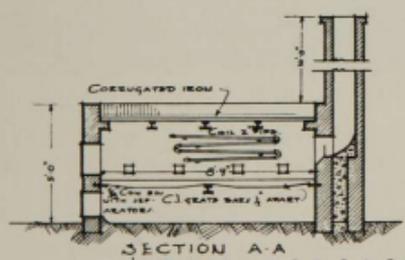
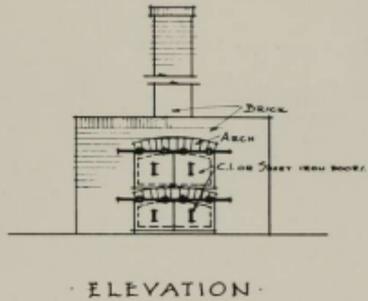
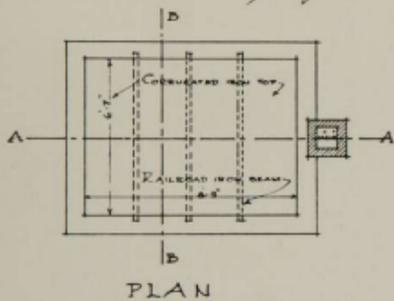


FIG. 107

Caserne. The camp as a whole theoretically was divided into 100 subdivisions designated "plots." To dispose of the wastes of the camp the following plan was adopted: When troops had been debarked from transports and were entering Camp Pontanezen preparatory to going into the interior of France, the camp billeting officer furnished the camp police officer with the designation of an organization together with its numerical strength and the camp "plot" to which it had been assigned. The camp police officer, using this information as a basis, estimated the number of galvanized-iron cans which would be needed by the organization, and had them delivered to the plot prior, if practicable, to the actual arrival thereof of the organization concerned. Daily the camp billeting officer furnished the camp police officer with a list of the organizations

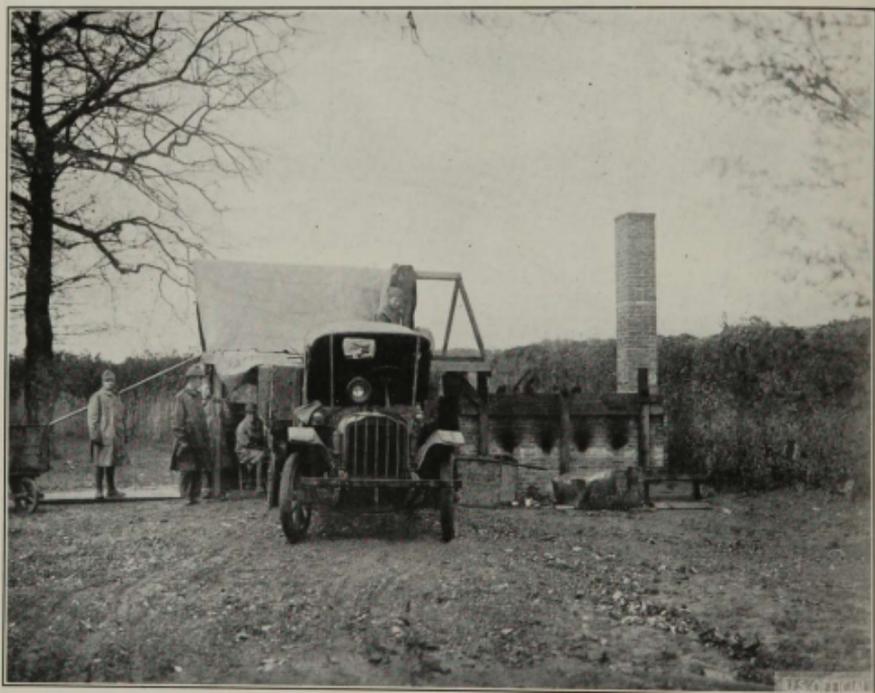


FIG. 108.—Type A incinerator in operation

destined to leave camp that day, so that garbage cans hauled from these organizations to the camp dump instead of being returned to the camp plot could be taken directly to the place where unused cans were stored.³⁰

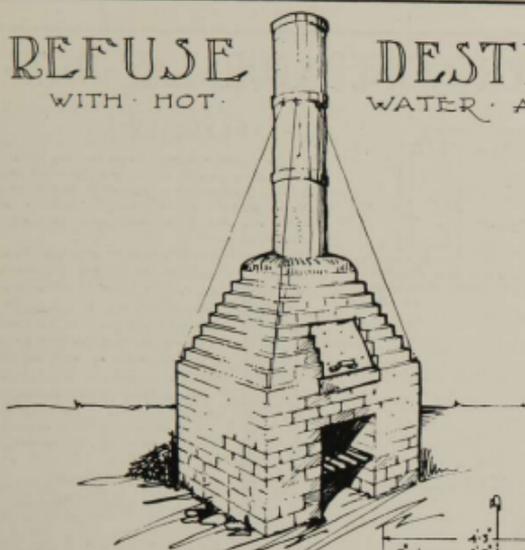
This method of disposal of wastes obtained until the barrack and tent sections of Camp Pontanezen were completed early in 1919. Many were the difficulties incident to such a system: It was during a period when the condition of the roads was at its worst, and extra teams of horses had to be maintained at the dump to help pull wagons in and out of it. Also the system was faulty in that it depended to a large extent upon the ability of teamsters to remember plot numbers, which they too frequently did not do, and as a result much time

REFUSE

WITH HOT

DESTRUCTOR

WATER APPARATUS



BILL OF MATERIAL

- 620 BRICKS
- 3 OIL DRUMS
- 6'3" ANGLE - IRON
- 55QT. SHEET-IRON
- 12FT. 1 1/2" IRON-PIPE
- 4 - 1 1/2" BACK-NUTS
- 2 - 1 1/2" TEES
- 1 - 1 1/2" CONNECTOR & NUT
- 4 - 1 1/2" BENDS & ELBOWS
- 20FT. WIRE FOR STAYS
- 1 30GAL. TANK OR BARREL
- 7 FIRE BARS - 20FT. L. IRON
- 1 - 3/4" BID COCK
- 2 BEARERS FOR FIRE BARS

HOT WATER CIRCULATION SHOWN IN DOTTED LINES
PIPES TO FORM BREAKING BARS

-PERSPECTIVE-

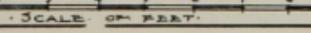
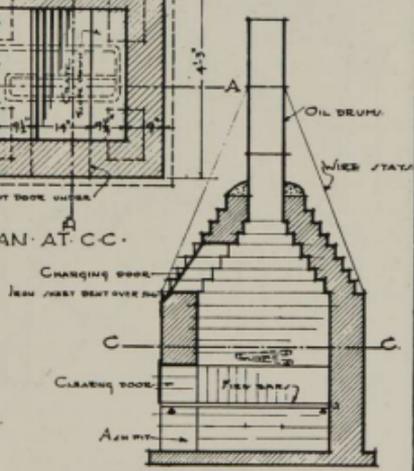
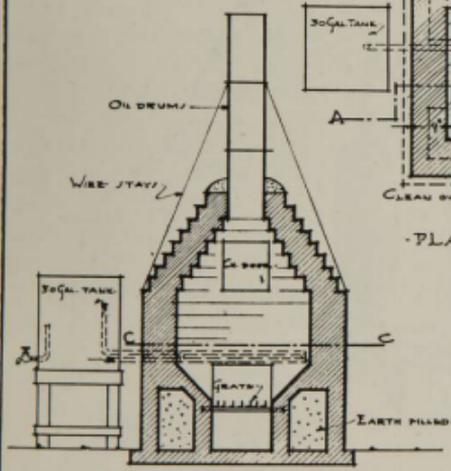
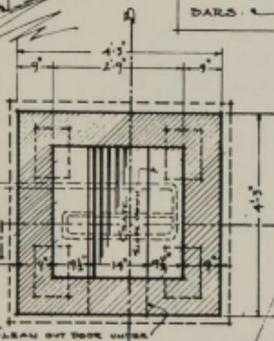
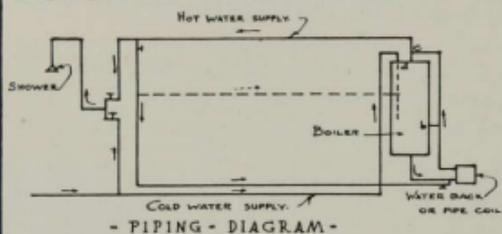


FIG. 109

TYPICAL - SHOWER-INCINERATOR - LAY-OUT -



- EXPLANATION -

HOT WATER PIPE FROM WATER BACK (OR COIL) ENTERS BOILER AT POINT "b", ONE THIRD DISTANCE FROM BOTTOM. COLD WATER SUPPLY ENTERS BOILER AT TOP AND IS CARRIED DOWN TO WITHIN ONE INCH OF POINT "b" AND HAS HOLE $\frac{1}{8}$ SECTIONAL AREA OF PIPE, DRILLED AT POINT "c".

CIRCULATION PIPE MUST BE SMALLER THAN HOT WATER SUPPLY AND IS CONNECTED

AT HIGHEST POINT IN H.W. SUPPLY AND CARRIED BACK AS SHOWN TO HAVE TURN OFF COCKS AT BOTH ENDS AS SHOWN. BOTH COCKS MUST BE EITHER ON OR OFF AT THE SAME TIME. DOTTED LINE SHOWS ALTERNATE PIPING.

CIRCULATION SYSTEM MAY BE OMITTED IF WATER IS PLENTIFUL.

CONNECTION RUNNING FROM POINT "b" TO POINT "c" MAY BE OMITTED.

FOR INCINERATOR DETAILS

SEE S.O.U. 6463-32.

- PERSPECTIVE -

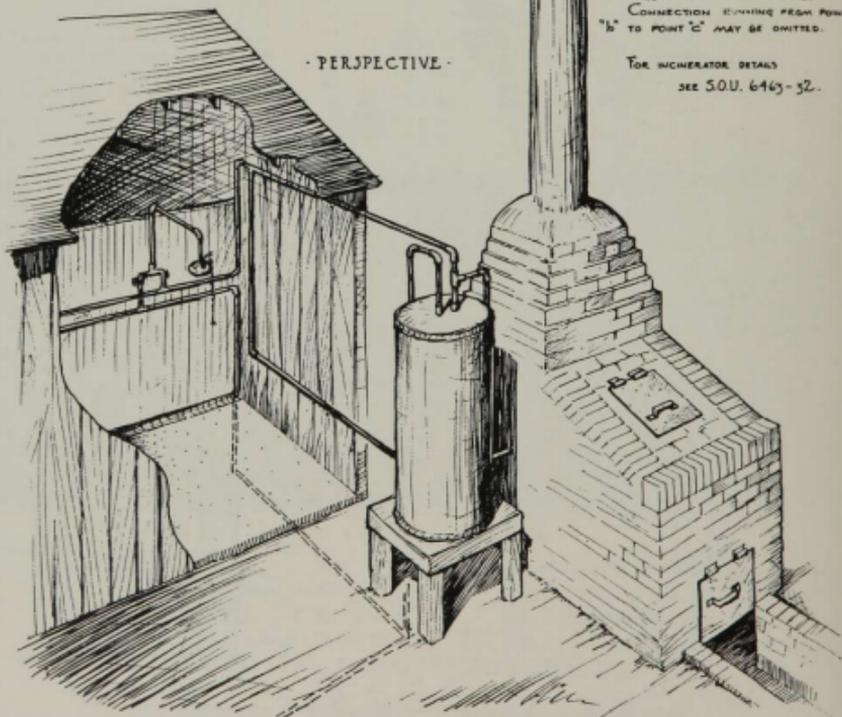


FIG. 110

was lost by the wrong placing of cans. Since no prisoners of war were available for such duty at the time under consideration, details of men had to be secured from among the transient organizations, with the inevitable lack of continuity of purpose, because such details were changed nearly every forenoon and afternoon.³⁰

Following the completion of the barrack and tented areas, garbage racks were constructed at the large kitchens, thus facilitating the maintenance of a cleanly condition about the kitchen, as well as the proper collection of the cans. In addition, the requisition of more wagons quickened the time spent on the labor of disposal of wastes and permitted a thorough cleaning of the camp twice daily.³⁰

By this time, a prisoner-of-war inclosure had been established and prisoners of war had become available for labor work in the camp, thus insuring the maintenance of an organization engaged in this work. As many as 70 wagons also were provided the camp police officer for use by his department. It was not until June, 1919, however, that the transportation for the camp police department was motorized. The use of 16 motor trucks permitted dispensing with 55 wagons.³⁰

With the motorization of the transportation, the camp system for collecting wastes became greatly simplified. Sixteen different routes were established, one truck being assigned to each such route. In addition, a few wagons were used to collect wastes from places where it was impracticable to send trucks, for example, over narrow camp streets in which there were right-angle turns.³⁰

Each truck had assigned to it a "route man" to whom the prescribed route of the truck was familiar; also, each truck had two separate operating crews, each crew working on alternate days. The labor of collecting the cans was accomplished by German prisoners of war, six of whom were assigned to each collecting truck, and four to each wagon.³⁰

In order that the wastes could be properly disposed of, the various cans containing garbage, trash, or material for salvage were placed upon the proper racks by the details of men in the billeting areas. Though separate cans were used for garbage, trash, etc., all these were placed upon the same rack. Each truck in going over its prescribed route through the camp collected the cans and conveyed them to the dump. Of the trucks available, 13 were used for conveying garbage to the dump; and since two collecting trips were made daily, garbage cans thus were cleaned twice daily.³⁰

All trucks and wagons upon completing the work connected with their respective routes were reported to the park police office, where temporary re-routings were given. Two sergeants made daily inspection trips of the camp. In the event of an oversight by the men of a collecting truck on its regular route, or for other reasons, garbage had to be removed to the dump without further loss of time, such fact was reported to the park police officer by one of the inspecting sergeants, whereupon the trucks and wagons were started out on such special routes as were necessary. This system proved to be very flexible, enabling the camp police officer to use his transportation facilities to the best advantage. Any sudden and unusual accumulation of garbage in any part of the camp resulting, for example, from an unexpected and relatively

large influx of troops into camp, was taken care of promptly by this system by means of which many additional trucks or wagons also could be supplied.³⁰

At the dumps three sergeants were on duty as overseers. Each supervised the emptying of the cans and the burying of waste material. Twelve men were detailed for duty at each dump; and as only two or three pits at each dump were being used simultaneously, these men were charged with caring for the pits, as follows: As the cans of garbage were emptied into a pit, by the truck details, the edges of the pit inevitably became soiled. This necessitated the spilled garbage being pushed or swept into the pit, and oiling the soiled surface. Such was the duty of the men detailed at the pits. Not only was it required that the edges of the pits be kept clean and oiled at all times, but at the end of each day's work the surface of the contents of the pits was likewise sprayed with oil.³⁰

Two different camp dumps were used at Camp Pontanezen.³⁰ During March, 1919, one of them was used for garbage and trash, while the other was used solely for garbage. Pits which measured 100 feet in length, 12 feet in width, and 12 feet in depth were the usual size, and of these, 25 were dug at one dump, 31 at the other. One of the pits, however, was exceptionally large: It measured 315 feet in length, 21 feet in width, and 15 feet in depth. This large pit was dug partly by steam shovel, partly by soldier labor.

When the material within a pit had reached within $2\frac{1}{2}$ feet of the surface of the ground, a layer of earth was added so as to fill the pit. Upon the layer of earth oil-soaked burlap now was placed, the burlap, in turn, being covered by a layer of earth measuring a foot or two in thickness. The success of this system was measured by the fact that at no time were any flies at the dump.

During the period when Camp Pontanezen was a rest camp, none of the camp kitchens had garbage incinerators.³⁰ Though it was recognized at this time that kitchen incinerators would solve the local garbage disposal problem, no incinerators were provided until the spring of 1919. In March and April, 1919, one incinerator was constructed at each model kitchen then in camp, each incinerator having a capacity of destroying all the garbage collected at the kitchen of which it was a part, usually about 45 galvanized-iron cans daily.

KITCHEN ECONOMICS IN RELATIONSHIP TO GARBAGE DISPOSAL

With the thought of saving as much as possible of the food which had been brought to the American Expeditionary Forces for its original purpose, thus reducing the monthly tons of shipping, the Salvage Service, A. E. F., established a kitchen economics branch on April 14, 1918.⁵⁴ The plan of operation of this branch was to reclaim or dispose of condemned canned goods, flour, sugar, beans, prunes, dried peaches, apples, and apricots; kitchen by-products, such as bones, fats, drippings, stale bread, swill, empty cans, sacks, burlap or wrappings from frozen beef, paper, rope, twine, bottles, boxes, barrels, and kegs.

These articles were either sold or converted into soap, tallow, dubbin, hog feed, chicken feed, fertilizer, and glycerin, at the main plant at Laponderie, near Tours, or at the subsidiary plants at Bordeaux, Brest, Gievres, Is-sur-Tille, and St. Nazaire.

The following instructions governed the collection and disposal of kitchen by-products:

(S. O. S. Doc. No. 1.)

JUNE 22, 1918.

REGULATIONS FOR SALVAGE SERVICE
[Extract]

INSTRUCTIONS FOR SALVAGE OF KITCHEN BY-PRODUCTS

32. A chart has been prepared showing how all by-products of the kitchen may be treated.
33. The term kitchen by-products in this connection refers to camp waste, such as meat, bones of various kinds, fats and drippings of all kinds, stale bread, empty cans of all kinds, empty sacks of all kinds, burlap and wrapping from frozen beef, all kinds of boxes, vinegar barrels, pickle kegs, bottles, etc.
34. Waste bones. This means bones from joints, which after cooking are saved and are salable for fertilizer.
35. Marrow bones are shin bones, thigh bones, and must not be broken up with chopping and are not to be cooked. These bones are valuable for munitions and are also salable.
36. Drippings, first class, are obtained from all surplus fats from meats, and after clarifying should be placed in pans to cool, then packed in barrels for Salvage Service.
37. Drippings, brown, are drippings from fats that have been discolored in cooking process or burnt from neglect of cooks, which makes the drippings less valuable, and they are classed as brown.
- (NOTE.—One hundred pounds fat will produce 10 pounds of glycerin for explosives.)
38. Raw fats should under no condition be sold locally, as by treatment they increase in value.
39. Cracklings. This is the fibrous residue left after rendering raw fat, and must be saved.
40. Swill is pig food; no glass, rubbish, coffee grounds or tea grounds or water should be thrown in container. Make contracts with local farmers for this by-product at 50 cents per barrel, until such time as a reduction plant is installed for degreasing same. Money received for swill should be turned in to a quartermaster.
41. Bones. One bullock will yield on an average from 70 to 80 pounds of bones; waste fat, 100 to 120 pounds.
42. Sheep bones. One sheep will yield on an average from 11 to 15 pounds of bones and 20 to 28 pounds of fat.
43. Barrels and kegs. Vinegar barrels should be tapped with a spigot; when empty should be returned to salvage depot for refilling. Kegs, pickle; save heads when opening; when empty use for drippings, to be shipped to kitchen economics branch, Salvage Service, Tours.
44. Sacks, burlap, and meat wrappings should be saved.
45. Bottles of all kinds; do not break; wash thoroughly. Retain until sufficient quantity has been accumulated to warrant shipment.
46. All of the above items, with the exception of swill, to be shipped to kitchen economics branch, Salvage Service, Tours.
47. The preservation and treatment of all fats is not only necessary from an economical and cookhouse point of view but it has become a matter of great importance to our Government.
48. These fats recovered are used for dubbin for shoes, soaps, and glycerins required to make explosives.
49. The United States Government has recently decided to pay all units for these by-products to the salvage depots. Money thus received will be used as a company fund.
50. The prices for these by-products will be fixed every six months. Prices to December 31, 1918, are as follows:

Bones, marrow...per hundredweight...	\$3. 36	Cracklings.....per hundredweight...	\$3. 54
Bones, others.....do.....	2. 64	Meat residue.....do.....	1. 80
Drippings, first class.....do.....	15. 36	Scrap bread.....do.....	3. 40
Drippings, second class.....do.....	13. 92	Bakery sweepings.....do.....	2. 04
Butcher's fat.....do.....	7. 44	Bags.....each.....	. 10

51. Company commanders will make application to the chief of salvage for the proper blanks pertaining to salvage of these kitchen by-products.

With a view to impressing all units with the importance of preserving and rendering all available fats, the following chart is issued showing the source from which fats can be recovered and the methods of treatment.

The preservation and treatment of all fats is not only necessary, from an economical and cookhouse point of view, but it has also become of national importance. These fats are used for dubbin, soap, and glycerin required to make explosives.

Chart showing how recoveries of fat, etc., are to be made

Source	Explanation	Treatment	Utilization	Remarks
A. From raw meat: 1. Suet.....	The surplus fat from the carcass.	Cut into small pieces or put through meat grinder. Render down and clarify.	For best cooking purposes. For issue in lieu of butter.	Suet can be used raw for suet puddings; it is better and more economical for that purpose than for drippings. NOTE.—Fat is an essential article of diet, and meats and joints must not be spoiled by over trimming.
B. In process of cooking: 2. Butcher's fat..... 3. Trimmings..... 4. Cracklings..... 5. Skimmings.....	Further surplus fat removed prior to cooking. The fibrous residue left after rendering down raw fat. The grease which rises to the surface of stews, stockpots, etc., which should be skimmed off. The large amount of melted fat left after frying. The fat which a joint loses in process of cooking.	Boil up with water and skim. Clarify and, if discolored, break up and put into fresh water and clarify again. Clarify. do.	Can be used for cakes and biscuits. First-class cooking. First-class cooking. If discolored and flavored, second-class best brown drippings for frying. Second-class brown drippings for frying. Makes excellent gravy.	Surplus to salvage depot. Do.
C. Refuse recovered: 6. Bacon fat..... 7. Baking dishes and residue..... 8. Refuse tubs or from garbage cans..... 9. Washing-up water.....	All pieces of fat, bacon rinds, and greasy materials should be kept and not thrown into swill. Water in which greasy plates, dishes, etc., are washed should be allowed to cool and the grease collected from the strainer. Meats bones from joints. Are shin bones and thigh bones. Means cans of all kinds.	Boil up in water and skim. Boil up with clean water and clarify once or twice or add to No. 8. Which after cooking are saved. Should be broken open, and put in soup stock for soup, and bones saved. Should be washed thoroughly inside then crushed. See No. 11. Washed thoroughly.	Munitions do. For fertilizer Munitions Place drippings in for shipping	The quantity left after frying is, roughly, double the amount required for use at the start. Surplus to salvage depot. For salvage depot. For No. 8 and No. 9 utensils should be kept for this purpose only. For salvage depot. For salvage depot. All meat must be scraped off bones before shipping. Marrow bones, when not broken or cooked, are valuable for munitions. For salvage depot. Ship tin cans loose in box cars filled to capacity to Gillet et Fils, St-Ouen-sur-Seine. For salvage depot. Should be kept in a cool place, if possible, while awaiting shipment.
D. Waste bones. 10. Marrow.....	Should be saved.	Don't break in head; tap with spigot. Save heads when opening to be used later. Don't throw glass, rubbish, dishwater, or coffee grounds in container.	For refilling.	Ship when empty to salvage depot.
E. Tin cans. 11. All tin containers with side area greater than square inches should be saved but shipped intact to salvage depot. F. Barrels, vinegar..... 12. Kegs, pickle..... G. Swill.....	Must be saved do. Is pig's food			When full, head to be put back and shipped to salvage depot. Make contracts with local farmers for this by-product; money received to be turned in to nearest disbursing quartermaster.

H. Bread, stale.....	Must not be sold or wasted.....	Keep in a dry place until ready for use; for croquettes (meat), grind up some stale bread and mix.	For bread pudding, croquettes, and tomatoes.	The presence of bread in garbage cans shows poor mess management and that too much is being drawn.
I. Sacks.....		Clean thoroughly.....	For reshipping of bread.....	Sacks of all kinds, not otherwise stipulated below, which are shipped to salvage depot.
13. Sacks, bread.....	In which bread is received.....	Must be cleaned thoroughly at bakery.		Turn in an empty sack as full as received; any surplus to be shipped to salvage depot.
14. Sacks, flour.....	Are most valuable.....	Tie in bundles.....		Empty flour sacks to be sent to salvage depot.
15. Burlap and course wrapping.....	Frozen beef covers.....	Open carefully; do not burn.....	Used for shipping from depots to ships, to necessary on ships, to transport new ones.	Ship to salvage depot.
J. Wooden cases.....	All boxes in which supplies are received.....			Supply officer will charge as part of fuel allowance all boxes used by organizations for fuel.
16. Boxes.....				

NOTE.—All units must render as much drippings as possible from source A, which is not required for cookhouse and edible purposes, and ship by freight, to American Salvage Depot, St. Pierre-des-Corps. Indre-et-Loire, France

The following excerpt from the report of activities at the hospital center, Mesves, A. E. F., exemplifies in general the experiences which pertained to the salvaging of wastes in our large hospitals:⁵³

SALVAGE DEPARTMENT, HOSPITAL CENTER, MESVES

This department was organized in the latter part of August, 1918, and at first began to salvage tin cans. These were washed and heaped upon an open space, the intention being to have them crushed by means of the steam roller, a hope that was never realized, because of the more important work that the roller was continually being utilized for. In order to prevent the waste of food in the kitchens, which became evident from the state of the cans, an order was issued causing them to be washed in the kitchens, and, subsequently, to save transportation space, to have them crushed also. Upon the advent of a switch engine in the camp, these crushed cans were loaded directly onto designated cars, and the crushing of those remaining uncrushed in the heap was commenced. After six carloads had been shipped away word was received not to ship any more crushed cans, but to dispose of them locally, and one car came back and had to be unloaded. Thereafter a contractor in the neighborhood collected the uncrushed cans and carted them to a point outside the camp limits. Large tin cans were saved to use as containers in the hospitals, and also for the shipment of fats.

After September, 1918, when drainage systems of one or two units were completed, trap grease was received by the salvage department and put into marmites, heated, strained, and separated from the accompanying straw and dirt. At first these operations were conducted in the open, but soon a building was erected out of old lumber, and as the weather grew colder the marmites were moved in and fitted with very serviceable chimneys made out of tin cans (stove piping being at that time unobtainable). Some supervision was necessary over the kitchens with regard to this grease, for patients would throw meat and bread from their mess kits into the traps. This grease when refined made a fairly consistent, slightly colored product. It was stored in kegs and shipped to the main salvage depot.

Saving of bacon fat and suet proved a most important and valuable work. In this regard it was necessary to watch carefully the kitchens, more particularly that of the patients, to try to inculcate the principles of economy, not so much in respect to a need by the department of the fats as with reference to the elimination of waste in overstocking the larders with bacon or meats at a given time. In other words, the problem was to draw the attention of those in charge to the error (a common one) of believing that patients had to have meat in some form three times a day, or bacon every morning, the said bacon being nearly always extremely rich in fat, and by some cooks cooked to a crisp. At times fresh meat was, however, scarce in the camps, and embargoes were placed upon corned beef, which was more needed at the front, so that the resourcefulness of mess officers was taxed considerably. Add to this a limitation of stove area, available water, cooking utensils, galvanized-iron cans, and in some instances of kitchen help (so that the unit with 2,000 patients had not enough of these desiderata, while a unit of 1,000 could manage very well), and the difficulty of using up all fats becomes readily apparent.

Bones could not be satisfactorily salvaged under the conditions existing. Even when they were boiled, they could not be kept without extreme danger of causing a fly nuisance. Then, too, for a considerable period of time there was a shortage of labor and lack of water in the salvage plant, and inadequate means of disposing of waste water prevented making any great effort to handle this product. All bottles were saved for use in the laboratories, and whenever any meat was condemned the fat was trimmed off and the meat sent to the center laboratory to make bouillon for culture purposes.

The saving of paper and burlap was a large activity. Two balers, made of 2-inch lumber, were used; for baling wire the wire with which they had been baled was used. With the advent of wet weather, however, this activity was trying, because of the difficulty of keeping burlap dry in the units, and after it reached the salvage department of drying it before it could be baled. Many bags were returned to the quartermaster for reissue, thus saving the purchase of new bags.

All products which could not be used locally were shipped to the salvage plant at St. Pierre des Corps, near Tours, where the fats were used for soap making, munitions, and the manufacturing of dubbin for waterproofing shoes. Prior to the end of November, 1918, we had shipped approximately 20,000 pounds of fats, 18,000 pounds of burlap, and 5,500 pounds of paper.

DISPOSAL OF CARCASSES

Prior to the establishment of the kitchen economics branch of the Salvage Service, A. E. F., in April, 1918, the accepted method of disposing of dead animals in the field was burial as promptly as possible.⁵⁴ During actual hostilities, of course, there was an inevitable delay in such a disposition, made more particularly evident and dangerous from a disease-producing standpoint, during warm weather when flies were prevalent; for example, in July, 1918, following the Chateau-Thierry operation, when innumerable dead animals were unavoidably left unburied for days, thus giving rise to one of the causes of the epidemic of diarrhea⁵⁵ with which, it was computed, fully 70 per cent of our men engaged there became affected.

Subsequent to the establishment of the kitchen economics branch of the Salvage Service, the disposal of dead animals was to be as follows: Dead animals unaffected with communicable disease were to be shipped for salvage; animals affected with communicable disease were to be either destroyed by fire, or buried deep.⁵⁶

Carcasses to be shipped for salvage were injected with a preservative.

DISPOSAL OF LIQUIDS

URINE

At the many places in the American Expeditionary Forces where no sewerage systems were available, the subsoil method of disposal of urine was necessary. Our pre-war method of subsoil disposal of urine was to utilize the pit latrine wherein urine entered, except during defecation, either from such receptacles as night urine cans, or from a trough, constructed adjacent to the latrine and connected therewith by means of a subsoil drain pipe.⁹ Relatively

little soakage surface exists in such a method and even this becomes clogged by the solids; also where the soil is not very pervious the pit soon fills with a liquid that with difficulty is covered with earth. There exist, consequently, an offensiveness and a danger, if untreated, from the uncovered liquid.

URINE-SOAKAGE PIT

With the purpose of providing a subsoil receptive area, separate from the pit latrine, thus reducing the possibility of interference with the absorptive qualities of the soil, and, at the same time, to eliminate exposure of the urine to possible fly contact, the urine-soakage pit was devised by the British during the war. The usual size of this pit was 4 feet in each of its three dimensions. It was filled nearly to the top with stones, empty tins, or broken bottles, into which funnels were inserted. Over the stones a layer of matting or hay was placed to support the several inches of sand or earth which were used to cover in the pit. The soakage capacity of such a pit was stated to be adequate for 200 to 250 men, dependent upon the nature of the soil.⁵⁷

In the divisional training areas, advance section, A. E. F., soakage pits of approximately the size of the one described above were used, but instead of having a funnel at each of the pit's four corners, a pipe led to the center as shown in Figure 111, and connecting therewith was the urine trough or funnel.⁵⁸

At the hospitals of the American Expeditionary Forces, where incineration of feces was practiced, urine-soakage pits were constructed adjacent to the destructor sheds.⁵⁹ Normally, such pits were 6 feet square and 12 feet deep. The bottoms of these pits were thoroughly loosened. The pits then were filled to near the top with graded stones and empty tins, the uppermost part consisting of a layer of clear gravel in which was embedded the discharge pipe which connected with the feces separator. Over the gravel a layer of sand was placed, this in turn being covered with cresol-soaked burlap. Upon the burlap, earth was placed to fill in the pit level with the surface.

Such pits were operated satisfactorily except at places where the ground was low; for example, at the hospital centers at Beaune and Allerey.^{42 43} At these places, after the rains of the fall of 1918 had begun, the soakage pits were impractical, and thenceforth urine from the separators there was disposed of through the sewerage systems.

DISPOSAL OF SULLAGE

In the large constructed hospitals in the American Expeditionary Forces sewerage systems were provided to carry off liquid water from kitchens and bathhouses. Likewise, in some of the masonry buildings which had been secured from the French where sewerage systems existed, such systems were made adequate to our purpose. At these places the disposal of sullage offered no problem, except where waste liquids contained considerable quantities of soap and grease the removal of which was necessitated prior to discharging the liquid into near-by streams, the consideration of which is given below. As stated on page 837, however, sewerage systems generally were not installed,⁵⁹ thus necessitating the local disposal of kitchen liquids and wastes from baths other than at hospitals, in such a manner as would not result in a nuisance. Frequently, allowing liquid wastes from kitchens and baths to flow into streams

URINE SOAKAGE PIT

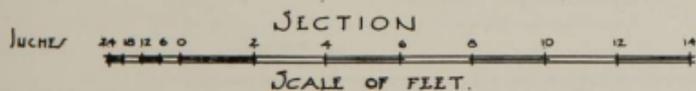
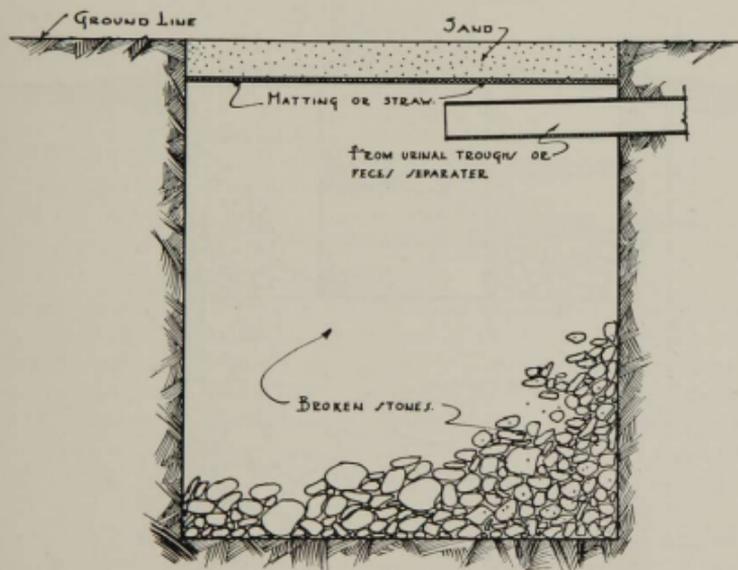
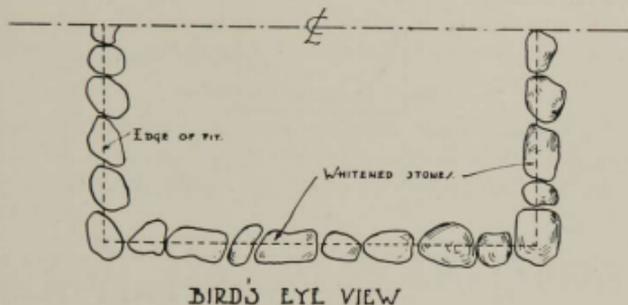


FIG. 111

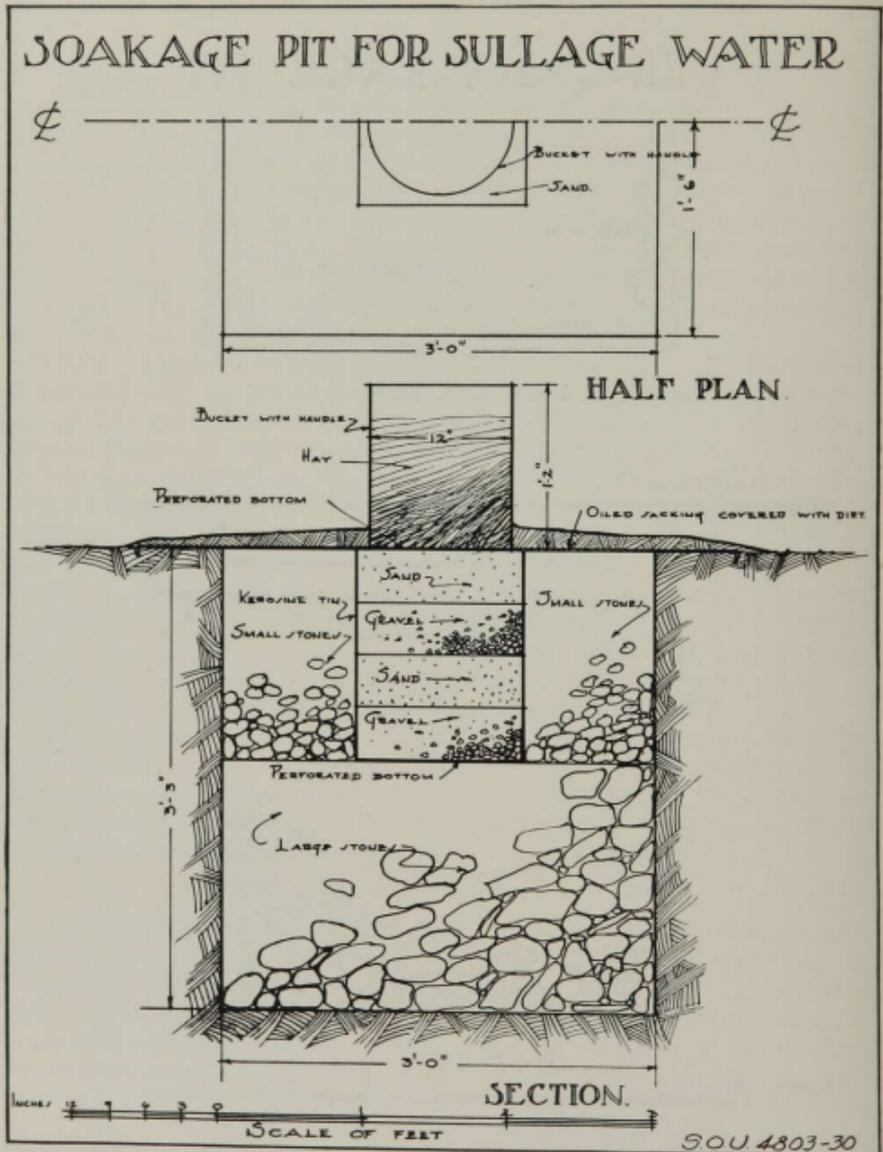


FIG. 112

through ditches and untreated was impracticable by reason of the need of the water of the streams;⁵⁹ consequently, sullage disposal by soakage into the soil was necessitated. The use of open ditches had the objection that both grease and soap sedimented within them, soon undergoing decomposition; then, too, this deposit gave an impervious character to the surface of the soil. Thus adequately to dispose of sullage by means of soakage demanded the removal from it of both grease and soap. These having been removed, ultimate disposal by means of a soakage pit, similar in construction to the soakage pits for the disposal of urine, was effected with relative ease (Fig. 112).

REMOVAL OF GREASE

The removal of grease from waste liquids from kitchens of the American Expeditionary Forces was highly desirable not only to permit the easy and satisfactory disposal of sullage by means of soakage pits but also because of its salvage value.

STRAINER, GREASE TRAPS & SOAKAGE PITS FOR SULLAGE WATER.

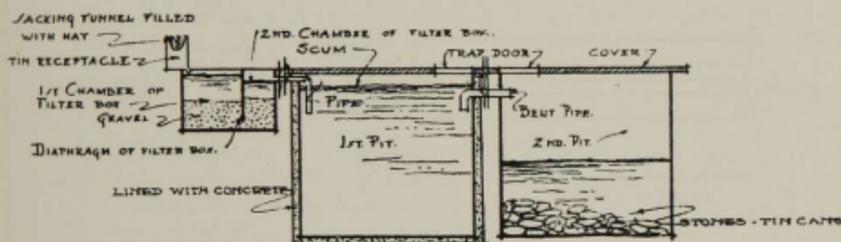


FIG. 113

Since grease which has been liquified by the hot water with which it has been mixed will coagulate on the surface of the water when the water cools sufficiently, all that is required, then, to accomplish the separation of grease from kitchen water is to retain the water in a convenient receptacle until cooled. Combining retardation of flow with ultimate disposal, and at the same time facilitating the recovery of the separated grease, was made reasonably possible in the American Expeditionary Forces by the arrangement shown in Figure 113. In so far as the elimination of soap from sullage is concerned, much study had been given without success by the French engineers, and investigations of the subject in general and of existing French and British plants showed the impossibility of complete purification; consequently, where it was necessary to discharge sullage into streams, to which practice objection was held by the French, the treatment chosen in the American Expeditionary Forces was that of sedimentation for several hours, and subsequent straining through straw screens. In some cases the effluent was sterilized by liquid chlorine.⁵⁹

ABLUTION BENCH AND WATER DISPOSAL

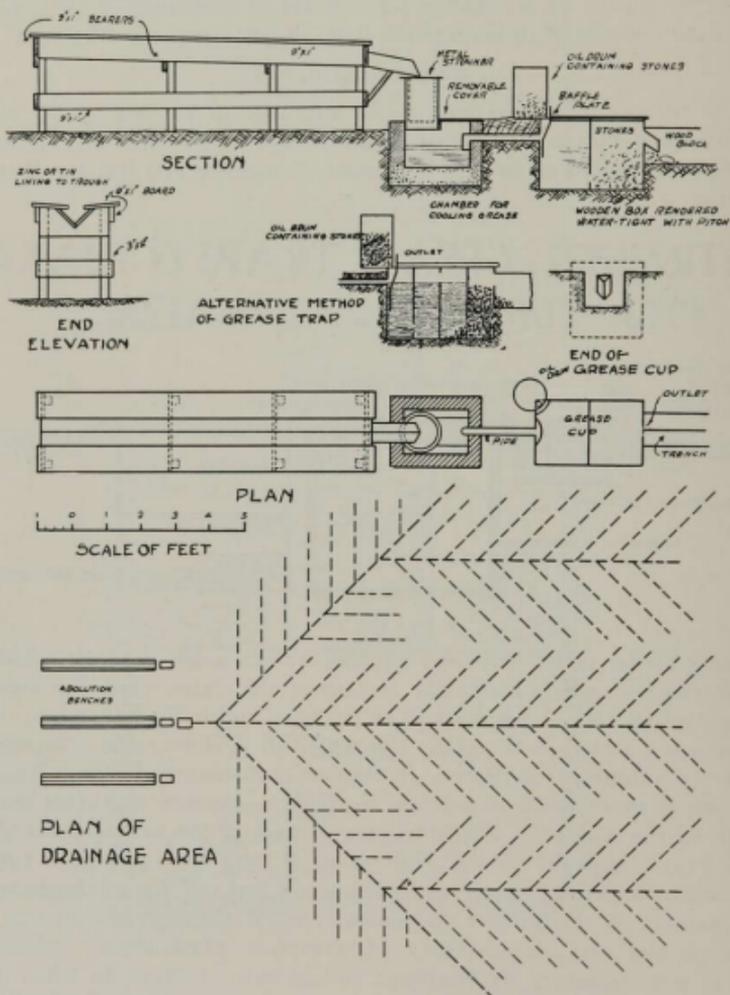


FIG. 114

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- (40) Report of Medical Department activities, 85th Division, A. E. F., undated, by the surgeon, 85th Division. On file, Historical Division, S. G. O.
- (41) Monthly Sanitary Report, for the month of December, 1918, from the sanitary inspector, First Replacement Depot, A. E. F., to the commanding general, G. H. Q., A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 721.5.
- (42) History of Hospital Center, Beaune, A. E. F., undated by the commanding officer. On file, Historical Division, S. G. O.
- (43) History of Hospital Center, Allerey, A. E. F., undated, by the commanding officer. On file, Historical Division, S. G. O.
- (44) First indorsement from the division surgeon, First Depot Division, A. E. F., September 16, 1918, to the chief surgeon, A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 414.45.
- (45) Order No. A-8558, September 7, 1918, office of the chief engineer, A. E. F., to the engineer depot officer. On file, A. G. O., World War Division, Medical Records Section. File No. 414.45.
- (46) Special Regulations, No. 28, W. D., 1917.
- (47) Based on Monthly Sanitary Reports, made to The Adjutant General, by surgeons of various organizations, A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 721.5.
- (48) G. O. No. 18, G. H. Q., A. E. F., January 31, 1918.
- (49) Letter from the camp quartermaster, Camp Coetquidon, A. E. F., May 22, 1918, to the chief quartermaster, A. E. F. Subject: Sanitation. On file, A. G. O., World War Division, Medical Records Section. File No. 721.4.
- (50) Memorandum for the chief surgeon, A. E. F., May 31, 1918, from the deputy chief quartermaster, A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 721.4.
- (51) First indorsement from the chief surgeon, A. E. F., June 4, 1918, to the deputy chief quartermaster, A. E. F. On file, A. G. O., World War Division, Medical Records Section, File No. 721.4.
- (52) G. O. No. 12, H. A. E. F., July 12, 1917.

- (53) History of Hospital Center, Mesves, A. E. F., undated, by the commanding officer. On file, Historical Division, S. G. O.
- (54) Historical Report of the chief quartermaster, A. E. F., 1917-19. On file, Office of the Quartermaster General, War Department, Washington, D. C.
- (55) Haven Emerson, Colonel, M. C., U. S. Army: Communicable Diseases in the A. E. F., *The Military Surgeon*, Washington, D. C., 1921, xlix, No. 4, 652.
- (56) Instruction Memorandum No. 2, Office of the Chief, Remount Service, A. E. F., June 20, 1918.
- (57) Lelean: Loc. cit., 195.
- (58) Letter from Maj. Henry Pleasants, jr., M. C., June 26, 1919, to The Surgeon General. Subject: History of Sanitary Squads, A. E. F. On file, Historical Division, S. G. O.
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CHAPTER IX

GENERAL PROBLEMS IN THE CONTROL OF COMMUNICABLE DISEASES ^a

The control of communicable disease in armies is, of course, materially complicated in times of war. The exigencies of combat, the necessity for rapid changes in the disposition of troops, the unavoidable concentration of men in limited areas, the choice of which has no relation to any considerations except those of tactical needs, the establishment of reserve and training camps along narrow arteries of communication, all these factors force the responsible sanitary officer to adapt his methods and his organization to ever-changing circumstances, most of which are absolutely beyond his control. These difficulties are common to all armies engaged in active operations and were naturally encountered by the American Expeditionary Forces as well. In addition to these complicating factors, however, our forces were confronted with problems which were shared by none of our allies except the Australian, Canadian, and New Zealand contingents of the British Expeditionary Forces, and by these troops to a limited extent only, since with them the numbers involved were smaller and the arrival of increments was more gradual.

The British and French Armies which were gathered for the campaigns in France were mobilized directly from their homes into large camps and, in the case of the French, sent relatively short distances, by train, on lorries, or by marches, to the zones of operation. In the case of the British there was added to this a short cross-channel transportation, which, because of its brief duration, had probably no noticeable effect upon sanitary conditions. For American troops there were superimposed, in the first place, prolonged railway journeys from the points of mobilization in the United States to the ports of embarkation there. Then followed the successive occupation, by many troop units, of a few camps, where embarkation was awaited; then a long voyage on crowded ships; and, after arrival in Europe, again redistribution in camps and replacement depots, preceding delayed train travel to training areas or to the front.

These conditions naturally led to disease in transit which would not otherwise have occurred. The expected losses, foreseen though deplored, due to the exposure, the crowding and the strain incident upon such conditions, were rightly considered of relatively slight importance in comparison with the urgent military necessity of bringing our men into action in the shortest possible period of time. The effects of such transportation conditions had results, both immediate and remote.

In yet another respect did the American Expeditionary Forces contend with unusual difficulties of sanitation. The American forces went into battle in large numbers at a time when the relatively stationary warfare of the preceding years was being changed to one of rapid forward movements and the active shifting of large bodies of men from one sector to another.

^a Statements of fact appearing herein are based on "Report on general problems of sanitation and the control of communicable diseases in the American Expeditionary Forces," undated, made to the Surgeon General, U. S. Army, by Lieut. Col. Hans Zinsser, M. C., on file, Historical Division, S. G. O.

The difficulties that arose from these various factors, from the circumstances of transportation and combat conditions, are dealt with in this chapter. Whenever troops are gathered into camps as raw recruits, as they were during our early mobilization days, there results a considerable amount of communicable disease. In general this is, of course, due to the fact that susceptible men for the first time come into crowded contact with their fellows who have either recently been in contact with infection of various kinds or are acute or chronic carriers of disease. When once an epidemic is started in such a camp, unless exceedingly prompt and effective sanitary measures can be taken, there is a rapid spread and many individuals are afflicted. After a time the command settles down to a gradually diminishing sick rate and the troops reach a condition in which they are spoken of, as regards infectious or camp diseases, as veterans. Generally it has been assumed that this is due entirely to the fact that susceptible individuals have had the disease, and that with adequate sanitary measures to prevent unusual exposure or massive doses of infectious agents, no further epidemic should occur.

There is, however, another element which has not been considered sufficiently. When military units have been training for some time and companies, regiments, mess, and barrack assignments have been made, there comes to be established a regular routine of association of individual with individual. A definite group of men eat together, sleep together, and associate with each other. Their contact with men attached to other units takes place either in the open air or under the more limited circumstances of special friendships or social intercourse. The routine of contact of individual with individual under the conditions which favor the transmission of communicable disease is well established in regular circles of daily association. After the first few weeks the susceptible individuals in such units have come in contact with the chronic carriers or recently exposed members of their military community and have either established immunity or have been infected and run their course. The occurrence of infectious diseases accordingly diminishes and epidemic outbreaks subside, somewhat as a fermentation subsides when fermentable material is exhausted. This does not, however, mean that there are not a considerable number of carriers left and that there are not a large number of susceptible men in the command who would contract disease if subjected to other routine associations. Should one take a definite group of men from a number of units in each of which this state of quiescence has become established, and form, with these individuals, a new command, intermingling and redistributing the men in squads, platoons, and companies, a new circle of routine associations would be started and infectious disease would again appear, even as it did when the raw recruits were first brought together, though perhaps this would take place with decreased violence.

The point it is desired to make at this time is illustrated in an occurrence observed in the 2d Division, A. E. F., stationed on the Western Front just north of Souilly in early April, 1918. There was an outbreak of scarlet fever in this division, the circumstances of which were as follows: On April 4 a private of the 17th Company of the 5th Regiment, United States Marines, was sent to a French hospital with a diagnosis of German measles. At this hospital a

subsequent diagnosis of scarlet fever was made, but this was not reported to the division surgeon's office, and was not discovered until the sanitary inspector of the division visited the hospital several days later.

On April 8 a depot company was organized in this division from which were sent men from various organizations as follows:

	Men
9th Infantry.....	27
23d Infantry.....	27
12th Field Artillery.....	9
5th Field Artillery.....	10
17th Field Artillery.....	12
2d Engineers.....	4
5th Marines.....	28
6th Marines.....	30

This company was assembled on April 10. On April 19 two cases of scarlet fever were discovered in the company and within the next three days seven more cases occurred. In the original unit—that is, the 5th Marines—in which a case of scarlet fever had appeared April 4, and from which 28 men were sent to the depot company, no further cases appeared. It seemed in this outbreak, then, as though in the original unit, the 5th Marines, the routine occurrence of the single case of scarlet fever did not lead to dissemination. Nor did the other units from which men were taken develop cases. When, however, the contacts of the original case were freely intermingled with susceptible men from these other commands, an outbreak occurred.

This sort of thing may be regarded as a principle in army sanitation: namely, that there is danger in the sudden redistribution of men in units, and that when an organization has once become settled in its habits of mutual association, especially as to sleeping quarters, mess, etc., it is wise to disturb this as little as possible. It was the impossibility of observing this principle which may have formed the basis of a great many of the smaller outbreaks of communicable disease occurring in the American Expeditionary Forces, and it is a principle that must always be borne in mind when dealing with troops under combat conditions, in which it is necessary constantly to replenish units at the front with men sent to them through replacement divisions and battalions. The removal of men from fixed associations in the United States, their shipment as casualties, their temporary incorporation in replacement depots, and their subsequent assignment to regiments in which they were replacing casualties sustained from illness or battle constituted not only a continuous disturbance of fixed unit associations but furnished an uninterrupted trickling influx of personnel that had been in association, since starting on its long journey, with successive groups of men, and consequently exposed to numerous possibilities of infection.

As soon as American troops left their camps in the United States they indiscriminately intermingled at the ports and on the ships coming across the Atlantic, and, in addition, this intermingling took place under conditions of great crowding and exposure which, besides giving rise to a large number of cases of infectious disease, led to the origin of numerous new carriers of the diseases acquired through the respiratory passages. These men, after disem-

barkation, were often sent in groups, varying in size from less than a hundred to five or six hundred, to such camps as that at St. Aignan, where it was necessary to billet them, and arrange for their care and their incorporation into established units. Their stay at these camps depended entirely upon the needs for replacements, in combat units, at the given time, and upon the degree of training which the particular men had had. One can easily understand the difficulties of the surgeons of such camps. They would be informed by telegraph that such and such a number of men would arrive at a given time from this or that base port. They would be told, perhaps, that these men had been exposed in transit to diphtheria, scarlet fever, and measles. It was their duty to receive the contingents, examine them rapidly, and see to it that no men recently exposed or in the early stages of an infectious disease were allowed to gain entrance to billets or to units already formed and perhaps getting ready to leave. In our replacement battalions of corps or in replacement divisions of armies the task was the same, and in spite of the most painstaking vigilance it was often impossible to prevent the slipping through, to healthy units, of men who constituted sources of infection. Under the ordinary conditions of peace it would be a relatively simple matter so to organize such camps of "passage" with receiving barracks and medical supervision as to render them innocuous, though, even under these circumstances, the problem would call for great vigilance and accurate administration. Under the conditions of haste, limited billeting areas, and rudimentary discipline which prevailed, however, such perfection of organization was impossible, at least during the earlier months of the American Expeditionary Forces. The dangers of the conditions were recognized, however, from the very beginning, and well equipped laboratories and supernumerary laboratory and sanitary personnel were placed at the disposal of the surgeons of such camps. In the replacement battalions of corps and armies receiving barracks and billets often were established and attempts were made to inspect properly the men soon after arrival at these camps and just before their departure for a combat unit.

The evil results incident upon these conditions of long-distance transportation are perhaps most noticeable in connection with outbreaks of diphtheria, a disease which, incidentally, has not in the past been regarded as of great importance as a military disease. There were two divisions particularly, in the American Expeditionary Forces, in which epidemics of diphtheria, obstinate in their resistance to sanitary control, could, almost without question, be traced to conditions of transportation. In one of these divisions, the 32d, there was little or no diphtheria while it was in the United States; however, on the ships used in transporting it to France a case of diphtheria occurred and several cases appeared at the port of disembarkation. The division was then entrained and other cases developed in numbers and were scattered throughout the division. While some of the regiments suffered more than others, it is nevertheless true that even in these regiments cases were scattered in such a way that it was apparent that we were dealing with many different foci rather than with an epidemic that could be traced to a single beginning. It was not until this division had been in France for several months that the occurrence of diphtheria subsided, and this in spite of extensive and careful carrier investigations and removal of infected men.

In another division, the 35th, similar conditions existed. This division had had a few cases at Camp Doniphan in April, 1918. After arrival in Europe, in the British area, diphtheria reappeared. In the week ending May 29, 27 cases occurred in 11 different units. A similar scattering of cases occurred in subsequent weeks, this condition continuing until July. Between June 12 and June 20, 32 cases occurred in 24 different units. The several waves of diphtheria occurred almost in direct relationship to travel on trains or service in the line. Whenever the division had been settled for a few weeks in definite camp areas the cases diminished. Whenever train travel was necessary an outbreak followed; and when the division finally entered the line the preponderant number of cases which occurred were among the men living in the dugouts; there were relatively few cases which occurred in the 137th Infantry, 14, or 87.3 per cent, of which occurred among men in the dugouts, only 17 per cent in that part of the regiment which was in billets or in reserve. It was not until late in the active war service of this division that diphtheria ceased to be an important sanitary problem.

Carrier examinations and Schick tests were made in these two divisions on a very large scale and in many instances an unusually large number of carriers were discovered. In one particular set of examinations, out of 103 tests 11 carriers were found, 7 cases having originated in the same group. It is sufficient to use these few examples in this place to illustrate what is thought to be the peculiar conditions relating to diphtheria incident upon the transportation difficulties of the American Expeditionary Forces.

The circumstances were as follows: There were in these divisions, as there are in almost all communities, definite, though small, numbers of chronic carriers of diphtheria bacilli. These men under ordinary camp conditions would not have proved to be serious foci, or, even though some of their comrades had been infected from them, it would have been relatively easy to trace the sources, find the carriers, and remove the danger. As it was, however, these men, on trains, and in ships, came into indiscriminate contact with hundreds of their fellows under conditions of crowding and exposure that produced catarrhal inflammations of the upper respiratory passages in a large percentage of the men. The carrier state was widely disseminated. The possibilities of contact of susceptibles with sources of contamination were obviously increased and wherever this took place under suitable conditions diphtheria appeared. The remote effects of these conditions formed troublesome sanitary problems for months after the divisions had been in France and had taken part in several actions. Incidentally, it is worthy of note that the percentage of positive Schick reactions obtained in a large number of tests made approximated the 10 per cent which in generally regarded as normal for individuals of the age group represented by the American Army.

It can not be denied that in both of these divisions attempts at rapid control of diphtheria failed absolutely. It is probable that the extensive culturing of entire regiments and immunization with antitoxin of men with positive Schick reactions may have considerably diminished the incidence. But in spite of this work, carefully and ably done, cases continued to appear. The experience has raised the question concerning the proper management of diphtheria when

once it has appeared extensively in army units. However, the problem is not of sufficient military importance to indicate the addition of active immunization with neutralized toxin-antitoxin mixtures to the already extensive prophylactic procedures practiced upon the men, since the therapy of diphtheria and its bacteriological diagnosis are so simple that with proper vigilance few lives are lost.

In other respects the sanitary control of diphtheria, when once it has appeared, as it did in the two divisions above mentioned, should be considered from two points of view, depending upon whether the outbreak takes place in a small isolated unit or whether it is indiscriminately scattered in a division in the manner above described.

When the disease appears in a relatively small unit an intensive sanitary campaign can be made with success, a fact which was illustrated by a small epidemic observed in the 119th Machine Gun Battalion in March, 1918. This unit of 135 men had traveled under conditions similar to those described and had developed one case of diphtheria before leaving its American camp, another during entrainment and two on the transport. After arrival at its first station in the interior of France four cases developed; the entire command was immediately cultured; four carriers were taken out of the kitchen personnel and eight other carriers were found among the enlisted men. These men were removed; Schick tests were made on the entire command, and men with positive reactions were immunized. The command was placed under complete quarantine, and some of the men were put into shelter tents in order to allow more sleeping space. The quarters were thoroughly cleaned every day, bedding was aired, mess-kit boiling instituted, and all the men inspected twice daily, cultures being immediately taken on all who showed suspicious throats. Promptly upon the rigid enforcement of these measures, diphtheria ceased. In this outbreak, it is interesting to note that the same conditions which had led to the dissemination of diphtheria had likewise produced in this small command, in the same brief period, 13 cases of scarlet fever, 10 cases of mumps, and 4 cases of follicular tonsillitis. The general measures described above ended these diseases with the diphtheria.

The situation illustrates that whenever diphtheria occurs in a small isolated unit which is stationary for the time being and can be thoroughly segregated, it is worth while to do wholesale culturing and Schick testing in connection with other sanitary procedures.

On the other hand, when diphtheria is scattered through many units of a large command and appears in small foci here and there over a considerable period of time, and appears to persist because of the considerable distribution of carriers, wholesale culturing and extensive attempts at laboratory control are of little immediate avail. As indicated by our experience, it is best under such conditions to take each case that occurs as the center of a circle of contacts, by careful epidemiological inquiry to determine those that have been recently exposed to the sick person, to make cultures, and to perform Schick tests upon the exposed men with promptitude, and for the rest, to pay particular attention to sleeping quarters, mess-kit boiling, and precautions of a general sanitary nature. It is useless to attempt to stamp out immediately conditions such as

these. Gradual conscientious following up of each case as it appears will diminish the incidence, and general attention to sanitary measures aimed at the diminution of respiratory disease will eventually solve the problem.

These last considerations, namely, the fact that, for the eradication of diphtheria, one must rely, in the last analysis, upon the measures aimed at the suppression of respiratory disease in general, introduce a matter which is of paramount importance in the establishment of efficient cooperation in the sanitation of armies. It is true that the trained sanitarian should be familiar with the technical details relating to communicable diseases, diagnostic clinical and laboratory procedures, and the specific measures of control adapted to each individual disease. This is his business as the authority upon which lay personnel of the army relies for guidance, advice, and aid in emergency. It is equally true, however, that by far the most important factors in the preservation of the health of an army are comprised in a simple routine of procedures, the comprehension of which requires no technical training, the success of which can be assured by common sense and good discipline. To make these simple principles clear to officers of the line, and even to enlisted men, it is well to explain to them that all important military diseases can be very simply divided into three classes: (1) Diseases that are conveyed with the secretions of mouth, nose, and throat and get into the victim by the same route; (2) those that are transmitted with the discharge of the intestine and are acquired by ingestion; and (3) those that are dependent upon vermin or insects. In the first two classes the measures which control one of these diseases will bring about a considerable diminution of the others; this is true, in a more limited sense, of the last class as well. If we can make clear that the general measures aimed at the suppression of meningitis, such as increased sleeping space, segregation of men with coughs and colds, mess-kit washing, warmth, dryness, ventilation, and the avoidance of overwork, will, at the same time, reduce the sick rates from measles, scarlatina, pneumonia, influenza, diphtheria, and mumps, the problem will resolve itself into its simplest form and the intelligent line officer will feel that he can become the most important sanitary officer for his command. Similarly he will easily understand that the care of the latrines and of his drinking water, the suppression of flies, and the cleanliness of his kitchens, will affect not only typhoid fever but all other intestinal diseases at the same time. It is in this sense that the sanitary order of the Second Army, A. E. F., detailed in the chapter on "The Sanitation of a Field Army," was written and, it may be said in passing, that this manner of putting the problem before the military public unquestionably led to beneficial results. The special measures of a more technical nature, aimed at the particular sanitary control of each disease, can then be taken up with medical officers and the specialized sanitary personnel.

The problems of respiratory disease control, therefore, are very closely related to the problems which are spoken of in the discussion of billets and quarters which follows. In all respiratory diseases there are, of course, two main subdivisions of control to be considered: One factor, the question of susceptibility of individuals and the hygienic fostering of individual resistance, the other, the problems of direct transmission. These factors are common to the sanitation of all respiratory diseases, but in different diseases the emphasis must be placed more definitely upon one or the other factor.

In respect to meningitis we have learned that the emphasis must be placed upon the factors of transmission so far as quarters, mess-kit washing, and the prevention of indiscriminate dispersion of secretions of the nose and throat are concerned. The underlying factors of meningitis susceptibility have been discussed in the paper on the "Sanitary organization of Armies"; however, it is necessary to recapitulate here to the extent of saying that in every military unit there are probably susceptible persons whose general physical condition has but a very slight influence upon their resistance to the disease. We have all seen the healthiest men come down on slight exposure when overworked nurses and doctors handling dozens of cases are spared. Although such men may be rendered more or less susceptible according to their temporary condition, this factor is, in all probability, a minor one and the problem in meningitis control is one of preventing the wide scattering of meningococci from the ever present fraction of chronic carriers in the command. When general respiratory infections increase as a result of dissemination of coughs and colds, when men hawk, spit and sneeze, insusceptible men become acute carriers and susceptible men are infected. Wholesale carrier examinations will not solve the problem. The solution lies in the improvement of "respiratory health," that is, in maintaining warmth, dryness, segregation of those with coughs and colds, and last, but most important of all, the spreading out of men in sleeping quarters, and ventilation at night.

In one command in which meningitis prevailed, the enforcement of sanitary precautions as formulated in Bulletin No. 1, Headquarters, Second Army, rigidly enforced, within three weeks reduced the daily sick call, which consisted chiefly of mild respiratory infections, from over 200 to from 10 to 20 a day. At the same time meningitis stopped. Bacteriological investigation is useful in such cases for the determination of a carrier rate which indicates how drastic should be the measures adopted in the command. But the matter of utmost importance is the prompt and forceful attempt that must be made to reduce immediately the respiratory sick rate of the command and to prevent the indiscriminate scattering of nasal, pharyngeal and bronchial mucus.

With respect to influenza there seems to be an almost universal susceptibility, and here our problem was one of early diagnosis and prompt segregation—so difficult a task that it is almost impossible to determine whether or not it has ever been successfully accomplished. This disease is more particularly discussed below.

With pneumonia, of the types that are not secondary to influenza, our problems in the American Expeditionary Forces were relatively simple. As analyses given in Chapter XV of this volume show, the serious pneumonia problem was a postinfluenzal one; but a few words may be said about the fact that in all the respiratory diseases, including primary broncho- and lobar pneumonia, the sanitary problem is rather one of prophylaxis than of sanitary management after the diseases have begun. The index of sanitary interference should be a rising daily sick call in which the bulk of the cases consists of mild respiratory infections. The common cold, the mild bronchitis, should be regarded as of great importance when they show a rising curve. The resistance of most individuals of military age to the ordinary respiratory infections is

relatively high. A well-fed man with dry clothing and shoes, working reasonably with his body and sleeping in warm, well-ventilated quarters, can receive into his mouth, nose, and throat considerable numbers of pneumococci, streptococci, and other organisms of these groups without suffering evil consequences. The problem of the military sanitarian in regard to these diseases is to maintain proper conditions. They are, in part, purely sanitary considerations, and, in part, depend upon vigilance and coordination with the Quartermaster Department. They are questions of clothing, food, avoidance of overwork, blankets, drying rooms, spreading out in quarters, prompt exclusion of men with colds from common sleeping quarters, undelayed evacuation of those sick in the early stages, and systematic inspection.

In diseases like measles and scarlet fever, where susceptibility is not based upon the individual condition of the men, spread is nevertheless of greater or less magnitude, dependent upon the prophylactic suppression of coughs and colds, since this avoids indiscriminate transmission of saliva and mucus from man to man. Added to this, of course, in these diseases, the most important feature has been found to be the removal of men in the preeruptive stages. We have found that in both of these diseases epidemics can be circumscribed if, upon the first occurrence of cases, inspections of the entire command are made twice daily and men with conjunctival injection, colds in the head, or sore throats, are immediately segregated as suspects.

Of the respiratory infections which prevailed during the World War, perhaps the most important one was influenza. This disease was of great sanitary importance, not so much in itself as because of its sequelæ. When influenza first appeared in the American Expeditionary Forces in the spring of 1918 it appeared as a mild disease. The weather was warm, the susceptibility to general respiratory infections was not great, men were not subjected to cold, exposure, wet, and overwork, and influenza was not at first followed by secondary infections of the bronchi and lungs. Indeed, in the first carefully studied epidemic at Chaumont it could in no sense be characterized as a true respiratory disease. Several hundreds of cases showed only systemic symptoms—fever, muscular pains, headache, and the signs of a general infection which ended favorably with such regularity in a short period that it was spoken of as "three-day" fever, and the investigating officers were at first at a loss to determine whether they were dealing with an insect-borne disease like papataci fever, a food-borne disease, or a respiratory disease. In an epidemic which occurred in the 42d Division, shortly after this, similar clinical pictures were in preponderance and only a few of these cases were followed by serious results or by infections of the bronchi or lungs. It was possible in this outbreak, by careful epidemiological examinations, to show that the infections were in most cases acquired by transmission from man to man, probably from the nose and throat, and perhaps indirectly by dust, and it was evident that influenza in its pure form is a relatively mild disease. Later, the superimposition of pneumococcus and streptococcus infections led to serious results. Whether or not the influenza bacillus also can be regarded as a superimposed infection or whether it is the original cause of the disease itself, is a problem which it is not fitting to discuss in this place. The fact remains that

influenza as a military disease is a menace chiefly because of the susceptibility it creates to more serious infections. When the troops were exposed to the harassing conditions of combat combined with exposure, cold and wet, as in the Meuse-Argonne operation, and when the cold weather and the rains ensued, influenza, from a relatively mild disease, became a serious menace which claimed many victims.

Its management therefore is of vital sanitary importance, and since susceptibility seems to be practically universal, it must be dealt with promptly and vigorously by the isolation of early cases and the prompt hospitalization of all who show the sudden onset of the febrile disease with perhaps catarrhal symptoms of the upper respiratory passages. It was clearly demonstrated that perhaps the most important thing from the patient's point of view is to hospitalize him as soon as the first symptoms appear. Patients that are promptly put upon their backs recover, in most cases, without serious results, whereas the retention of soldiers on duty after influenza has been suspected will almost surely prove a menace to the unit and a danger to himself. When, in the course of battles, influenza occurs, it is important to make arrangements that influenza patients be evacuated separately from the wounded so that cross infection during transit in ambulances is avoided. One particular division succeeded in evacuating such patients continuously in special ambulances, masking them in transit. After hospitalization, the sanitary problem of influenza is perhaps as important as it is in the field, and it is here that the arrangement of cubicles in hospitals, and the masking of attendants and of convalescents, is of vital importance.

The secondary infections which ensue upon attacks of influenza are various, apparently depending to a considerable extent upon the prevailing organisms in the particular location. It is a point of considerable interest that evidence was adduced in Evacuation Hospital No. 2, A. E. F., among cases of our 88th Division and in an influenza epidemic, that influenza patients seemed to develop a special susceptibility to meningitis, and a number of cases of meningitis could, by circumstantial evidence, be traced to preceding attacks of influenza.

While contact with influenza, direct or indirect, in barracks, billets, hospitals, etc., can be regarded as unquestionably the most important factor in the transmission of this disease, it is also likely that the infection may linger in barracks or dugouts after the infected troops have been removed. Just before the Meuse-Argonne operation the French who occupied this region before the Americans took it over had large numbers of cases which came from certain artillery dugouts. The epidemic was, according to the French physicians who studied it, in all probability a place epidemic rather than a unit epidemic. Similar observations were made by one of our medical officers in connection with barracks of an American artillery camp in the south of France. It is important to remember this when troops are passing through an area and are successively occupying the same barracks and billets. The matter was seriously thought of when the American troops took over the Argonne front previous to the attack, but fortunately the advance made was so rapid during the first few days in this particular region that it was not necessary to place

American troops in these infected dugouts. When they were finally occupied it seems that a sufficient time had elapsed to render them safe, since few, if any, cases could be traced to them.

When our troops arrived in France they had, with very few exceptions, been recently vaccinated against typhoid and paratyphoid fevers. The small incidence of such diseases during the winter and spring of 1918 is set forth in Chapter XV dealing with statistics. Intestinal fevers played but a minor rôle in the sanitary problems of the American Expeditionary Forces until later in the summer, at about the time of the German offensive in the Chateau-Thierry region on July 15. Before this time routine sanitary precautions concerning the disposal of feces, and the protection of water supplies, effectually prevented any considerable extension from the isolated cases which were observed. The few concentrated outbreaks that took place were limited to small units and, in several instances, were traceable to sources originating in the United States. What leakage there was in sanitary precautions was overcome by the relative immunity of the vaccinated men. When American troops became engaged in active combat during the hot weather, conditions ensued which led to the occurrence of an enormous number of mild diarrheas and a not inconsiderable number of light cases of true typhoid and paratyphoid fevers and of the dysenteries.

Diarrhea and dysentery had occurred from time to time among German and allied troops in France during the preceding years of the war, and in 1915 and the ensuing years a definite number of small dysentery outbreaks had occurred among the civilian population of France. In all of these epidemics, both among the French and the British, it was a noticeable fact that the majority of cases of intestinal disease consisted of relatively mild diarrheas, with only a sprinkling of more severe cases clinically recognizable as one of the diseases mentioned. This was the condition that also prevailed among the American troops.

The exact origin of the outbreak that occurred among the American troops of the Paris group in July probably will never be traced. That there was much diarrhea among the German troops engaged over the area through which they retreated, we know by personal observation of German latrines. However, it is not at all necessary to attribute our own outbreak to these sources since the conditions prevailing during this battle were such that an epidemic of intestinal infections might have been considered inevitable. The weather was warm, unburied men and horses and uncovered manure polluted the limited water sources; measures for the protection of latrines and the prohibition of indiscriminate defecation were practically impossible; kitchens were temporary and unprotected, and the men were exhausted. Increasing diarrheas propagated more cases, and a vicious circle was initiated which could not be broken until relative quiet of the front had been reestablished and sanitary measures undertaken on a comprehensive scale.

There are many things that could be said in criticism of the management of the sanitary problems during this operation. Many procedures were advisable that were not attempted, and, of course, it is always possible that prompt action by organized special sanitary troops such as that later attempted during the St. Mihiel and the Meuse-Argonne operations perhaps might have modified the story. It must be remembered, however, that during the epidemic in

question the Germans attacked. The forward movement of the American troops constituted a development of the battle that was hoped for but that could not have been definitely foreseen, and it will always remain a question in the minds of those who participated whether, even though the proper organization had been available, it would have been possible to carry out any systematic plan under the conditions of transportation and other obstructive circumstances that prevailed. That the attempt should have been made, no one will question, but the problem was a new one—its lesson learned, as in so many other phases of army organization.

The bacteriologic analyses of cases that occurred during this epidemic demonstrated that, in addition to simple undefined diarrheas, there were interspersed cases of true typhoid and paratyphoid B, and of dysenteries of the Shiga, Flexner, and "Y" varieties. There were also cases from which organisms were isolated, the true nature of which is not clear at the present time. These were Gram-negative bacilli, nonmotile, mannite-fermenting, and giving the general reactions of dysentery bacilli on the double sugar medium. They made no gas but grew heavily, the growth resembling more that of a proteus than that of a true dysentery bacillus. The true nature of the mild diarrheas will perhaps never be known, but there were many true typhoid and paratyphoid A and B infections which were masked and rendered mild by the relative immunity of the vaccinated men. There were also bacterial factors involved in many cases which could not be studied owing to their short duration and their occurrence during active battle. Many of the men were not hospitalized, and the greater number recovered within two or three days.

The interesting feature of this epidemic, as of subsequent epidemics, was the fact that there were many different types of infection; indeed, it is but natural that epidemics of intestinal disease occurring in armies on a large scale should not be limited to a single type of infection. The deplorable circumstances incident to battle conditions, the utter inability to control the smaller water supplies of the most advanced units, neglect of proper feces disposal, of fly extermination, and of the protection of kitchens and mess led to an indiscriminate dissemination of all types of infectious agents that can produce intestinal disease. It is not necessary, however, to assume that the disease originated in a preceding epidemic existing among enemy troops. In a very large body of troops, especially when they have been vaccinated, there will be found a considerable number of carriers of various intestinal pathogens. Given rapidly multiplying cases of diarrhea, given the means of transmission described above, it is entirely to be expected that more and more men will become infected with such organisms, the number going up by geometrical progression as the sources of infection multiply arithmetically. We must not expect a single type of infection but rather be prepared for just the sort of thing that happened, namely, an outbreak characterized by all varieties of intestinal disease. The solution of such problems is sanitary rather than bacteriological. What the laboratory can do in such cases is to determine that we are dealing with a series of true intestinal infections and not merely with disease of dietetic origin, such as spoiled meat or moldy bread. The laboratory man makes the diagnosis of the epidemic rather than of the individual case, and the problem becomes in a minor way a laboratory one, in a major way a sanitary one.

The cases from this epidemic were evacuated. They were scattered in all parts of the Services of Supply, and many of these cases became metastatic foci of small local epidemics. It is more of academic than of practical interest to attempt to determine whether such epidemics begin as water epidemics or as fly or carrier epidemics. It is unquestionable that all three sources contributed in an important way. It is certain, too, that only the most drastic sanitary interference can arrest an epidemic of this kind, an interference which is perhaps rendered impossible by the very conditions which made the origin of the epidemic possible; namely, that all human effort for the time being is concentrated upon other lines and that no additional personnel or transportation can be spared for sanitary purposes alone.

It is very likely that this epidemic, as well as a less severe one later occurring in the Meuse-Argonne operation, largely increased the carrier rate among our troops. Men who were vaccinated had, in large numbers, acquired infections, had resisted the development of clinical disease, but retained in their intestines for shorter or longer periods the organisms they had acquired. That many subsequent small outbreaks could be directly traced to carriers is definitely determined, as can be shown by the analyses of the kitchen personnel in the 79th Division during its epidemic and by the immediate cessation of cases in small organizations like Company A of the 5th Engineers upon the removal of a carrier from the kitchen. It is important to note that in the wake of these epidemics there followed a considerable number of cases of intermittent diarrheas. In a great many instances subsequently studied where carriers were discovered it was found, upon inquiry, that the infected individuals gave histories of a sharp attack of diarrhea, perhaps with fever, but of short duration, followed subsequently by short acute diarrheal attacks whenever indiscretions of diet, or physical hardships were encountered. This brings out the important point that in the sanitary supervision of armies that have gone through campaigns like the one described, it is extremely important to follow out the British system of considering simple diarrheas, especially if not immediately yielding to dietetic treatment, or if repeated, as possible source of infections, and isolating them promptly on purely clinical grounds. The inspection of kitchen personnel clinically and the removal of cooks or kitchen police who give histories of recent intestinal upsets, is a matter of considerable importance in the eradication of intestinal disease.

The outbreak in the 79th Division, alluded to above, is an interesting illustration of the point in question. This division had been exposed to conditions such as those described above. Subsequently a number of cases of typhoid fever occurred, scattered throughout various units of the division. In the kitchens of almost all the units which had cases, one or more carriers were discovered, and 17 per cent of the total divisional kitchen personnel gave histories of recent diarrhea. A subsequent examination of 100 indiscriminately chosen men of an infected regiment showed a typhoid carrier rate of 3 per cent on first examination.

It is, of course, a hopeless task to expect to remove all carriers or even any considerable fraction of them from armies if they have once been infected in the way described above, and it is also plain that a repetition of the described campaign conditions would very probably lead to a repetition of the experience recorded above, in spite of any sanitary efforts that could be made during battle.

CHAPTER X

PROBLEMS IN THE CONTROL OF COMMUNICABLE DISEASES AT REPLACEMENT DEPOTS ^a

At large replacement depots, in time of war, the problems encountered in the control of contagious diseases were new and unusual. Owing to the unprecedented requirements, old systems of control served as little more than a basis upon which to build a new system which would meet the altered conditions. The population of the camps was constantly changing. Exposure to infectious diseases was general. Men had to be considered by thousands rather than individually. It was of paramount importance that medical and sanitary work be accomplished in such a manner as not to seriously interfere with the military machinery of the movement of troops.

Representatives of the section of laboratories and infectious diseases, central Medical Department laboratories, A. E. F., always were available to proceed to camps as their services were needed, to assist in the examination of cases of infectious disease, and to advise in problems of isolation and quarantine.

The principal replacement camp of the American Expeditionary Forces was the First Replacement Depot, located at St. Aignan sur Cher. The function of this depot was to operate as a source of supply for the replacement of men lost in action or through other casualties throughout the American Expeditionary Forces. Most of the troops at the First Replacement Depot came directly from the mobilization camps in the United States. A smaller number were patients discharged as cured from American military hospitals in France.

At the replacement depot the men were examined physically, fully equipped for field service, and, if time permitted, were given a brief period of military training before being sent to the front. The stay of a soldier at the depot varied from a few days to several weeks.

The depot was divided into two parts, first, a classification or receiving center, and second, holding camps where the men were quartered until such time as they could be forwarded. Large, well-equipped hospitals were provided for the care of the sick.

Upon the arrival of the troops from the United States at the depot, there were, as was to have been expected, many infectious diseases among them. The conditions under which the troops had been mobilized and transported to France were such as to favor the spread of infectious diseases.

In the First Replacement Depot the control of infectious diseases was divided into two parts: First, the segregation and weeding out of men already infected and, second, the isolation and treatment of contacts, to prevent further spread of infection.

^a The contents of this chapter have been taken from *The Military Surgeon*, Washington, D. C., 1919, xlv, No. 1, 59.

Medical officers met all trains; new arrivals were lined up and given a rapid medical examination before being sent to their quarters at the classification camp. This examination necessarily was hurried. Its object was to pick out the men manifestly sick who needed hospitalization. The following day all the men were given baths and were required to pass naked before a board of medical examiners, at which time a more critical and minute physical examination was given. Men in whom defects were discovered, and who required careful examination, were sent immediately into a separate room where they were carefully inspected by a board of specialists. On this board there was a neurologist, urologist, orthopedist, and a specialist in internal medicine. The men who were found physically fit were permitted to proceed to their quarters. The sick were sent to hospital; contacts were investigated.

Soon it became apparent that extensive quarantine, for prolonged periods, could not be established for large groups of men. The exposure to infection had been so general that to establish wholesale quarantine would have necessitated the keeping of tens of thousands of men at St. Aignan for weeks at a time, and would have held up military operations, as these men were urgently needed at the front. Moreover, an efficient quarantine was difficult, as the men were billeted throughout large areas, and frequently lived in houses occupied by civilian families. It was impossible to keep quarantined men so placed from coming into contact with outsiders. Frequently, less disease would be developed in the quarantined groups than among those outside quarantine.

To meet these conditions a system of compromise had to be adopted. Contacts were divided into two classes, immediate contacts and remote contacts. Immediate contacts included the men who slept close by the infected cases, sat beside them at table, or were their close friends. Remote contacts included men who were in the same company or had traveled on the same train with infected men. In nearly all instances only the immediate contacts were isolated; remote contacts were disregarded, except in the case of the virulent infections.

As extensive quarantine within the classification camp had proved impracticable, it was discontinued. All cases of infectious disease and their immediate contacts were sent to the hospital for observation and treatment immediately upon their detection. An exception to this rule was made in influenza. This epidemic was so widespread and entailed so great a mortality that the remote contacts as well as immediate contacts were segregated and carefully watched. Contacts were placed in detached groups of buildings at the classification camp, where they were examined twice daily by medical officers, their temperatures being taken at each examination.

The control of diphtheria, measles, mumps, meningitis, typhoid fever, and influenza will be described in detail, as they demanded special attention on account of their frequency and virulence.

Men suspected of having diphtheria and their immediate contacts were sent to the hospital immediately upon their detection. Those showing positive cultures were kept under observation until three successive cultures, taken a week apart, were reported as negative. Contacts having negative cultures were not detained. Shick tests were made of entire organizations in which two or more

cases of diphtheria had occurred at about the same time. Men showing positive reactions were held under close observation for the period of incubation; their temperatures were taken and throats examined daily.

Special attention was paid to measles in view of the possible complication of pneumonia. Measles cases and their immediate contacts were sent to hospital, the contacts being kept under observation there for the period of incubation.

Patients having mumps were sent to hospital and were kept there for a period of not less than 21 days. Contacts were not detained, as the disease is not dangerous to life, and the cases were so numerous and the incubation period so long that an undue amount of hospitalization would have been required for their isolation.

On account of its high mortality, very stringent measures were at first employed in the quarantine against epidemic meningitis. Entire companies and battalions were isolated under guard upon the appearance of a single case of this disease within the command. No one was allowed to enter or leave the quarantined area without special permission from the division commander. Men in quarantine were required to spray the nose and throat three times daily with Dakin solution. This rigid quarantine, however, was found difficult to maintain. The results were not satisfactory, and as sporadic cases of meningitis were of frequent occurrence, wholesale quarantine was soon discontinued. Instead, immediate contacts were promptly evacuated to the hospital, where cultures were taken from their throats, in order to determine whether or not they required detention. Positive cases were kept under close surveillance in hospital wards.

In the First Replacement Depot the outbreak of typhoid fever was limited to one replacement organization. In that organization about 40 cases were detected within a few days of each other. All the men affected had come from the same mobilization camp in the United States and the infection was particularly severe, the mortality rate being about 25 per cent. Perforations occurred in three cases, all of which were operated upon, with subsequent recovery. The typhoid cases as well as their contacts were isolated in hospital. The stools and urine of contacts and all men working about kitchens and mess halls were examined in an effort to locate carriers, but none were found. Cases were kept in hospital after their recovery until four examinations of stools and urine, made a week apart, were reported negative. The epidemic was studied by the section of laboratories and infectious diseases. It was found that many cases of typhoid had occurred in the camp in the United States from which the affected men at St. Aignan had come. It was shown that the men had been exposed to a gross infection, and it was believed that the epidemic was due rather to the overwhelming infection than to failures in the administration of typhoid vaccine.

The epidemic of influenza reached the First Replacement Depot through replacements from the United States. The sickness and death from this cause, for a time, equaled the rate from typhoid fever in armies prior to the days of protective inoculation. The deaths, for a time, numbered 20 or more

a day. Unusual precautions were taken in handling these cases. Contacts, immediate and remote, were placed in a separate part of the camp and isolated there for 10 days. Each man in quarantine was examined twice daily by a physician. The slightly sick were immediately evacuated to the hospital. A floor space of 40 square feet per man was insisted upon. When space was not available in barracks, men were placed in shelter tents. To prevent men coughing in each other's faces at night, the men sleeping beside each other were required to lie in opposite directions, so that the head of each man was opposite the feet of his neighbor on either side. Officers of the day were required to inspect sleeping quarters at night to enforce these instructions and to see that maximum ventilation was being maintained by keeping doors and windows open. In companies where influenza was especially prevalent all men were required to wear masks. It is believed that the most useful factor in the control of this epidemic was the prompt removal of infected men upon their showing the first symptoms of the disease.

Of the influenza cases, nearly one-third developed pneumonia. The mortality of the pneumonia cases ranged from 20 to 45 per cent, at different stages of the epidemic.

In the control of infectious diseases at the First Replacement Depot the ideal had to be subordinated to the practical. Time-honored principles and procedures suffered violence in the process, but events showed that St. Aignan fulfilled its functions as a strainer without unduly retarding the stream of replacements which passed through it. The number of acute infectious diseases at the front was always negligible. The number of cases at the mobilization camps and base ports, from which replacements were drawn, was uniformly high. There were never more than 200 men in quarantine or 2,000 in hospital at St. Aignan at a time, although the troops passing through the depot sometimes numbered 4,000 a day.

CHAPTER XI

PREVENTION OF VENEREAL DISEASES

The prevention of venereal disease among our overseas troops during the World War resolved itself broadly into two main subdivisions, having to do, the one, with such of our troops as were in allied countries, the other, with those in an unfriendly country. Since France contained the greater number of our overseas forces, and, in addition, our general headquarters whence came promulgations for the control of venereal diseases, it is deemed appropriate to discuss the subject mainly from the viewpoint of our forces in that country. Furthermore, precepts established by us there were equally applicable to our troops located in the countries of our other allies, except in so far as such precepts were peculiar to France; that is to say, general instructions concerning venereal disease prevention applied to all our troops, no matter whether they were in France, England, or Italy. However, following almost immediately upon the signing of the armistice our Third Army occupied enemy territory. Here, complete control over the inhabitants offered a unique situation, in so far as the repression of prostitution was concerned; therefore, our experiences in Germany in this connection are included in this chapter.

In so far as north Russia and Siberia are concerned the interest in venereal disease among our troops in these places is almost wholly in connection with incidence, and since no special problems were met there, not similar to the ones dealt with herein, no further mention will be made of them.

The methods adopted for the control of venereal diseases in the American Expeditionary Forces were, excluding artificial immunization, essentially the same as the methods applied in the control of other communicable diseases limited to human beings and spread by contact. These methods comprised the prevention of infective contacts, and the prompt prophylactic treatment of persons exposed. Supplemental thereto were such forces as social hygiene, recreation, and discipline, which, through a direct or indirect manner, facilitated the application of basic principles having to do with the limitation of infective contacts.

PREVENTION OF INFECTIVE CONTACTS

REPRESSION OF PROSTITUTION

Absolute suppression of prostitution within a fixed radius of military camps and posts in the United States was authorized by an act of Congress, approved May 18, 1917. In France the application of similar measures to the American Expeditionary Forces was studied by the chief surgeon and the judge advocate, A. E. F., in July, 1917.¹ This study showed the steps taken by the British Army in the British Army zone to be founded on certain French laws giving powers to the military in time of war. However, at the time under consideration, like powers could not be exercised by the American Expeditionary Forces by reason of the fact that an American zone had not been established. Until the establishment of an American Army zone,

dependence had to be placed on the French for such control as was necessary over the civil population in the French Army zone.¹ In this connection the following excerpt from the Manual of Military Urology, American Expeditionary Forces, is of interest, as showing how the French regulated prostitution in France:²

REGULATIONS CONCERNING PROSTITUTION IN FRANCE

Neither the Penal Code of 1810 nor the laws subsequently enacted in France declare prostitution a crime. It is nevertheless under the active supervision of a morals police and of a complicated system of regulations. The act of prostitution subjects a woman to arrest and imprisonment, for which arrest the police and the prison authorities need have recourse to no legal action, for there has been no violation of the law.

"Though such a situation contravenes the principles of personal liberty, it has existed in France for 60 years and excited singularly little protest" (Charpentier and du Saint). Arrests of innocent women are reported from time to time, and the illegality of the situation has been many times pointed out, but with no result.

The legal basis for this situation is found in the law of April 5, 1884, which in article 17 states that it is the duty of the municipal police to insure public order, safety, and health, to maintain order in public places, and to prevent and control epidemics of contagious disease. The regulations are approximately the same all over the country. In Paris they are issued by the prefect of police, in Lyons by the prefect of the Rhone, elsewhere by the mayors, subject to intervention by the departmental prefects in case the mayors refuse to act, by virtue of article 99 of the law of 1884.

During the war all towns in the "Zone des Armées" are under martial law empowering the military authorities to issue and enforce such special regulations as they deem necessary for the control of prostitution; while the decree of August 2 and the law of August 5, 1914, declaring a state of siege, place the whole of France under military law.

A woman may become a licensed prostitute at her own request, at the request of the woman in whose house she plies her trade, or perforce if she has been proved to prostitute herself on three different occasions. The majority of prostitutes are said to be voluntarily inscribed, either because they are in licensed houses or because they believe the license card helps their trade. It is of course impossible to estimate the number of clandestine prostitutes, but in time of peace they are believed to outnumber their licensed sisters by 5 or 6 to 1. The disruption of social ties, etc., resulting from the war has multiplied the clandestine prostitutes many times.

The licensed prostitutes are classed as: 1. Housed women, who inhabit licensed houses of prostitution. 2. Women with cards (*filles en carte*) who are licensed to solicit upon the streets, under certain restrictions.

All licensed prostitutes are required to submit to a physical examination at stated intervals, usually once a week. This examination at stated intervals usually consists of an inspection of the exterior of the body and of the interior of the mouth and genitals. The same speculum is used for all examinations and merely wiped with a towel each time it is inserted, though if a syphilitic lesion is found the speculum is dipped for an instant into an antiseptic. It is not uncommon for the records to show no case of venereal disease for months together in houses containing five or more women. The police regard this as evidence of the thoroughness of the medical examination and the cleanliness of the licensed prostitute; but the world-wide evidence of the infectiousness of all prostitutes makes the presumption quite the opposite.

Special hospitals are provided for the diseased prostitutes, and evasion of the medical inspection or other defiance of the law is punished by imprisonment.

Licensed streetwalkers are forbidden to solicit during the hours of daylight or after 11 o'clock at night, to speak to men accompanied by women or children, to solicit from windows, to form a group of three or more persons upon the public street, to share their lodging with one another (unless the house is licensed), or to frequent certain streets and public places. The regulations providing for the arrest and punishment of clandestine prostitutes have been interpreted as having no application to concubines who live with a man.

The following recent regulations still further restrict the activities of streetwalkers:

FRENCH REPUBLIC.

By my circulars of February 1, 1914, February 2, July 21, and December 4, 1916, I have called your attention to the great importance of making every effort to prevent the propagation of venereal disease, notably syphilis. The need of this is greatest in places where troops are stationed.

My previous instructions related to the duties of mayors in this matter, but I feel that in order to insure the more efficacious supervision of public women it is essential that you should use the police powers conferred upon you by article 99 of the law of April 5, 1884. Therefore I suggest that you issue an ordinance conforming to the appended model and post it in all the communes of your Department where it is applicable.

Moreover, you should insure the strict enforcement of the Penal Code, article 475, paragraph 2, imposing upon those who rent rooms the obligation to maintain a register in which is inscribed the name of every person who has gone to bed or passed the night in the house, and to present this register at specified times to the mayors and police officers or commissioners, or other authorized citizens. These renters of rooms should, moreover, at the present time require the identification of those whom they take into their houses. The enforcement of these regulations will permit you to verify whether a woman has been registered several times in the company of different men, thus proving that she is practicing prostitution. In this event she should, after due warning, be inscribed as a registered prostitute.

Furthermore, the Council of State has decided on August 6, 1915, that the military authorities are authorized to close places where liquor is sold (*débts de boissons*) when their character is such as to compromise the interests with which the military authorities are charged during the state of siege. It will therefore be necessary to transmit to the military authorities the name and address of every café, bar, or inn which does not conform to Article I of the above order.

Kindly notify me of the receipt of this communication.

MALVY,

Minister of the Interior.

TO THE DEPARTMENTAL PREFECTS:

PARIS, May 30, 1917.

FRENCH REPUBLIC.

In accordance with the law of April 5, 1884, concerning municipal organization, notably articles 97 and 99 of this law, in order to insure public surety, order, and hygiene, special supervision should be exercised over those establishments and public places where prostitution may occur.

It is therefore ordered:

ARTICLE I

That it is forbidden for all those who sell liquors, and for proprietors of cabarets or cafés:

1. To employ in their establishments (exception made for the wife, children, and grandchildren of the owner, or orphans of members of the family under his charge) women less than 18 years of age, or to employ women over 18 years of age who do not possess a certificate of morality covering at least three months, unless they are members of the family of the owner.
2. To place in the windows of saloons, cafés, counters, bars, and similar establishments opaque curtains or windows, and in general to employ any other means obstructing the view of the interior of these establishments from the street.
3. To receive customers in any other rooms than those to which the public has access, such as rooms in the back of the house which do not open upon the street.
4. To permit the girls or women employed in these establishments to sit and drink with customers.
5. To employ or habitually to admit depraved women for the purpose of prostitution in these establishments or upon the premises.

ARTICLE 2

Licensed prostitutes are forbidden to frequent the neighborhood of barracks, arsenals, schools, churches, public squares, markets, public promenades, and the principal streets and in seaports the quays where passengers disembark, the jetties, seawalls, and beaches.

ARTICLE 3

Hotel keepers and those who rent lodgings shall not lodge or even occasionally receive for the purpose of prostitution licensed prostitutes unless they show that they have conformed with the law, notably in reference to sanitary inspections.

ARTICLE 4

In order that they shall be regularly submitted to sanitary inspection, a special register shall be kept of all women who incite or practice prostitution or solicitation in any manner on the public streets or in places open to the public or in any place opening upon the public streets.

ARTICLE 5

Every infraction of this order shall be reported and vigorously prosecuted according to the law.

ARTICLE 6

Subprefects, mayors, officers of the gendarmes, police commissioners, and all other officers and agents of the police are charged, each in his special department, with the execution of the above order.

REPRESSION OF PROSTITUTION AT PORTS OF DEBARKATION

During the summer and early fall of 1917, St. Nazaire was the base port in France which was used most extensively for debarking our troops.³ Because the source of many new cases of venereal diseases, which had appeared in our recently arrived divisions, could be traced to St. Nazaire, this port was made the subject of an investigation by the consultant urologist, American Expeditionary Forces, in October, 1917.⁴ In his report to the chief surgeon, A. E. F., the consultant urologist stated:⁵

1. *General situation.*—St. Nazaire is a typical seaport town of between 30,000 and 40,000 population, with great numbers of prostitutes and other types of loose women. About 150 of these women are registered, and more or less carefully examined by the French. Several so-called regular houses of prostitution are recognized and regularly examined. Our study shows that this inspection and examination is thoroughly inadequate and insufficient, and we have records to show that in the course of a month at least 14 cases of venereal disease, mostly syphilis, were acquired from one of these supposedly best houses, which is examined three times weekly by the French authorities. It is evident that very little protection is thus afforded. The cafés, buvettes, hotels, and stores contain large numbers of loose women, and many are also to be picked up on the streets. Almost all portions of the city are open to prostitution.

2. *The liquor situation.*—There are scores of saloons which sell "hard" liquor both by the glass and bottle to our soldiers, although they deny it to the French soldiers. As a result drunkenness among our men is often very great, especially when new regiments of troops arrive by transport. This leads to much disorderliness, huge crowds invade the houses of prostitution often filling the streets, individual women serve great numbers of men and little provision for washing and cleanliness is afforded. It is evident that many women thus transmit the disease from one man to another without perhaps acquiring it themselves.
* * *

3. *Conditions at camp.*—(a) Large numbers of troops pass through here at stated intervals. Recently as many as 12,000 were in camp at one time. From 10 to 20 per cent of these men were given leave from 4 to 10.30 p. m. During this time from 1,200 to 1,500

were often in St. Nazaire, about $1\frac{1}{2}$ miles distant. A huge per cent would drink heavily of the liquors afforded, particularly cognac, eau-de-vie, and niger rum, which is sold to our soldiers regardless of French laws. The reports indicate that not infrequently several hundred men get drunk. * * * Almost none of these men receive prophylactic treatment, although many have had sexual intercourse. In addition often 200 to 300 men, drunk but still able to walk, wander back to camp. * * * Many of these are unable, or refuse, to take prophylactic treatment. As a result, probably hundreds of cases who should be given prophylaxis do not receive it, and the unusually high amount of venereal disease recently contracted by regiments passing through St. Nazaire is probably attributable to this failure to use prophylaxis.

(b) Camp commander reports that owing to the wide extent of Camp No. 1 it is impossible to guard it, and many men steal away without leave, and these also fail to report for prophylaxis. Camp commander strongly recommends the erection of a fine barbed-wire fence around Camp No. 1, asserting that this will greatly simplify the problem of guarding the camp and preventing absence without leave. If this is done, no difficulty will be experienced in keeping men in camp and he strongly recommends that all transient organizations and detachments be kept in camp while at St. Nazaire. The large athletic fields, amusement halls, reading rooms, moving picture places which have been amply provided furnish adequate amusement and occupation—far more in fact than St. Nazaire itself. Troops who are now permanently stationed at Camp No. 1 and at work in St. Nazaire are regularly provided with passes.

4. *Prophylactic stations.*—At Camp No. 1 these are thoroughly inadequate if present conditions allowing huge numbers leave in the city at night are followed. Better stations with considerably more equipment, more personnel, better sanitary arrangements and provisions should be provided. In St. Nazaire the prophylactic stations are scattered all over the city with the various detachments. Some are well equipped and organized. Others are absolutely unsatisfactory. In some no privacy is afforded, the treatment being given in the open barrack in full view of everybody. One station was exposed to the weather, with no covering. In other places the equipment was thoroughly inadequate. There seems to be little realization on the part of certain commanding officers of the great importance of venereal prophylaxis from the military standpoint and the orders requiring lectures to the men, instructions and advice are in some cases not followed.

5. *Prevalence of venereal diseases.*—Some detachments have a very high rate of venereal—8 to 10 per cent. Others, better looked after, have an extremely low rate, particularly the 19th Engineers, whose rate per thousand last month was zero, and the 17th Engineers, whose rate last month was 0.9. Among the stevedores the rate is 51 per thousand. A detachment of 300 men recently coming from St. Nazaire showed a 4 per cent venereal rate, due largely to cases acquired at St. Nazaire. They report very inadequate prophylactic measures. The same report was made by officers of the 23d Infantry, who state that during the eight or nine days spent at St. Nazaire two battalions developed 36 cases of venereal disease. This probably is largely due to drunkenness and consequent failure to take prophylactic treatment.

It will be noted in this report that a number of contributing factors made for the unsatisfactory status of the venereal disease incidence at the time in question; nevertheless the fact stands out preeminently that the relative ease of access to the prostitutes of St. Nazaire was really at the base of the difficulty.

As mentioned above, since the American Expeditionary Forces had no military control over civil communities in France, except later in our zone of the armies, it was impossible to suppress prostitution at St. Nazaire. However, following a visit by General Pershing to St. Nazaire to make a personal investigation of the reported situation there indirect measures for the repression of prostitution at that place were put into effect. These measures comprised restriction of opportunities for members of the American Expeditionary Forces to leave their commands while at St. Nazaire, of which more will be

said later, and placing houses of prostitution "out of bounds"; that is to say, near all known houses of prostitution in St. Nazaire military guards were stationed so as to prevent the entrance thereto of members of the American Expeditionary Forces.⁷ This last measure was reported as having a decidedly beneficial effect as evidenced by the diminished number of subsequent local venereal prophylactic treatments.⁷

The following letter from the chief of the French mission, American Expeditionary Forces, to General Pershing, shows what measures the local French authorities agreed to take to control prostitution, the difference between their methods and those we had placed in force lying in the fact that the French repression looked toward clandestine prostitution only:

[Translation]

No. 794/S. S.

FRENCH MILITARY MISSION, A. E. F.,

December 13, 1917.

From: General Ragueneau, Chief of the French mission, A. E. F. (for the Medical Corps).

To: Commander in Chief, A. E. F. (for the Medical Corps).

Subject: Repression of prostitution (report of the SS. Prefet of St. Nazaire).

I have the honor of informing you that following your visit of October 26, 1917, at St. Nazaire and the fears you expressed regarding the propagation of venereal disease a meeting has taken place at the Sous-Prefecture of St. Nazaire.

At the demand of Colonel Bash, commanding the American base, M. le Sous-Prefet has taken, in agreement with the qualified civilian and military authorities, the following measures in order to check as much as possible the spread of venereal diseases.

If it has been impossible to proceed simply to the closing of the houses of prostitution, which are considered even from the material point of view as the lesser evil, as shown by the medical statistics, the rigors of examination for the women who are residing there have been increased and any infraction severely punished.

Regarding the expulsion of the prostitutes known as such, it is applied with extreme severity against those which have no domicile, these women being also closely watched.

Clandestine prostitution will be relentlessly repressed and severe action taken against the culprits, with this special reservation, that a careful distinction must be made between professional debauchery and passing shortcoming, and efforts must always tend to safeguard family honor.

The military authority will continue to be inflexible for the bars and restaurants guilty of infractions, frequent visits will be made in the rooms, and numerous rounds will insure the clearing of the street.

The cooperation of the American police will be accepted with the greatest pleasure, and great interest will be shown to all data touching prostitution regulations in the United States.

The colonel, director of the services,

(Signed) F. REBOUL,

One copy to commander in chief, A. E. F. (general staff).

One copy to commander in chief, A. E. F. (information for chief surgeon).

On December 18, 1917, General Headquarters, A. E. F. recognized the principles of repression of prostitution as distinguished from the principle of regulation and issued a general order which required that, at ports of debarkation, by earnest cooperation with the French authorities and, if necessary, by the use of a military secret service, every endeavor was to be made to locate the habitations, rooms, or apartments and town sections occupied by women engaged in prostitution.⁸ All such places were to be considered "off limits;"

they were to be described and posted in each company or detachment, and the visiting or frequenting of these places by members of the American Expeditionary Forces was to be prohibited. Though this order was intended especially for application at the ports of debarkation of the American Expeditionary Forces, it was to be "interpreted in general as applying to all stations where troops were stationed."⁸

The effect of the repression of licensed prostitution on the incidence of venereal diseases at St. Nazaire is exemplified by the following table, which shows plainly the great reduction in the number of venereal disease contacts (number of venereal prophylaxis treatments) subsequent to November 15, 1917, when licensed houses of prostitution were placed "off limits."⁶

TABLE NO. 44—Data from venereal reports of American troops permanently stationed in St. Nazaire, France, showing the effect of repression of prostitution

Month	Strength of command	Number of venereal prophylaxis treatments	Venereal disease incidence absolute numbers	Venereal disease rate per 1,000 strength
<i>White troops</i>				
1917				
August.....	4,571	1,669	72	16
September.....	9,471	3,392	124	13
October.....	3,966	2,074	67	16
November.....	7,107	885	81	10
December.....	4,281	539	44	10
1918				
January.....	3,777	523	8	2
<i>Colored troops</i>				
1917				
August.....	430	14	20	19
September.....	411	.....	21	51
October.....	607	91	66	109
November.....	1,807	398	142	103
December.....	2,830	111	59	21
1918				
January.....	5,613	289	62	11

The proscription of licensed houses of prostitution obviously had no effect on clandestine prostitution; however, through the observations of our urologists in the base sections, A. E. F., it was shown that the opportunities offered for venereal disease contact were infinitely less through the medium of clandestine prostitution in our debarkation ports in France than was the case with licensed houses of prostitution.⁶ Our troops, newly arrived from the United States, contained few men possessing any knowledge of the French language, and for this reason many of them refrained from speaking to a French girl on the street. Many who went so far as to converse with women of the street withheld from accompanying them to a strange house through lack of a clear understanding. On the other hand, the same soldiers would find no such difficulty in visiting a house of prostitution where there was an interpreter. The houses of prostitution were prepared for sexual commerce in a wholesale manner; whereas the clandestine prostitute, through the

necessity for searching for persons with whom she could carry on her trade, was thus physically restricted from effecting many venereal disease contacts during a given period of time. It was reported that 60 prostitutes in licensed houses of prostitution in Bordeaux had, during a 10-day period in September, 1917, 15,000 sexual relations.⁶

Not only were licensed houses of prostitution put "off limits" in St. Nazaire, but, also on December 14, 1917, to make their proscription more effective in so far as the American Expeditionary Forces were concerned, a large area of the city which encompassed houses of prostitution as well as disreputable grog shops was made into a restricted district into which none of our sailors or soldiers, and no American civilians, attached to the American Expeditionary Forces, were permitted to enter, except on bona fide business.⁹ This method of closing off certain undesirable portions of cities to the American Expeditionary Forces subsequently came to be generally applied in France.¹⁰

Thus controlling licensed houses of prostitution, in so far as the American Expeditionary Forces were concerned, inevitably ran counter to the French principle of the control of venereal diseases, which, as we have seen, was based on keeping in close touch with declared prostitutes, and by so doing to limit automatically the occurrence of clandestine prostitution. The establishment of precedent in the control of venereal disease in the American Expeditionary Forces arose in a number of instances from conditions studied at St. Nazaire. We have seen how licensed houses of prostitution first were declared "off limits" there by us: also, how this delimitation subsequently was expanded so as to include an area containing such objectionable places. It is natural, then, for the first voicings, on the part of the French, of an objection to this application of our system which was so diametrically opposed to their system, to have originated in St. Nazaire. The following extracts from a report of the base urologist, Base Section No. 1, A. E. F., December 14, 1917, show some of the apprehensions entertained by the local French authorities, connected with the restrictive measures we then were enforcing in St. Nazaire.⁹

The mayor and the police officials have been very active in their opposition to the restrictions which have been imposed on the houses of prostitution. The mayor has brought forth many arguments as to why soldiers should be allowed these privileges; he has had many conferences with Colonel Bash and urged that the houses be opened. He called on the present commanding officer lately in regard to the negro stevedores and urged that something must be done, for the French would be in danger.

Yesterday, he offered three suggestions: (1) That three houses of prostitution be opened for the negroes, (2) if this was not found to be satisfactory, that negro women be brought over from the United States to serve as prostitutes for these men; (3) that, if neither of the above suggestions could be accepted, all of the negroes be sent back to the United States.

* * * * *

The mayor claims that he is going to take up the matter with the officials in Paris.

* * * * *

Meanwhile the Medical Department of the French Army was studying the American system for suppressing prostitution. In a report of January 31, 1918, to the French Minister of War, urging reform of the regulations for the French Army, concerning prostitution, and which formed the basis of a communication from the French Premier to the chief of the French mission, A. E. F., to be quoted later, there are the following statements:¹¹

Before communicating with the American Army authorities on so delicate a subject, the cabinet of the minister requested the Undersecretary of State for Hygiene to enlighten them as far as possible concerning the viewpoint of the American Government, and concerning the steps already taken or contemplated on this subject.

The inclosed report of Medical Inspector Simonin reveals unmistakably that it is not possible, for the present at least, to propose the regulation of prostitution to the American authorities, in view of their hostility to this system.

But the facts related in this report demonstrate that in the existing moral conditions, and despite the prophylactic and disciplinary measures taken by the American authorities, the absence of regulation of prostitution in the towns occupied by troops arriving from America results in most deplorable conditions.

The report of Medical Inspector Simonin referred to in the above-quoted statements begins with a comprehensive review of our War Department instructions concerning the program of social hygiene for soldiers, which was promulgated by the Surgeon General, United States Army, in bulletin form, August 17, 1917, and the zone regulations, as described by the Secretary of War in his letters to mayors and sheriffs of the United States, on August 10, 1917.

The report then proceeds to discuss the viewpoint of the French Government on the question of the prevention of venereal diseases in their Army and includes a review of our antivenereal campaign at St. Nazaire, as follows:¹¹

In absolute contrast to the above is the secret note of January 15, 1916 (No. 1061-5) French Headquarters, relative to the prevention of venereal disease, which contains the following paragraph: "The multiplication of public houses should be discreetly favored and their inmates examined at least every two days by the military physician."

The Academy of Medicine on June 22, 1916, among the recommendations presented to the authorities, included the following:

"The supervision and daily inspection of women in houses of toleration, and biweekly inspection of other inscribed prostitutes."

It is to be noted, however, that this same assembly on March 22, 1917, animated by the same spirit as our great American ally, insisted "on the necessity of notifying young persons that chastity is not only possible but commendable and sanitary, and of notifying married men that it is their duty, not only from the moral but also from the hygienic point of view, to avoid casual cohabitation."

More recently still (December, 1917) "Cabinet du Ministre (*Section des Oeuvres militaires diverses*)" requested the opinion of the Undersecretary of State for Health on the propriety of favoring the establishment of houses of toleration well supervised in the "centers of furlough (*herbergement*) for the American Army at the front."

This policy seems very little in accord with the regulations of the honorable Secretary of War at Washington and qualified to surprise him not a little.

III

THE ANTIVENEREAL CAMPAIGN AT THE AMERICAN BASE AT ST. NAZAIRE

FRENCH AND AMERICAN ACTIVITIES

As early as August, 1917, Doctor Gouin, chief of the municipal center of skin and venereology of the eleventh region at Nantes, noted a very marked increase of syphilis in the regions of Nantes and of St. Nazaire. He believed that this coincided with a considerable increase of prostitutes of all classes attracted by the arrival of the Americans. Since the month of June, 1917, the town of St. Nazaire had a subcenter of skin and venereology and a special hospital service, the activities of which were very satisfactory, thanks to the combined efforts of the subprefect, the mayor, Doctor Gouin, Doctor Salamo, and the Commission des Hospices.

A laboratory, with Doctor Weil-Halle, physician of the Paris hospitals, at its head, performs bacteriological and Wassermann reactions.

The official prostitutes are well supervised in the three public houses, which include 43 inmates, as well as among the 50 women inscribed with the morals police. Prostitutes are visited regularly every week and also visited unexpectedly quite frequently.

The dispensary holds daily consultations, morning and afternoon and at 7 p. m. Out-patients are received there. The morals police, whose number has been increased, carefully control the feminine frequenters of cafés, hotels, and lodgings.

The Americans on their arrival have therefore found an antivenereal organization as perfect as possible, both from the medical and police point of view. From June to October, 1917, the number of women in the houses of toleration rapidly increased to 70 and the licensed streetwalkers to 76. But the number of prostitutes also increased, as did the prostitutes among the factories of St. Nazaire situated in the town and which employ 1,928 women.

Syphilis promptly appeared in the American Army. The American medical authorities accused the women of St. Nazaire, and an investigation was begun to locate the source of the infection.

The official prostitutes were first investigated. These 146 women, being frequently inspected, are but little dangerous as far as syphilis is concerned, but can, of course, in spite of all precautions, transmit gonorrhœa. Doctors Salamo and Weil-Halle requested the American sanitary officer to accompany them in the inspection of prostitutes from August to October, 1917. Sixteen authorized prostitutes afflicted with secondary syphilis were arrested and placed under treatment. These may have been sources of contamination, but only during a brief period, since they were visited three or four times a week.

Moreover, 16 authorized prostitutes were found afflicted with primary syphilis and had therefore been contaminated by their clients.

As a result of these observations, the American Medical Department placed the licensed houses out of bounds for American troops at the end of September. What was the result? Clandestine prostitution took care of all the Americans. The factory workers, the employees of cafés, laundries, hotels, shops, etc., multiplied their advances and disseminated their contagions. The question then arose whether the difficulty did not arise in part from the Americans themselves. Were there not some men afflicted with syphilis among the Americans disembarking in France?

Up to October 21, 1917, no sanitary inspection had been made of American troops before debarkation. Since October 21, such visits are made and the American medical authorities have been somewhat surprised at the number of cases of syphilis discovered at the time of debarkation.

Contamination arises therefore from both sides; from the French population and from the American troops.

Here, according to the American reports, is the percentage of men found contaminated at their arrival in France in October and November, 1917: Civil employees, 45 per 1,000; Hospital Corps and marines, 67 per 1,000; chauffeurs and automobile mechanics, 80 per 1,000; hommes des trains, 85 per 1,000; *soutiers et débardeurs*, 220 per 1,000.

The last debarkation, according to Doctor Salamo, chief of the subcenter of dermatology at St. Nazaire, gave 2 to 25 per 1,000 men afflicted with venereal disease.

In the face of such figures we may well wonder how many French women were infected from June to October by these Americans.

However this may be, Colonel Ford, American surgeon at St. Nazaire, made the following request of the subprefect: 1. Closure of all licensed houses; 2. banishment of licensed streetwalkers; 3. exclusion of prostitutes not residing at St. Nazaire; 4. severe repression of clandestine prostitution and closure of houses to which they take their clients; 5. prohibition of prostitutes who have left St. Nazaire to return.

The subprefect, Doctor Gouin; Doctor Salamo, chief of the center of venereology; Doctor Melkoeh, civil physician in charge of the supervision of licensed houses; Doctor Weil-Halle, hospital physician in charge of the laboratory at St. Nazaire, replied that this measure would make prostitution exclusively clandestine, and that the extension of official prostitution, well supervised, was the best guaranty against the spread of venereal disease. It was therefore proposed to the Americans that licensed prostitution be placed under a com-

bined civil and military, French and American, control with the collaboration of an increased zeal in the supervision exercised by the French-American police.

Doctor Weil-Halle even suggested the experimental installation of a station of American prophylaxis in the public houses where an expert hospital sergeant could apply prophylactic treatment immediately. Furthermore, a register could be established at this point upon which would be inscribed the name of the American soldier with that of the woman. This would permit a certain ultimate control of alleged contamination.

The director of the health service of the eleventh region in transmitting these propositions expressed the desire that the American health service would be willing to submit troops and workmen arriving from the United States to a strict physical inspection before their embarkation for France.

On December 22, 1917, the Undersecretary of State gave his approbation to the proposition made by the civil authorities and the health department to Colonel Ford, medical officer of the American base at St. Nazaire, inasmuch as they concerned venereal prophylaxis. But our allies, faithful to those principles emanating from the Secretary of War, Mr. Baker, declined the proposition and have persisted in their original plan so that the situation at St. Nazaire on January 1, 1918, is as follows:

1. Licensed houses are declared out of bounds by the American commander.
2. Licensed streetwalkers are also forbidden the American troops.
3. Sentinels placed at the entrance of streets inhabited by licensed streetwalkers prohibit access to all quarters which are known or suspected to contain such women.
4. The only material defensive or protective measure consists in the installation of prophylactic stations where the men who have had sexual relations are required to report (a) in order to be registered; (b) in order to submit to a friction of calomel ointment and a preventive mercurial injection of collargol [sic].

This procedure reminds one of the sanitary cabinet suggested long ago in France by Mr. Cheron.

The Americans have added, however, the prospect of court-martial for all soldiers, who, having failed to report at the prophylactic station, are subsequently found afflicted with venereal disease—the best possible means of inciting them to carefully conceal their disease.

The object of the Americans is to prevent their soldiers from having sexual relations. To attain this they bring into play every means for retaining the soldier in his camp by giving him all possible distractions, even the most modern.

Beginning with the principle that chastity is possible, they have decreed an official continence, and they confide to religion and morals the duty of maintaining morality in man and of keeping him always master of his passions. They depend, however, on violent physical exercise to afford distraction and to diminish the desire of their soldiers.

It would seem that this new state of things promises a future full of hope for clandestine prostitution at St. Nazaire, and, on the other hand, many difficulties and trials for police supervision, given the fact that the Americans are by no means free from venereal disease, when they debark in France.

* * * * *

In short, the first results obtained by the Americans from prohibition of licensed prostitution for their troops have been the following:

1. According to the reports of police commissioners, the number of rapes and attempts at seduction has never been so great as during that period.
2. The centers of clandestine prostitution have been broken up. They are no longer in the center of the city. They have extended beyond the limits of the commune and are so much the more difficult, if not impossible, to supervise. Indeed, clandestine prostitution at the present moment thrives in the communes of Trignoc, St. Brevine, Labaule, Pornichet, Lecroisic, etc.

Be that as it may, the military medical authorities and the French civil authorities will continue to multiply their efforts to support the American theory of prevention.

America has the noblest official moral aspirations. These should be encouraged, but can our Ally give similar guaranties of individual morality? Or at least, will she be willing

to support our efforts by imposing on her troops before embarkation for France, as well as at the time of debarkation, a careful sanitary inspection and prompt treatment of all contagious venereal lesions? This would not seem too much to ask, and from it one might expect a most excellent result.

On February 17, 1918, the following letter was written by M. Clemenceau, French Premier and Minister of War, on the subject of hygiene of allied troops, a copy of which was transmitted to General Pershing:¹²

No. 1168-C.

[Translation]

MINISTRY OF WAR, 4TH BUREAU,
Paris, February 17, 1918.

From: The President of the Council, Minister of War.

To: Chief of the French Mission, A. E. F.

Subject: Hygiene of allied troops.

The presence on French territory, specially in certain important centers, of American troop assemblages brings up questions of social hygiene which it is of great importance to solve to the best interests of the health of the allied troops and of the civilian population.

Regarding more specially the propagation of venereal disease, the methods followed so far by the American Expeditionary Forces do not seem to have given good results. In fact, total prohibition of all regulated prostitution in the vicinity of the American troops has had for result, in spite of the measures of prophylaxis and discipline taken by the American authorities, the increase of propagation of venereal diseases among the civilian population of the neighborhood.

Consequently, I would be very much obliged to you for calling again the attention of the American high command to this serious question.

In this respect, it is certain that clandestine prostitution offers to men more numerous and, above all, more dangerous temptations than regulated prostitution. The latter, under its strictest form—that is, the house of prostitution—excludes, if not completely, at least reduces very sensibly, the dangers of unrestrained prostitution. Owing to the administrative and sanitary control by the public authorities it offers the maximum of security, reducing the risk of contagion to the minimum.

Should the American high command see this question in the same light, I would put my services at its disposal for causing, if necessary, in concert with the Minister of the Interior, the creation of special houses of this kind.

I beg of you to let me know as soon as possible the reply of the American commandant.

(Signed) G. CLEMENCEAU.

In a reply to the above letter, the chief surgeon, A. E. F., on February 23, 1918, expressed the belief that the statement made in M. Clemenceau's communication that the methods followed by the Americans have not given good results in the prevention of venereal diseases, was without foundation. As a matter of fact, it was thought that the records of the American troops for noneffectiveness and for admissions because of venereal disease was better than that of any other army of which he had knowledge.¹³ It was proposed that a conference on this question take place, in which it was desired that three officers of our Medical Department participate and any number of French medical officers to be determined by the French Government.¹³

Such a conference was arranged; the representatives of the American Expeditionary Forces chosen were so selected because of their knowledge of social hygiene.¹⁴

It was evident to the American representatives throughout the progress of the conference that it would be impossible for the French to understand the American viewpoint regarding the subject of suppression of prostitution; likewise, it was impossible for the Americans to understand the French point of view. It was explained to the French delegates that licensed prostitution never had succeeded in the object which it sought to accomplish; moreover, that public opinion in the United States would never tolerate the adoption of licensed prostitution.¹⁴

A subcommittee of the conference investigated the allegations made by the French Government concerning conditions at Base Port No. 1, A. E. F.⁴ It was found that not only had the incidence rate of venereal diseases been markedly reduced at this port since the proscription of licensed houses of prostitution to the American Expeditionary Forces, on November 15, 1917, but that the prophylactic treatments among our troops stationed at this port also had been reduced from an average of about 500 per thousand per month to about 150 per thousand per month. During the three months following the banning of licensed houses of prostitution to our troops in St. Nazaire, the occurrence of one rape and one attempted rape by American troops on French women was reported to the provost marshal, Base Section No. 1; whereas, during the three months preceding the issuance of the orders referred to, precisely the same number of similar crimes had been reported, viz, one rape and one attempted rape.⁴ These periods are brief; however, they cover the time the French officials had in mind.

During the conference, which intermittently covered the period of about a month, the French representatives showed every desire to view the problem from our point of view, and to put into effect any regulations which would in any way prevent the spread of venereal disease. Because it was the expressed opinion of the American representatives at the conference that the sale of alcoholic liquors of all kinds in houses of prostitution was one of the most important factors in the question under consideration, the French were quite willing to advocate the prohibition of the sale of alcoholic liquors, even agreeing, in a set of regulations which they proposed, to specify that no beverages except tea, coffee, chocolate, sirups, and lemonade would be permitted to be sold in houses of prostitution.¹⁴

On May 12, 1918, the chief of the French military mission with the American Army, sent the following letter to the chief surgeon, A. E. F., inclosing the proposed regulations referred to above:¹⁵

I have the honor of addressing you. There is attached a copy of letter No. 3627 C, dated May 9, 1918, from the president of the council, the Minister of War, upon the subject of hygiene of allied troops, as well as a statement relative to the organization and the functioning of the houses, so-called "licensed houses," for the prevention of venereal disease in the Army.

The president of the council asks if you will be disposed, granting the observance of the rigorous requirements of the regulations above mentioned, not to forbid to American troops access to the licensed houses which are subjected to supervision as prescribed.

I would appreciate the receipt as soon as possible of your reply upon this subject, so that I may communicate the information to the president of the council, the Minister of War.

The attitude of the chief surgeon, A. E. F., toward the proposals of the French Government that we accept the proposition that it were better to license houses of prostitution was unequivocally expressed in the following letter to the commander in chief, A. E. F.:¹⁶

1. Under date of February 17, 1918, M. Clemenceau, the French Premier, addressed a letter to the commander in chief suggesting that the Americans give serious consideration to the prevention of venereal disease so that the spread of these diseases would be kept at a minimum among the American troops and that the civil population in France would be protected. In this letter the Prime Minister brought up the question of licensing houses of prostitution. The result of this communication was several conferences between the French service and the American service on the venereal question. The attached letter from the Minister of War, which relates the result of the series of conferences, incloses regulations for the government of houses of prostitution, which were drafted by the French service, and the question is asked if the American authorities will cease putting houses of prostitution out of bounds if the regulations suggested are approved and vigorously enforced.

2. It is thought most commendable on the part of the French service that they should have viewed this subject in such a broad light and should have adopted so many points in favor of American ideas. The regulations which are proposed for the government of houses of prostitution are very good. They abolish many of the privileges which had heretofore been allowed in these houses and adopt the practice of prophylactic treatment, which has been developed by the Americans during the past several years. Particular attention is invited to the fact that these regulations were drafted by the French service and that the American members of the commission had nothing to do with their formulation.

3. In view of the stand taken by our Congress in passing law for the protection of soldiers in camp and in consideration of the instructions of the Secretary of War putting into operation the act of Congress, it is not believed the United States Army can adopt any policy except that all houses of prostitution shall be put out of bounds. It is recommended that an answer be given to the Minister of War on this basis.

REPRESSION OF PROSTITUTION IN INTERIOR CITIES

Though General Orders, No. 77, G. H. Q., A. E. F., December 18, 1917, was to be applied to all stations where the American Expeditionary Forces were stationed, regarding the habitations of prostitutes being considered "off limits" to our troops, reports from various sources in the American Expeditionary Forces indicated that, during the winter of 1917-18, in places other than ports of debarkation, houses of prostitution were being tolerated by our officers and to which our soldiers were permitted free access.¹⁷ In a number of instances local French authorities made strong pleas to local commanders either to establish houses of prostitution, especially for American troops, or to authorize officers of the Medical Department, A. E. F., to cooperate with French physicians in the examination of the inmates of licensed houses of prostitution.⁴

In August, 1918, misconception as to what should be done regarding licensed prostitutes definitely was made impossible by the following instructions from General Headquarters, A. E. F.:¹⁰

HOUSES OF PROSTITUTION

Throughout the A. E. F. all houses of prostitution, as well as saloons indulging in the improper sale of intoxicants to members of the A. E. F., will be designated as "off limits." Commanding officers will adopt the necessary means and disciplinary measures to prevent soldiers from visiting them.

REPRESSION OF CLANDESTINE PROSTITUTION

In the attempt to repress clandestine prostitution in the American Expeditionary Forces, recourse was had, under the French law, to the deportation of women discovered to be clandestine prostitutes from the cities where they were practicing their profession. The following paragraph in Bulletin No. 45, G. H. Q., A. E. F., August 8, 1918, recognized this means of dealing with the question:

APPREHENSION OF CLANDESTINE PROSTITUTES

By cooperation with the French police, military and civil authorities, every effort will be made to repress clandestine prostitution and streetwalkers, and employ every available means under the French law to have all women sent away.

Such a method could have a temporary repressive value only, since nothing prevented a prostitute from establishing herself in another city in or near which the American Expeditionary Forces were located.

In some cities, notably Paris, indirect methods of repressing clandestine prostitution were resorted to. In Paris, the overwhelming majority of the estimated 75,000 prostitutes during the World War were "streetwalkers."¹⁸ Of these, only about 5,000 were licensed and inspected. The remaining 70,000, including practically all the clandestine prostitutes, were without supervision or control of any sort, and were permitted to remain by the Paris police so long as they were not publicly too offensive. Solicitation by these prostitutes was the rule, and was more open than elsewhere in France.¹⁸ Partially to prevent members of the American Expeditionary Forces from coming in contact with these women, our Paris provost marshal and plain clothes members of the intelligence police were ordered to report all ranks and militarized civilians who were seen associating with prostitutes and women of questionable character.¹⁹ All officers so reported were to be brought to trial by court-martial; appropriate disciplinary action was to be taken against other offenders.

PREVENTION OF CONTACT THROUGH RESTRICTING THE LIBERTIES OF THE AMERICAN EXPEDITIONARY FORCES

DEBARKING TROOPS

In the early fall of 1917, many members of the American Expeditionary Forces were acquiring venereal disease at the debarkation port (St. Nazaire) soon after arrival in France. St. Nazaire, being a small seaport at that time, did not possess adequate facilities to permit rapid debarkation of the shiploads of our troops arriving from America.⁶ As a result, many days frequently would pass before the troops would be debarked, and during this time the men were given shore leave for exercise and amusement. In the rest camp at St. Nazaire many thousand soldiers were being detained while awaiting dispatch to our training areas then being prepared for their reception in the interior of France. With free access to town there was much drunkenness among our men, and the houses of prostitution did a flourishing business with them.⁶

In consequence of such a dangerous combination of circumstances, a general order was issued by the base commander, Base Section No. 1, A. E. F.,²⁰ which

provided, among other measures, that while our troops were detained on board transports at St. Nazaire, awaiting either a direct movement to railway trains, or arrangements for their reception in local rest camps, commanding officers of the troops concerned were not to permit enlisted men to leave the transports for recreation. When delay occurred in removing troops from the transports, commanding officers could obtain authority from the base commander to issue shore passes to troops for special reasons. Such passes, however, were to be issued to squads of men, and for a limited period only, each squad to be in charge of a noncommissioned officer of undoubted integrity.

After debarkation, and when established for the time being in local rest camps, the troops were to be governed by the same system as to passes. In addition, the commanding officer of each camp was required to provide a prescribed entrance to his camp through which entrance all men returning to the camp were to pass. Here, a guard was to be maintained.²⁰

Without an effective inclosure, however, the control of the movements of the men was almost impossible of accomplishment. On October 19, 1917, the senior consultant in urology, A. E. F., saw this as the crux of the situation at St. Nazaire and recommended that Camp No. 1 and similar camps where men were to be detained after debarkation be inclosed by a fence so that all men entering or leaving the camps must pass through established gates, where efficient sentries could be stationed.⁵

On December 18, 1917, General Headquarters, A. E. F., made generally applicable to all the debarkation ports of the American Expeditionary Forces the restrictions as to passes for transient troops that had been adopted in Base Section No. 1.⁸

IN CITIES OF FRANCE

Since repression of prostitution could not wholly protect the American Expeditionary Forces from acquiring venereal disease, especially in view of the great number of irrepressible clandestine prostitutes, certain orders were issued from time to time in the American Expeditionary Forces which in most instances were intended solely to prevent contact with diseased prostitutes by controlling the liberties of our troops. One of the earliest general orders promulgated by General Headquarters, A. E. F., had for its purpose the guidance of military police, American Expeditionary Forces, in cities.²¹ These instructions required all officers below the grade of brigadier general to report in person at the assistant provost marshal's office within 24 hours after their arrival in any city in which an assistant provost marshal was stationed, and to present their authority for being in such city. All enlisted men were to report to the noncommissioned officer in charge at the assistant provost marshal's office, for an examination of their papers and to obtain a pass, were their papers sufficient. Since the assistant provost marshal's office stamp was a necessary affix to their papers before a railroad ticket could be purchased, there was thus in existence a force tending to prevent the uncontrolled movements of individual members of the American Expeditionary Forces from place to place and to restrict them to their proper organizations. Though intended as a general military measure, the merit of this order in influencing the incidence of venereal disease is evident.

The control of men either on a leave status or on duty in the cities of France, with a view to minimizing the incidence of venereal disease, presented a problem which was worked out early by adopting the plan of the medical departments of the Canadian and New Zealand branches of the British Expeditionary Forces.⁶ The experiences of the Canadian and New Zealand medical department authorities in London showed that highly beneficial results could be obtained by making adequate provision for the control of venereal disease among men on leave. The basic thought in making these safeguarding provisions was the establishment of one or more army hotels wherein men in cities on leave could be quartered, thereby affording opportunity to practice methods which had in view the control of venereal disease incidence, and which otherwise were not practicable when the men were allowed volitionally to disperse through a city. For the present our interest is with the gathering of the men together; more will be said later as to the other methods referred to.

On September 9, 1917, the practice of the Canadian and New Zealand contingents of the British Expeditionary Forces was put into force in the American Expeditionary Forces; that is to say, it was then prescribed that in cities in which members of the American Expeditionary Forces were present, either on a leave or a duty status, and where official accommodations already were not available, the provost marshal general, A. E. F., was to designate certain hotels where the class of men referred to were to be required to reside.⁷²

All-night and week-end leaves proved a fertile source of venereal disease infection by multiplying contacts and by delaying prophylaxis.⁶ This is exemplified in Chart III which shows the week-end increases in the number of prophylactic treatments given at Rennes, A. E. F., during a portion of the winter of 1917-18. Such leaves were to be denied as much as possible throughout the American Expeditionary Forces.¹⁰ Moore, in discussing the situation relative to "all-night leaves" for the American Expeditionary Forces in Paris, reported as follows:¹⁸

Many soldiers, even though thoroughly instructed in venereal disease matters and fully provided with the opportunity of Y. M. C. A. and Red Cross entertainments, were obstinate in preferring the society of women of the Paris streets. For this class, it was necessary to institute disciplinary measures. This was complicated by several factors: (1) The soldiers in Paris, were, for the most part, soldiers in name only, since most of them were highly skilled office or technical workers, whose day was entirely taken up by routine duties, uncomplicated by drills or other military inconveniences. Thus they were as a whole unaccustomed to and intolerant of restrictions or discipline. (2) They were divided into small detachments, often commanded by officers whose prime interest was technical work, who came into contact with their men only during office hours, and who, being uninterested in discipline for themselves, were careless of the welfare of their men. As a result of this, the general custom was that after the day's work was done, the soldier's night belonged to him, to do with as he would. (3) Detachments were widely scattered in various large or small barracks, so that just after the armistice, 125 detachments lived in 52 different places. As for the floating personnel, they were usually left to their own resources, and were wholly beyond the reach of officers or discipline.

Owing to these facts, the "all-night leave," with its consequent multiple exposures and failure to use prophylaxis until from 12 to 14 hours after the first intercourse, was a tremendous evil. In June, 1918, over one-half of all prophylactic treatments were taken after all-night exposures. The question then became one of preventing men from being on the streets all night. In those camps or barracks situated outside the city the commanding officer was

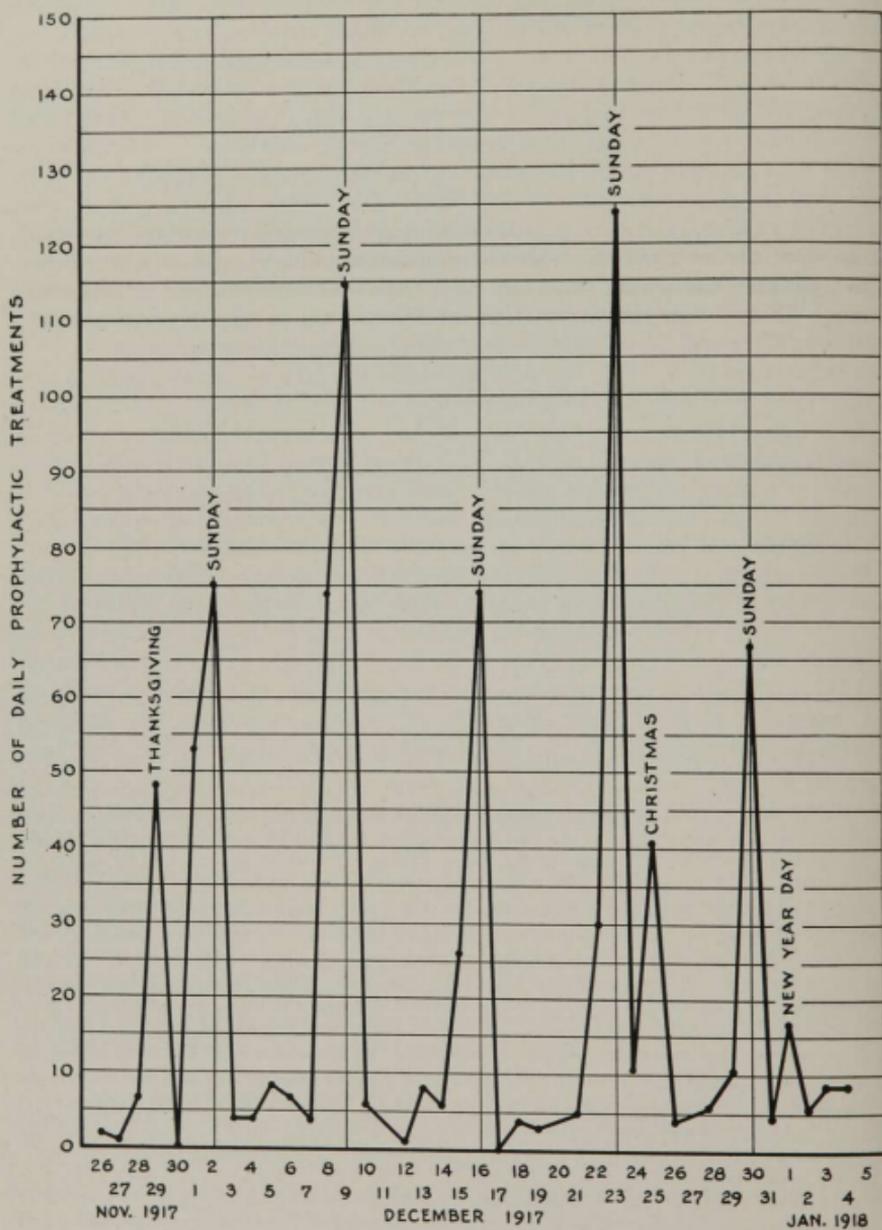


CHART III.—Record of prophylactic treatments at Rennes

requested to allow his men leave to Paris only once a week, and to insist that they return by midnight. In the city itself all troops were required to be in their barracks by 9 p. m., unless furnished with a pass to visit a designated place of amusement. Enforcement of these seemingly stringent measures was accomplished by roll calls in all barracks, when every man must be present or accounted for, and by the cooperation of the military police, who were required to examine passes of all men found on the streets after 9 p. m. Rigid enforcement of General Pershing's admirable General Orders, No. 77, 1918, was insisted on, especially those points relating to the questioning of all men returning from pass by a guard as to exposure, with compulsory prophylaxis if exposure was admitted, and compulsory prophylaxis without regard to exposure if a man returned intoxicated.

In Base Section No. 1, A. E. F., the several forms of passes issued had a direct influence upon the incidence of venereal disease there.²³ Passes for more than four hours demonstrated that prophylaxis was not nearly so efficient as when passes were limited to four hours.²³

In August, 1918, all permanent passes for enlisted men in Base Section No. 1, A. E. F., were recalled, and thereafter passes, except for official business, were limited to four hours and not later than 9.30 p. m.²⁴ Though other measures, such as requiring men returning from pass to sign statements as to exposure to venereal disease, and compulsory prophylaxis in instances where men returned to camp intoxicated, were enforced at the same time, the venereal-disease rate fell from 34.92 per thousand per annum for St. Nazaire for the month of August, 1918, to 28.80 per thousand per annum for September; in Base Section No. 1 the rate fell from 24.24 per thousand per annum for August to 22.68 per thousand per annum in September.²³

Rigidly restricting passes to four hours continued only until the end of the month of August, 1918, at which time company commanders in Base Section No. 1 were directed to classify the men of their companies as follows: Class 1, men of excellent character; class 2, men of character very good to good; class 3, all men having character lower than good.²⁵ New men upon joining a company were to be placed in class 1. Company commanders were empowered to promote men from classes 2 or 3 to the next higher class, or to demote men from classes 1 and 2 to the next lower class, for just cause; however, a man in class 3 was to remain therein for not less than 30 days. Men in class 1 were given permanent passes authorizing them to be absent from their organizations, when not on duty, from 9 a. m. to 9.30 p. m.; men in class 2 were given permanent passes authorizing them to be absent from their organizations for such time, not exceeding four hours nor later than 9.30 p. m., as was authorized by their post or camp commanders; to men in class 3 no pass privileges were given. The venereal-disease incidence rate for St. Nazaire dropped from 28.80 per thousand per annum to 25.08 for October; the incidence of venereal disease in Base Section No. 1 was lowered from 22.68 per thousand per annum in September to 20.76 in October.

On October 16, 1918, in order to standardize the issuance of passes to men in Base Section No. 1, organizations instead of individual members thereof were classified.²⁶ The working of this classification was as follows: The monthly venereal-disease incidence of the American Expeditionary Forces in St. Nazaire was taken as a basis; each company, similar unit, or detachment having a venereal-disease rate equal to or below that obtaining in St. Nazaire was to

be classified as class A and its commanding officer was to have permission to issue passes to its members under the instructions of August 31, 1918, referred to above; units having a venereal-disease rate above that of St. Nazaire were to be classified as class B, and their respective commanding officers were to issue four-hour passes only until such time when the venereal-disease rate became equal to or below that of St. Nazaire.

Abuses of these privileges occurred.²³ In St. Nazaire there was a decided increase of the venereal disease rate in November, 1918, over that for October; that is, the rate rose from 25.08 in October to 37.32 for November. Again, in December the rate rose to 49.92 for St. Nazaire, while for the whole of the base section it became 38.64 per thousand per annum. On December 17, 1918, because of the alarming increase of venereal diseases, existing pass regulations were rescinded, and a return was made to the system of prescribing four-hour passes, effective only before 9.30 p. m. In addition, in all organizations whose venereal rate exceeded that of St. Nazaire, officers as well as enlisted men were to be denied all pass privileges until such time as it was at least as low as that of St. Nazaire. Following the return to the four-hour pass system there was a parallel decline in the incidence of venereal diseases in both St. Nazaire and in Base Section No. 1 as a whole, the rate in St. Nazaire reaching the record low rate of 22.20 per thousand per annum for all troops for the month of March, 1919.²³

General Orders, No. 8, Headquarters, Base Section No. 1, A. E. F., January 14, 1919, was made to include all measures then in force in that section, whose purpose was the reduction of the incidence of venereal diseases. It is given here in its entirety because of its pertinence to the relationship between the control of men and the incidence of venereal disease and its successful application, after an experience of approximately one and one-half years in a situation attended with utmost administrative difficulties:

SERVICES OF SUPPLY,
HEADQUARTERS, BASE SECTION NO. 1,
France, January 14, 1919.

General Orders, 8.

1. No passes will be granted for more than four hours except for official business.
2. No passes will be granted effective to an hour later than 9.30 p. m. Local commanding officers are authorized to fix an earlier hour if deemed by them advisable.
3. When passes on official business are granted for more than four hours, the nature of the business will be stated and certified to by an officer having authority to grant such a pass, and the hour of expiration will be stated.
4. Upon returning from pass, every enlisted man will report to the guardhouse and will there be requested to sign a statement that he has not exposed himself to venereal disease during his absence on pass. If he is not willing to sign such a statement, if he is under the influence of alcohol, or if for any other reason there is just cause to believe that he has been exposed to venereal infection, he will be transferred to the most convenient prophylaxis station, and will there have the venereal prophylaxis treatment administered to him.
5. All passes will be taken up at the guardhouse, will have the time of return noted on them, and will be turned in with the guard report for such disposition as the commanding officer may direct.
6. All permanent or other passes not conforming to the requirement of this order will be canceled.

II. 1. All houses of prostitution, licensed or unlicensed, in any place in this base section, will be declared "off limits." There will be conspicuously posted in each company

or detachment a description or plan showing the location of such places, and the visiting or frequenting of them by members of the A. E. F. will be prohibited. At the headquarters of each station or camp, in each company or detachment, and at each prophylaxis station, there will be conspicuously posted a copy of General Orders, 6, 34, and 77, H. A. E. F., 1917, and of this order.

2. Assistant provost marshals will keep the commanding officers of troops in their vicinity informed as to the location of houses of prostitution.

3. A high venereal rate in an organization is an indication of inefficiency on the part of its commander. Every organization commander will give zealous personal attention and supervision to all regulations and orders relating to the suppression of venereal diseases.

III. 1. The provost marshal in each town will render a weekly report to the base commander on the conditions in restricted areas and on the enforcement of Section II of General Orders No. 57, these headquarters.

2. The base sanitary inspector and base urologist will report to the base commander any failures to carry out the provisions of Section II of this order that may come under their observations.

IV. 1. Commanding officers in granting passes will see that the limits of the pass are defined, both as to time and location. A pass to visit St. Nazaire will include only St. Nazaire and not the surrounding country.

2. Commanding officers may grant passes to visit all districts which are described as "off limits," but the purpose for which the pass is given will be stated, and such pass will only be given to trustworthy men.

3. Each man absent from quarters or camp must have an individual pass signed by his organization commander, and approved by camp headquarters, unless such men wish to attend the theater or some other place of amusement, when they may be marched in a body to and from camp under charge of a noncommissioned officer, who will have one pass for all men and be responsible that his party is kept intact at all times while away from camp.

4. Men on pass to visit St. Nazaire from embarkation camp will go by direct routes; first, by the Chemin Vicinal Ordinaire and the Rue Villez-Martin, or, second, by the Chemin Vicinal Ordinaire and the route Chemin—St. Nazaire—Pornichet. All other roads and all farms and houses in the vicinity of embarkation camps are off limits.

5. Men in the automobile park may visit the city passing along the Boulevard de l'Océan. All country surrounding the automobile park except the Boulevard de l'Océan is off limits.

6. Men will not be allowed to visit the small stores along the Chemin Vicinal Ordinaire, and the Chemin Vicinal Ordinaire and Rue Villez-Martin.

7. That part of the former restricted district included in Rue de Paris to Rue Ville Aubry to Rue de Meau to Rue Almiral Courbat to Rue de Nantes and Rue Villez-Martin to Rue de Paris is removed from the restricted district.

8. All places where alcohol is sold are declared "off limits," and men will not be allowed to visit such places, no matter what they intend to purchase, or for what purpose they visit these stores.

9. Men will not be allowed to stop in doorways or gateways in the city of St. Nazaire or vicinity, nor will they congregate in places which are not well lighted.

10. These regulations will be enforced in the vicinity of each camp and St. Nazaire by the commanding officer, embarkation camp; commanding officer, Montoir; commanding officer, United States troops, and provost marshal.

(V.) 1. The above regulations concerning passes have proven their value in keeping down the venereal rate in St. Nazaire and vicinity. It is recognized, however, that there may be local conditions at different reserve camps in this base section, which might justify the modification of some of the provisions of the pass instructions now in force. Reserve camp commanders will submit any recommendations along such lines concerning their own camps to these headquarters.

2. General Orders, 57, dated August 12, 1918, and Memorandum No. 10, these headquarters, dated January 25, 1918, are amended accordingly.

By order of Colonel Sewell.

C. BURNETT, *Chief of Staff.*

Official:

JOHN F. DANIELL, *Adjutant.*

LEAVES AND LEAVE AREAS IN THEIR RELATIONSHIP TO VENEREAL DISEASE CONTROL

The subject of leaves in the American Expeditionary Forces, when considered from the viewpoint of venereal disease prevention, naturally divides itself into two periods: That before the signing of the armistice, or the period of hostilities; the armistice period. This arrangement is largely due to the fact that, during the period of hostilities, conditions obtained which, as will be seen, prevented the granting of leaves to but relatively few thousands of men; consequently, noneffectiveness caused by the acquisition of venereal disease did not become a problem of magnitude to the Medical Department, A. E. F., until about the beginning of 1919. Since the system of granting leaves and establishing leave areas during the period of hostilities was the basis upon which the modifications of the armistice system of leaves were made, it is considered advisable to discuss the subject at some length from its beginning, and to separate it into the two periods as outlined above.

LEAVE SYSTEM DURING HOSTILITIES

It was appreciated at General Headquarters, A. E. F., in the summer of 1917, that it would be advisable, from the standpoint not only of morale but of health as well, to grant to members of the American Expeditionary Forces regular leaves of absence.²⁷ During the months which followed, the whole question was given considerable study, in conjunction with the French, because of the necessity of their cooperation in making any leave system of ours successful in France. The proposition of the French military authorities concerning our leave system was as follows:²⁷ (a) A leave of seven days, time of travel not included, was to be granted to officers and soldiers every four months, the first period to begin on February 15, 1918. (b) Since very few members of the American Expeditionary Forces had immediate relatives in France, leave centers were to be chosen by the American authorities with the concurrence of the French. (c) Officers and enlisted men having near relatives in France were to be permitted to visit such relatives, provided they certified to such relationship. In case the locality to be visited under such circumstances was in the zone of the armies, the approval of French General Headquarters was to be secured. (d) The development of leave areas was to be made progressively in accordance with the needs of the American Expeditionary Forces, such development to be subject to the approval of the French authorities. (e) The organization of special trains for men going on leave was to be made. (f) Discipline was to be maintained on trains by military police, particular emphasis being placed on the fact that our men should not carry arms.

With some modifications these suggestions were embodied in General Orders, No. 6, G. H. Q., A. E. F., January 6, 1918. Under the provisions of this order the term "leave" was used to designate both leaves of absence and furloughs. The administration of the order was made the duty of the commanding general, Services of Supply, through the provost marshal general's department, in cooperation with the Young Men's Christian Association, for accommodations and entertainment, and the director general of transportation, for transportation of the men to and from the leave areas.

LEAVE PRIVILEGES

General Orders, No. 6, prescribed that officers and men of the American Expeditionary Forces might be granted 1 leave of 7 days every 4 months, the time of travel to and from the destination prescribed in France not to be included. Complying with the suggestion of the French, granting of leaves was not begun until February 15, 1918.²⁷ Unfortunately, the military situation soon made the granting of leaves impractical, and on March 3, 1918, General Headquarters, A. E. F., ruled that no more leaves would be granted for the time being. This ruling remained in effect until May 24, 1918, when it was so modified as to apply only to those parts of our forces actually on specified portions of the front. Again, on September 1, 1918, because of the impending St. Mihiel operation, leaves were discontinued for all units of the First Army, then our only Army, and were not permitted to be resumed until October 13, 1918.²⁷

LEAVE FOR OFFICERS

The frequency and duration of leaves which might be granted to officers were the same as for our soldiers; however, no limitation, as to the points to be visited by officers on leave, other than Paris, was made, except that a prospective visit to the French zone of the armies necessitated the approval of the French military mission with the American Expeditionary Forces.²⁸

LEAVE AREAS SELECTED

Leave areas were selected by the commanding general, Services of Supply, in cooperation with the Young Men's Christian Association. Aix-les-Bains, the first one chosen, was opened on February 16, 1918, and was the only one in operation until the opening of the Auvergne area on September 21, 1918.²⁷ At about this time two other leave areas, namely, the Brittany area and the Dauphine area, were selected and subsequently were opened.²⁹

DUTY STATUS

The original plan for leaves contemplated that our soldiers would pay their own expenses for board and lodging. This plan proved impractical, however, because the soldiers generally lacked sufficient funds for the purpose; consequently, since there existed no law for paying commutation of quarters for men on leave, it was decided to establish the leave areas as military posts and to order the men thereto on a duty status so that quarters could be furnished them in kind.²⁷ Because the usual rate of commutation of rations was inadequate, soldiers were given commutation at the rate of \$1 per day. Men who went on leave to places other than regular leave areas, however, could not be considered on a duty status and only commutation of rations at 60 cents per day, with no commutation of quarters, was given them.²⁷

DISCIPLINE

After a study of the French and British systems of handling the men of their forces while on leave, a leave paper suited to our own needs was prepared. This form and General Orders, No. 6, G. H. Q., A. E. F., 1918, covered in detail the regulations for visé of the leave papers of our men and for their proper registry.

Misconduct while on leave was to be reported by the local assistant provost marshal to the commanding officers of the men concerned, for disciplinary action, and men guilty of serious breaches of discipline were to be returned promptly to their respective organizations.

TRANSPORTATION

The French authorities desired that all our men going on leave travel on special trains in order to avoid congestion on regular trains. This arrangement was provided for in General Orders, No. 6, G. H. Q., A. E. F., 1918, transportation on special leave trains being furnished by our Government. Where special trains were not available, travel on regular trains was to be at the expense of the soldier. This provision was modified, however, on August 24, 1918, on which date authorization was made for travel on ordinary trains to leave areas, at Government expense, when special leave trains were not available.³⁰

EXCEPTIONAL DESTINATIONS

In addition to the leave area system outlined above, provisions were made for leaves to exceptional destinations.

PARIS

Leaves to Paris were limited for several reasons, but primarily because of the serious venereal situation then obtaining in the city.²⁷ The shortage of accommodations was another difficulty. This, the Young Men's Christian Association offered to overcome by building temporary barracks, an offer which was not accepted because of the bad effect the presence of a large number of American soldiers on the streets of Paris would have on the morale of the French people at a time when the military situation demanded the greatest possible effort at the front.²⁷ However, a limited number of passes was allowed, these being allotted to units of the American Expeditionary Forces by the provost marshal general, A. E. F.

DESTINATIONS OTHER THAN LEAVE AREAS OR PARIS

Our soldiers were not permitted to go on leaves, prior to the armistice, to places other than regular areas or Paris, except to visit relatives or for other very exceptional reasons. When the exceptional destination was in the French zone of the armies, the approval of the French military missions with the American Expeditionary Forces was essential before the visit could be made.²⁸

LEAVE SYSTEM DURING THE ARMISTICE

In December, 1918, General Pershing directed that a most liberal policy be adopted with reference to leaves, and that a thorough study of the subject be made, especial attention to be given to the following points:²⁷ The extension of the duration of leave periods; the extension of leave areas, including Great Britain and Italy; the granting of leaves to men ordered to the United States before embarkation. The new features of the leave system based on the above premises comprised five classes of leaves as follows:³¹ Class A, for soldiers to regular leave areas; class B, for officers, and for soldiers to points other than

regular leave areas; class C, for officers and soldiers to Paris; class D, for casual officers and soldiers ordered to the United States; class E, for officers and soldiers in exceptional cases.

Soldiers in class A leave status were considered to be on a duty status; their necessary expenses while on such leave were paid, as before the armistice. In all other classes of leave, soldiers were not on a duty status, therefore their expenses legally could not be paid by the Government, although they received commutation of rations.

TRANSPORTATION

Much difficulty was experienced by the American Expeditionary Forces in securing suitable equipment from the French to operate special leave trains; however, the situation improved gradually during the armistice period, so that, by March 1, 1919, 39 special leave trains were in operation in each direction, thus requiring 24 complete sets of equipment, as compared with three sets of equipment operating on December 1, 1918.²⁷

All special leave trains were furnished, by divisional and separate organization commanders with a guard of officers and soldiers who were responsible for the maintenance of order both on the trains and at the railroad stations.²⁷

EXCEPTIONAL DESTINATIONS

PARIS

General Pershing's wish was that all members of the American Expeditionary Forces, now that hostilities had ceased, might have the educational advantages of a trip to Paris.²⁷ His thought was that our men might be taken to Paris by battalions or regiments, perhaps half a division at a time, for a stay of three or four days, a measure that would tend to decrease the number of members of the American Expeditionary Forces then visiting Paris surreptitiously. However, so many powerful objections to such a plan developed that the conclusion was reached that it would be inexpedient; consequently a plan was adopted, and incorporated in General Orders, No. 14, G. H. Q., A. E. F., 1918, which provided for a special three-day leave to Paris to a relatively much smaller number of men.²⁷

ALLIED COUNTRIES

The granting of leaves to allied countries was dependent on available transportation, and the existence or nonexistence of military police to maintain disciplinary control over our men visiting such countries.²⁷ Thus channel transportation limited the number of our men who visited England to 150 men per day; available trains to Italy provided for an average of but 140 of our men a week, until March, 1919, when improved transportation facilities made it possible to increase the number to 100 men a day. In Belgium, because of the lack of military police control, the number of our men then on leave at one time was arbitrarily fixed at 500.

NEUTRAL COUNTRIES

Because of the difficulty of controlling our men in neutral countries, no plan for granting such leaves was adopted.²⁷

CIRCULARS CONCERNING LEAVES AND LEAVE AREAS

The following circulars, published at headquarters, Services of Supply, A. E. F., define a leave area, and describe in detail not only how leaves were to be accomplished but also what was to be done by the representatives of the leave areas bureau for the comfort and amusement of the men on leave.

AMERICAN EXPEDITIONARY FORCES,
HEADQUARTERS SERVICES OF SUPPLY,
LEAVE AREAS BUREAU.

WHAT IS A LEAVE AREA?

1. A leave area is a well-known winter or summer resort in France to which the soldier is sent for not exceeding 7 days on class A, or duty status, leave. On duty status means the United States Government pays the expense of his quarters and meals in a contract hotel. He is sent with the purpose of giving him rest and a change from his military duties. It is not the intent to provide a week of excitement, but a week in which the soldier can rest, get up when he pleases and, from the amusements provided by the Y. M. C. A. or the excursions to places of interest planned by them, select that which he likes best and go or not as he desires.

The casinos are rented by the Y. M. C. A. and run by them for the soldiers.

The hotels vary in size, but the Government contract for meals and their quality is the same in all.

2. No military duty is required or expected, but the soldier is required to—

Try and be a credit to the Army he represents.

Observe the usual military courtesies.

Observe the area regulations which are framed entirely with a view to the comfort and security of all visiting soldiers.

Observe the local French laws and regulations regarding cafés.

3. The areas, and soldiers while in the area, are under the control of the commanding officer of the leave area, who protects the soldier's interests.

4. It must be remembered that both winter and summer resorts have to be used both in and out of season, as otherwise very few men could be sent on leave, also that transportation facilities determine where the soldier is to go. If the weather is bad during his week, it is hard luck but it can not be helped.

LEAVE AREAS BUREAU.

Tours, *March 1, 1919.*

AMERICAN EXPEDITIONARY FORCES,
HEADQUARTERS SERVICES OF SUPPLY,
LEAVE AREAS BUREAU.

Leave Areas Bureau Circular No. 2.

CLASS "A" LEAVE ON A DUTY STATUS FOR SOLDIERS

1. This circular supersedes Circular No. 1, dated December 21, 1918.

It is requested that unit commanders read carefully before soldiers are sent by them to leave areas, and instruct the soldiers in necessary details. A further supply may be had on application to this bureau.

2. By paragraph 2, G. O. 65, Hq., S. O. S., December 14, 1918, a leave areas bureau was established in Tours under the commanding general, S. O. S., to administer the affairs connected with authorized leave areas, organized first under G. O. 6, G. H. Q., 1918, and now operating under G. O. 14, G. H. Q., January 18, 1919. By G. O. 217, G. H. Q., November 27, 1918, the military police corps was relieved from all connection with leave areas except as regards furnishing the military police for areas.

3. The leave areas bureau has no authority to approve or disapprove leaves of any class. It is concerned only with the class A leave and with the reservations for class A

leave in a leave area after permission for same has been granted by proper authority to the soldier. Class A leave on duty status as prescribed by G. O. 14, G. H. Q., January 18, 1919, necessitates the provisions of the following paragraphs being observed.

4. Soldiers on class A leave on duty status, will be furnished in accordance with paragraph 10, of G. O. 14, G. H. Q., with "ordres de transport" to be issued by the R. T. O. or other authorized officer, for the trip to the area, at the expense of the Government. When travel from a railhead is by leave train, the officer or officers in charge will usually have transportation for the train. Transportation furnished soldiers at home station will be to area only and by the best and most practical route, and not at the option of the soldier. It will be furnished by and at the area for the return trip.

5. Accommodations under class A leave for soldiers in authorized duty status leave areas are allocated by headquarters, S. O. S., to the three armies, to all base sections, and other depots on a ratio basis. Arrangements are made between the headquarters of the armies and the base sections and the leave areas bureau, direct, as to the details of transportation and method of assigning accommodations in accordance with their allotment. Specific directions will be given unit commanders, by the authority allotting to them the number of men to be sent from their units on class A leave, regarding the method of obtaining reservation numbers, the date of arrival in and name of the area to which the soldiers are to be sent. With the three armies, the movement will usually be in the form of leave trains, either direct or via a collecting station. Outside the armies, as may be arranged with base section or depot headquarters, the leave areas bureau will telegraph a reservation number, date of arrival, and the name of the area, either to the base section or depot headquarters for distribution or to the unit direct. It is necessary, in order to keep the areas filled and to prevent a waste of space, that the leave area to which sent and the date on which a leave is to begin should be named by the leave areas bureau. The selection of the area can not be at the option of the soldier on account of transportation arrangements and necessities. This method is based, from a transportation standpoint, upon sending the soldier to the nearest available area. Is-sur-Tille will be a collecting station and is expected to have by February 25 accommodations for several thousand soldiers overnight and a constant train service which will run from there to certain areas.

6. Where accommodations are required for colored soldiers on class A leave, this must be stated so they may be sent to the leave area reserved for their use.

7. Reservations, when made, are to be considered by the soldier's commanding officer as an obligation which, if not fulfilled, must be released by telegram to the directed authority, in sufficient time to be assigned elsewhere. This release is to be sent to the leave areas bureau, Tours, or to base section or depot headquarters, depending upon instructions from base section or depot headquarters.

8. Reservations in all instances are made based upon the soldier arriving in the area on the date assigned. The daily outward movement is replaced by an inward movement of men on leave, and under these circumstances, if a soldier does not arrive in the area on the date set, he is not entitled to stay in the area longer than the expiration date calculated from the date on which his leave was to begin in the area. Barring accidents, failure to arrive on time, except on special leave trains, can be considered the soldier's fault, and the loss should be deducted from his stay in the area in justice to the soldier following him. It is requested, where travel is by ordinary train in part or all, that unit commanders send their soldiers in time to arrive on the date given, as the leave begins a minute after midnight on that date, and are requested to warn them that delays en route will be their loss. It will not do for a soldier to arrive a day ahead of the date named, as the accommodation to which he has been assigned will be occupied. He must arrive on the date set.

Unit commanders are responsible by regulations and G. O. 14, G. H. Q., for the following, except where otherwise stated:

(a) A soldier must have a white duty status leave card, with all the data called for filled in.

It is requested the home station and A. P. O. number of the unit be noted on the leave card.

On arrival at the area the soldier should report to the area headquarters, where he will be assigned to his quarters.

The number of the reservation is necessary to obtain transportation and accommodations except for movements by special train, in which case, the words, "Leave train of....." with date of departure of the train and the designating numeral of the Army or name of the depot is sufficient.

(b) Groups of 3 or more soldiers must be furnished with travel rations to the area.

(c) Commutation of rations at \$2 per day under G. O. 132, G. H. Q., 1918, paragraph 4, subsections F and H, requires a certificate that it was impracticable to furnish rations of any kind.

(d) The leave area will furnish travel rations for the return trip to home station or commutation of rations when justified.

(e) Coffee money at the rate of 21 cents per day is to be provided in advance to soldiers going to the area. It will be furnished by the area headquarters for the return trip. Where travel rations are issued and coffee money provided, the milk and sugar components of the former are to be omitted. Circular 5 of the office of the chief quartermaster, Hq., S. O. S., instructs that liquid coffee when obtained from the French must be paid for at the time in cash.

(f) G. O. 14, G. H. Q., provides that a soldier's equipment should be taken. This includes, no matter where sent, his overcoat, blankets, and mess kit. If a soldier is sent to Chamonix, Annecy, Grenoble, Bagnères de Luchon, Cauterets, or Eaux Bonnes, he should have two extra blankets and an extra pair of shoes (field) on account of the snow.

(g) Inspection required by paragraph 8 of G. O. 14 before leaving, should include inspection for any contagious disease or influenza. This last is most important, as an epidemic of influenza closes an area.

(h) The soldier's pay book must be in order. The leave areas are not equipped to furnish back pay, and pay for amount due on the current month is all that the soldier can ask at the area.

(i) Bread tickets are supplied at the leave areas for use of the soldiers while there.

10. Soldiers arriving in leave areas without being sent there on reservations obtained from the leave areas bureau have no just claim for accommodations in hotels with which the Government has contracts or for accommodations at Government expense. Soldiers on class B leave are not permitted to visit authorized duty status leave areas without approval of headquarters, S. O. S., through channels. Soldiers on class B leave are not given hotel accommodations in leave areas reserved for soldiers on class A leave.

11. The commanding officer of the leave area reports directly to the officer's commanding general, any failure on the part of the soldier's immediate commanding officer to observe the requirements of G. O. 14, G. H. Q., or if he sends soldiers to a leave area without leave cards or without first having secured reservations for them.

12. Following is a list of the leave area towns and their French departments, in operation this date:

St. Malo, Dinard (Ille et Vilaine).	Nice (Alpes Maritimes).
Aix-les-Bains (Savoie).	Cannes (Alpes Maritimes).
Grenoble (Isere).	Menton (Alpes Maritimes).
Chambery and Challes-les-Eaux (Savoie).	Monaco (Alpes Maritimes).
(For colored troops only.)	Bagnères-de-Luchon (Haute Garonne).
Vals-les-Bains (Ardeche).	Cauterets (Haute Pyrenees).
Lamalou-les-Bains (Herault).	Eaux Bonnes (Basses Pyrenees).
Chamonix, St. Gervais (Haute Savoie).	Biarritz (Basses Pyrenees). (Biarritz to be opened about March 1.)
Annecy (Haute Savoie).	
Nimes (Gard).	

13. A supply of the new white class A leave card has been sent to headquarters of each army, base section, and depot division. This new card is to be used hereafter, and the former large buff card to be discontinued entirely for class A or leave on duty status. Further supplies of the new duty status leave card can be obtained from this bureau.

14. The amusement features in leave areas are arranged for by the Y. M. C. A., which leases the casinos for the use of the soldiers, arranges for the daily excursions, and furnishes the evening's entertainment. Arrangements are being made to supplement the Y. M. C. A. entertainments by having always present in all leave areas, theatrical units organized from soldiers of the A. E. F.

J. FRANKLIN McFADDEN,
Major, A. S., U. S. A.,
Chief, Leave Areas Bureau.

TOURS, FRANCE, A. P. O. 717, February 1, 1919.

LEAVE AREAS OPERATED

The following table gives the leave areas which were organized, together with the principal towns therein, and statistical data concerning the dates of their opening and closing, their separate maximum capacities, and the number of men visiting each area:³²

TABLE 45.—Statistical data concerning leave areas in the American Expeditionary Forces

Name of area	Principal towns	Date of first arrivals	Date of closure	Maximum capacity	Total arrivals
Savoie	Aix-les-Bains	Feb. 6, 1918	June 1, 1919	4,347	103,927
Do.	Chambery *	Jan. 11, 1919	do	538	6,926
Do.	Challes-les-Eaux *	do	do	885	7,965
Brittany	St. Malo, etc.	Aug. 25, 1918	June 15, 1919	3,591	66,976
Auvergne	La Bourboule	Sept. 21, 1918	Jan. 15, 1919	3,908	27,058
Dauphine	Grenoble	Oct. 21, 1918	May 6, 1919	2,412	36,099
Ardeche	Val-des-Bains	Nov. 26, 1918	Apr. 25, 1919	1,256	14,503
Herault	Lamalou-les-Bains	Dec. 30, 1918	Apr. 27, 1919	1,350	8,394
Nimes	Nimes	Jan. 6, 1919	Apr. 20, 1919	610	3,534
Cannes	Cannes	Dec. 19, 1918	May 1, 1919	889	8,154
Nice	Nice	Dec. 11, 1918	May 27, 1919	3,359	45,026
Menton	Menton	Dec. 20, 1918	May 10, 1919	2,484	24,567
Monaco	Monaco	Jan. 16, 1919	May 15, 1919	2,325	20,331
Haute Garonne	Bagneres-de-Luchon	Dec. 28, 1918	May 10, 1919	1,552	10,994
Haute Pyrenees	Cauterets	Dec. 21, 1918	May 20, 1919	2,722	24,722
Eaux Bonnes	Eaux Bonnes	Dec. 28, 1918	Apr. 19, 1919	900	4,961
Alpine	Chamonix	Jan. 15, 1919	May 5, 1919	2,364	18,675
Haute Savoie	Annecy	Feb. 7, 1919	May 20, 1919	1,170	8,155
Biarritz	Biarritz	Mar. 1, 1919	June 15, 1919	1,486	16,305
				38,138	457,704

* Opened January 11, 1919, for colored troops only. Previous to this date, both places were included.

ADMINISTRATION OF LEAVE AREAS

Tables of organization for the administration of the leave areas of the American Expeditionary Forces in general provided for a commanding officer, with three other officers for such duty as adjutant, athletic officer, and censor.³³ The commissioned and enlisted personnel of the Quartermaster and Medical Departments, for the military police, and the Transportation Corps were assigned to the respective leave areas by the commanding general, Services of Supply.

Upon the arrival at each area of soldiers on leave, they were met by representatives of the Army, and were taken to the place of registration. Here they were assigned to hotels, but invariably before being sent thereto they were instructed as to venereal disease dangers. Likewise were they informed as to the locations of venereal prophylactic stations.³³

Invariably, men were examined to determine whether or not they were suffering from venereal disease, immediately prior to their departure from

their respective organizations for the leave areas.²⁸ Also, upon the arrival of men at leave areas, they were again examined with a view to detecting venereal disease. These measures were adopted to exclude from the leave areas all men capable of transmitting venereal disease; men found infected on arrival at the leave areas were returned immediately to their organizations.²⁹

SAVOIE LEAVE AREA

The Savoie leave area, comprising the towns of Aix-les-Bains, Chambéry, and Challes-les-Eaux, was opened on February 16, 1918, thus being the oldest, in point of duration, of our leave areas in France. Aix-les-Bains, in which was located the headquarters of the leave area, contained well-paved and well-lighted streets, numerous shops, beautiful villas, and grand hotels. A large and handsome casino, rented by the Young Men's Christian Association, contained, besides offices for headquarters of the leave area, such facilities, as a theater, a cinema hall, concert halls, and a ballroom, which were used for the entertainment of our men on leave. Outdoor diversions included boat trips on the adjoining Lake Bourget, excursions to near-by mountains, suburban estates, and châteaux which were thrown open to American soldier visitors.³¹

In January, 1919, Chambéry and Challes-les-Eaux were set aside as a leave area for colored soldiers of the American Expeditionary Forces.³⁴

The problem of preventing venereal diseases in this area was constant, and was made more difficult of solution by reason of the fact that 130 hotels were utilized to house the men on leave. During a large part of its existence—that is, from the time of its opening in February, 1918, until after the beginning of 1919—conditions obtained which were not comparable with conditions subsequently existing after the leave areas became thoroughly organized, and efforts to prevent the occurrence of venereal diseases therein were concentrated upon.³⁴

Because of the degree of liberty which was given to the men on leave in the leave areas, and because it was inevitable that a great many prostitutes would be attracted to the leave areas, more especially such leave areas as those which contained cities of some size, or fashionable resorts, it was to be expected that opportunities for venereal disease contact would be immeasurable. Measuring venereal disease contact by the number of medical prophylactic treatments given, and taking into consideration one other factor—that is, the proximity of cities—the success attained in the control of venereal diseases in the Savoie leave area was high. It will be seen by examining Table 46 on page 931, that to the 103,927 men visiting this area 26,938 medical prophylactic treatments were given, a percentage of 25.92. Compared with such percentage for the other leave areas this figure stands midway on the list of 16; furthermore, of the leave areas which showed a lower percentage of prophylactic treatments, all the regions are included, such as the Brittany leave area and the Pyrenees leave areas which, because of their relative isolation from large centers of population, afforded relatively little opportunity for exposure to venereal diseases.³⁴

BRITTANY LEAVE AREA

The Brittany leave area, established next after the Savoie leave area—that is, on August 25, 1918—comprised the towns of St. Malo, St. Servan, Parame, and Dinard, in a district that has been one of France's famous seaside resorts. The natural beauty of the region, the accessibility of points of historic interest, and its mild climate made it an ideal place for one of our leave areas. The towns of St. Malo and Parame adjoin each other, and are separated from Dinard by the mouth of the River Rance. Dinard and Parame are essentially resorts for the well-to-do of France; their many and expensive villas, and hotels of varying capacity, testify to the popularity of this part of France as a summer residence. St. Malo is a walled city, with historic associations of great interest. Here, the headquarters of the leave area was located. St. Servan, adjacent to St. Malo, was used during the early months of 1919, but because it was necessary there to place men in pensions, it proved to be not desirable for that reason.³⁴

Two well-equipped casinos, one in Dinard and the other in St. Malo, were used for indoor diversions; whereas outdoor entertainment for the men on leave included sailing trips to near-by islands, boat trips up the river, and walks to various points of interest in the vicinity.³⁴

The Brittany leave area was not without its venereal disease problem, for during November, 1918, many prostitutes arrived there from various parts of France. As these women gave fictitious names, employments, and addresses, it proved to be extremely difficult to locate and to dislodge them. However, by January, 1919, a vigorous campaign which had been carried on against them resulted in the deportation of many of them. This was made difficult because of the practice of many local hotels and cafés in evading the French laws, some of the prostitutes actually securing lodgings in the hotels to which our men were being assigned.³⁴

On the whole, however, the Brittany leave area stood well below the average of leave areas in the percentage of venereal disease contacts, as measured by the number of prophylactic treatments administered. To the 66,976 men who visited this area, 14,247 medical prophylactic treatments were administered, a percentage of 21.2. Among the men on leave, 50 venereal diseases occurred while they were at the leave area; 23 venereal diseases occurred among the personnel on duty there. Of the venereal diseases occurring among the duty personnel, however, three instances were attributed to sources outside the area.³⁴

NIMES LEAVE AREA

The Nimes leave area, established January 6, 1919, operated until April 20, following. Nimes was selected only after careful consideration, and its operation was, in most respects, excellent. Earnest cooperation on the part of civil authorities was manifest at all times, and everything possible was done in the effort to interest the men in things worth while during their leave. Trips were made to near-by points of historic interest; dances, vaudeville shows, moving pictures, and other means of indoor diversion were carried on. Despite these factors, there was a higher rate of exposure to venereal disease at Nimes than at any other area. Among the 3,934 men who went to Nimes, 3,719

medical prophylactic treatments were administered, a percentage of 94.3. Among the men so exposed four subsequently developed venereal disease. Here an excellent opportunity was afforded to observe the relationship between opportunities for exposure to venereal disease and the number of such exposures as evidenced by the number of medical prophylactic treatments applied for. From January 6, 1919, when the first of our men arrived on leave at Nimes, until January 22, there were no restrictions on any of the streets of the city. The men could go where they willed. During this time and from January 22 until the end of that month, even though during the latter period certain undesirable streets were out of bounds, 1,370 medical prophylactic treatments were administered. Since the number of men in the area at this time was 1,192, the percentage of prophylactic treatments was then 115.5. Greater restrictions as to control of prostitution were made effective on February 12; the percentage of medical prophylactic treatments for this month was 65; in the following month this percentage dropped to 43.8. On April 1, 1919, restrictions as to streets were removed; the percentage of prophylactic treatments for the month of April was 55.³⁴

NICE LEAVE AREA

Nice, because of its numerous, splendid hotels, its attractions, and the beauty of its setting, made an ideal leave area for the American Expeditionary Forces. Next to Aix-les-Bains, more of our men went to Nice than to any of the other leave areas. From a venereal disease prevention standpoint, Nice proved the greatest of all such problems among the leave areas, for nearly 25 per cent of the medical prophylactic treatments given in all our leave areas were administered to the men on leave in Nice. The total number of men visiting Nice on leave numbered 45,026, and to them 30,011 medical prophylactic treatments were administered, a percentage of 66.6.³⁴

At Nice, more so than elsewhere among the leave areas, means adopted for the prevention of venereal disease had to be along coercive lines rather than otherwise. Though houses of prostitution were placed out of bounds, measures directed toward the repression of prostitution proved impracticable; therefore, there remained only entertainment, education, and medical prophylactic treatment following exposure to venereal diseases.³⁴

The large and lavishly decorated casinos, of exquisite architecture, which had been obtained in Nice for the use of our men on leave, made excellent club rooms wherein the men could spend their indoor hours. Here, in addition to such indoor games as billiards, other features such as theatrical and cinema shows and dancing were available to divert the men to a great extent. Regular excursions were planned to near-by points of interest; trips both by boat and by motor cars also were conducted in an effort to give the men innocent and time-consuming, though pleasurable, diversion.³⁴

For those men who were insistent on exposing themselves to venereal diseases, medical prophylactic stations were provided. At the time the leave area was officially opened, there was but one prophylactic station. Because of the number of prophylactic treatments that had to be administered, however, two additional stations were established on March 1, 1919, followed by a fourth on March 15, and subsequently by seven others.³⁴

DAUPHINE LEAVE AREA

The Dauphine leave area, comprising the towns of Grenoble, Allevard, and Uriage, was opened October 20, 1918, and was thus the third oldest of our leave areas. Located in the foothills of the French Alps, near the Italian and Swiss border, its surrounding natural scenery is unsurpassed for beauty and vastness. Grenoble, the principal city and capital of the Department of the Isere, contained at the time under consideration 110,000 inhabitants. Because it was a demobilization center for the French Army, in addition to its use as a part of the Dauphine leave area, Grenoble abounded in cafés and prostitutes. Though all known houses of prostitution were placed out of bounds to our men, no cooperation was had from the local French authorities in expelling women of easy virtue from the leave area. Among the 35,620 men who visited this place, 16,862 medical prophylactic treatments were administered for exposure to venereal disease, representing a percentage of 47. Among the men exposed to venereal disease, 97 subsequently developed venereal infections, thus placing this leave area atop all others in point of numbers of such diseases.³⁴

TABLE 46.—Comparative figures on exposure to venereal disease in leave areas, A. E. F., and resultant venereal disease incidence

Leave area	Prophylactic treatments administered						Total number of men	Percentage of treatments	Venereal diseases	
	1918	1919								
		January	February	March	April	May				Total treatments
Savoie.....	10,968	4,147	1,455	4,200	2,837	3,131	26,998	103,927	25.92	27
Brittany.....	4,383	3,072	2,675	1,740	1,037	1,340	14,247	66,976	21.27	70
Dauphine.....	2,090	1,527	3,433	5,346	3,918	548	16,862	36,099	46.71	97
Ardeche.....	211	238	1,051	927	723	-----	3,450	14,503	23.79	3
Herault.....	-----	222	402	504	103	-----	1,231	8,594	14.67	0
Nimes.....	-----	1,370	1,054	599	689	-----	3,712	3,434	94.36	4
Cannes.....	-----	604	786	1,336	878	-----	3,604	8,154	44.20	28
Nice.....	-----	-----	-----	-----	-----	-----	30,011	45,026	66.65	31
Menton.....	50	317	589	1,728	2,317	452	5,453	24,567	22.20	21
Monaco.....	-----	300	1,350	2,260	2,003	710	6,623	20,331	32.58	20
Haute Garonne.....	-----	89	254	855	896	36	2,130	10,994	19.37	0
Haute Pyrenees.....	-----	245	398	532	359	104	1,638	24,722	6.63	2
Basses Pyrenees.....	-----	22	57	148	53	-----	280	4,991	5.61	0
Haute Savoie.....	-----	12	410	909	484	-----	1,815	18,675	9.71	2
Annecy.....	-----	-----	786	1,647	1,926	390	4,749	8,155	58.23	15
Biarritz.....	-----	-----	-----	1,568	1,996	1,920	5,484	16,307	33.63	3
Total.....	17,702	12,165	14,700	24,299	20,219	8,631	128,227	415,755	30.84	323

Source of information: Final report made by surgeons of leave areas, A. E. F., to chief, leave areas bureau, A. E. F. On file with final report, chief, leave areas bureau, A. E. F., in the Historical Branch, the Army War College, file No. 74-19.7.

EXPOSURE TO VENEREAL DISEASE, LEAVE AREAS, AND RESULTANT INCIDENCE OF VENEREAL DISEASE

Throughout, the Medical Department, A. E. F., looked upon the question of venereal disease prevention in leave areas of the American Expeditionary Forces with considerable apprehension. Statistics which had been collected by the senior consultant in urology, A. E. F., in the fall of 1917 showed that although the men in the French and in the British armies had leave of only 7 to 10 days every 4 to 6 months, thus representing a leave status of one-twentieth of their time, nevertheless, 60 to 70 per cent of the venereal diseases contracted in these armies had been contracted during the relatively short

leave periods.³⁵ Both the British and the French soldiers were within practicable traveling distance of their homes. In so far as married soldiers were concerned, this fact tended to keep the incidence of venereal diseases in these armies below a rate that would undoubtedly have obtained had the situation been similar to that in the American Expeditionary Forces where, with few exceptions, our men were wholly detached from home.

Table No. 46 shows 323 venereal diseases to have been contracted by men on leave in the leave areas included in the table. As explained in the following letter of the chief surgeon, A. E. F., it was next to impossible to compute the correct number of such diseases, in view of the fact that many, if not most, of them did not develop until after the men who had been on leave had returned to their proper organizations. It will be seen also that, in some instances, the rate of venereal disease in some organizations, which were attributed to leave areas, reached the percentage of 75 of the total number of venereal diseases occurring within the organizations concerned. This letter, which is in the nature of a summary, since it was written toward the end of the existence of the leave areas in the American Expeditionary Forces, is of particular value, because it reveals what had been done by the Medical Department, A. E. F., in the way of preventing venereal diseases in the leave areas.

AMERICAN EXPEDITIONARY FORCES,
CHIEF SURGEON'S OFFICE,
France, April 22, 1919.

Memorandum for General Connor:

1. The telegram from C. in C. dated April 8 was answered by General Kean on April 11, showing that efforts are being made, have been made, and will be made: (a) To improve prophylactic stations; (b) to install more where needed; (c) to select and instruct proper attendants; (d) to educate all soldiers as to dangers of venereal disease and as to importance of continence and prophylactic measures; (e) to reduce disease incidence in leave areas; (f) to send more medical officers and attendants there; (g) to locate sources of infection and to remove them wherever possible; (h) to supply adequate prophylaxis for leave trains; (i) the telegram from the C. in C. was published to all medical officers in the A. E. F. by both circular and bulletin from the C. S. O.

2. Requests were made for orders for necessary details of men and officers to trains and orders were issued.

3. Supervisors and inspectors are now paying special attention to all points mentioned by the C. in C. and making efforts to correct faults.

4. Individual prophylactic packets are issued to men on convoy and other duty taking them away from stations. The supply of packets was precariously low and is still so for general use to the army, but the needs above mentioned are thought to have been met.

5. Much emphasis has been placed on more frequent, thorough, and unexpected inspections, and a part of the recent rise in rates is attributable to them.

6. Our statistics as to leave areas deal with the men stationed therein, it being impossible to include men on leave for the reason that most of the venereal disease which is contracted in leave areas does not appear until they reach their organizations. However, various organizations have made efforts to locate the places of origin to all their cases. This information, received by us usually from two to four weeks after the disease is shown, indicates that a large proportion of the venereal disease is contracted in leave areas and in Paris.

The reports for the First, Second, and Third Armies, during the past two months, have attributed from 50 to 70 per cent of their infections to men on leave in leave areas. The three points which have been most prominent are Nice, Grenoble, and Paris.

The First Army, over a period of two weeks, reported 190 cases, of which 61 were infected in Paris, Nice, and Grenoble.

The Third Army claims that 65 per cent of their infections during the last month have been in leave areas. For the week ending April 9 they reported 62 cases, of which 36 were

infected in leave areas, Paris being responsible for one-fifth of this number. If the annual rate had been computed on their own army region alone, it would have been 6 per annum instead of 18.

The last report from the Second Army is as follows:

"Source of infection: Over 75 per cent of new cases were infected in leave areas as shown by the following table:

Organization	Leave areas	Billeting areas	Others
LX Corps troops.....	1	0	1
79th Division.....	11	0	0
88th Division.....	3	1	0
7th Division.....	8	0	3
Army troops.....	1	0	4
	24	1	8

Divisional reports are as follows:

The 78th Division, in 42 cases, attributed 19 to Grenoble. Grenoble itself is responsible for one-third of the total infections in this division from January 29 to March 19. Another division, name unknown, among 19 infections, attributed 13 to Grenoble.

The 6th Division has reported a total of 217 cases since being in France. Among these 178 occurred among the men on leave.

The last report from the 79th Division shows 11 cases, all of which were attributed to leave areas.

The 7th Division shows 8 cases, all of which occurred in leave areas.

Last week's scattered reports from the First and Second Armies give the source of infection for 23 cases; Paris was responsible for 6 cases, Grenoble for 10, and Nice 5.

No reports have come in attributing large numbers of infections to Nice, but the aggregate of reports shows that a large number have been contracted in that place.

In the scattered reports from armies and elsewhere, 84 gave the source of infection as follows: Paris, 38; St. Malo, 17; Grenoble, 14; Nice, 9; Monte Carlo, 6.

In the classification camp at St. Aignan, among 4,275 who passed through that place, 24 attributed their infection to Paris.

It has been impossible to get the exact number who claim to have been infected in Lyon, but undoubtedly this point has been responsible for a great many.

In all the reports which have come in, the three most conspicuous places are Paris, Nice, and Grenoble. Following these in order of frequency are Lyon and Marseilles.

Aix-les-Bains was formerly complained of a great deal, but lately the conditions there have markedly improved.

The leave areas in the Pyrenees have been almost free from complaint.

St. Malo has had a number attributed to it, but recently these have dropped. The other smaller areas have come in for only an occasional case.

7. The work being done in Paris embraces everything within our power and is being pushed most vigorously. Because of the size of the city, the great number of prostitutes, and the lack of control over men visiting there, a closure of Paris to men on leave would be of very great assistance in the reduction of venereal disease.

Grenoble, one of the worst leave areas for venereal disease, has recently been markedly improved as the result of inspection, but is ordered to close on the 6th of May.

Aix-les-Bains, long a bad place, has greatly improved since Colonel Reder's inspection.

St. Malo now furnishes us a degree of cooperation on the part of the French such as we have received nowhere else.

Chambery-Challes les Eaux (Savoie), the colored leave area, gives little trouble.

Nice gives much trouble. It has recently been thoroughly inspected and constant efforts are being made to improve it. A change of personnel, which has been effected in Base Section No. 6, may prove helpful, but we are informed that the leave area is to be closed on May 20.

Biarritz is giving no trouble at present.

WALTER D. McCaw,
Brig. Gen., M. D., U. S. A.,
Chief Surgeon.

EXPOSURE TO VENEREAL DISEASE EN ROUTE TO LEAVE AREAS

The requirements that men going to leave areas were to be examined both before departure from their organizations and upon their arrival at the leave areas,³¹ disclosed the fact that many of them were acquiring venereal diseases en route to the leave areas.³³ Though it was intended that men travel on special leave trains which would thus take them directly from their organization to the leave areas, the supply of railroad equipment for this purpose depended upon the ability of the French Government to deflect sufficient cars from other purposes for our leave area use. Before the armistice there was a shortage of special leave trains, and when such trains were not available traveling was done to and from the leave areas by commercial trains.³⁷ Because it was unusual for commercial trains to make through trips to leave areas, it was frequently necessary for men to remain overnight in places where changes of trains were made. At such stop-over places, exposure to venereal diseases tended to cause a high rate of incidence of such diseases, since frequently no American Expeditionary Forces organization existed thereat for the prevention of venereal disease. Such a place was the city of Lyon, where, even when special leave trains were increased in number early in 1919, many members of the American Expeditionary Forces stopped over between trains. No figures are available, but the chief surgeon, A. E. F., reported that Lyon was responsible for the occurrence of a great many venereal diseases.³⁶

On April 8, 1919, General Pershing, after a personal visit to the various leave areas, made the following statement, in a telegram to the chief surgeon, A. E. F.:³⁷

* * * * *

Individual (medical prophylactic) packets should be supplied to soldiers in convoy or other duties which may carry them out of touch with prophylactic stations. * * * Little attention is being paid at rest points for leave and troop trains, and houses of prostitution are in many cases not put out of bounds, and no prophylactic facilities are provided. Medical officers, fully provided with facilities for administering prophylaxis, should accompany all troops and leave trains.

Based on the recommendation of the chief surgeon, A. E. F., one medical officer and two enlisted men, Medical Department, on April 10, 1919, were assigned to all leave trains taking men on leave from our First, Second, and Third Armies,³⁸ and were equipped for the purpose of rendering medical prophylactic treatment as well as any emergency medical equipment.³⁹

MEDICAL PROPHYLAXIS FOR VENEREAL DISEASE

COMPULSORY PROPHYLAXIS

Since 1912, the submission of members of our Army to medical prophylactic treatment following exposure to possible venereal diseases has been compulsory.⁴⁰ That part of War Department orders concerning this requirement reads as follows:

* * * * *

2. Commanding officers will require that men who expose themselves to the danger of contracting venereal disease shall at once upon their return to camp or garrison report to the hospital or dispensary for the application of such cleansing and prophylaxis as may be prescribed by the Surgeon General. Any soldier who fails to comply with such instructions, if found to be suffering from a venereal affection, shall be brought to trial by court-martial for neglect of duty.

* * * * *

The issuance of the above instructions had followed an experimental period in the Army in which medical prophylaxis was offered to the men, to be used volitionally following exposure to possible venereal disease,⁴¹ though at a few stations men were required to avail themselves of the means of prophylaxis provided.⁴² Experience gained during this experimental period conclusively proved that no material reduction in the incidence of venereal disease in the Army could be anticipated by placing reliance only on the optional use of medical prophylaxis; therefore, at the instance of the Surgeon General, the instructions partly quoted above were issued.⁴³ Following this, even though the use of the individual prophylactic tube was in vogue at this time and for some time subsequently, the annual venereal rate in our Army immediately declined to a figure lower than any that had obtained since the Spanish-American War, dropping from 145 per thousand per annum for 1911 to 116 for 1912.⁴⁴

Shortly after the War Department directed the punishment of men who failed to take medical prophylaxis following exposure, Congress enacted a law which additionally penalized such men. The pertinent part of this law, the whole being promulgated to the Army as General Orders, No. 31, W. D., September 12, 1912, is as follows:

Provided, That no officer or enlisted man in active service, who shall be absent from duty on account of disease resulting from his own intemperate use of drugs, or alcoholic liquors, or other misconduct, shall receive pay for the period of such absence from any part of the appropriation in this act for the pay of officers or enlisted men, the time so absent and the cause thereof to be ascertained under such procedure and regulations as may be prescribed by the Secretary of War.

Compulsory prophylaxis obtaining, plus an indeterminate beneficial effect accruing from sex hygiene instruction, the venereal disease rate had been decreased gradually until for the year 1916 it had reached the relatively low figure, 91.2.⁴⁵ As stated by the Surgeon General in explanation of the inability of the Medical Department further to reduce the incidence of venereal disease:⁴⁵ "It should be understood that the prime source of infection in venereal diseases lies not within military jurisdiction and control, but in the civilian life, quite apart from the immediate garrison life of the soldier and the rigid supervision incident thereto."

We have seen, in the discussion on measures taken in the American Expeditionary Forces in the effort to repress prostitution, how imperfect those measures unfortunately were, through our inability to control civil communities, thus necessitating our chief reliance being placed in medical prophylaxis for men who exposed themselves to venereal disease.

VENEREAL PROPHYLAXIS UNIT

The material used in the prophylactic treatment of venereal diseases comprised the following articles:⁴⁶

Venereal prophylaxis unit

[In pine box with hinged lid; weight, 45 pounds]

Basins, e. w. number ..	3	Soap, Ivory	cakes ..	2
Form 77, M. D. do.	200	Sponges, gauge, 1 dozen in box ..	boxes ..	4
Graduate, glass, 120 c.c., in case.		Syringes, penis, h. r.	number ..	4
Hydrargyri chloridum corrosivum, tablets (antiseptic) (par. 902), 350 in 12-ounce tin	1	Towels, hand	do.	12
Protargol, 2 grams in ampul ..	200	Unguentum hydrargyri chloridi mitis, 30 per cent, ½ pound in wide-mouth bottle	bottles ..	4

NOTE.—List of contents and directions for administering the prophylactic are pasted on inside of cover.

This equipment was intended for the use of organizations in the field. When organizations were so situated as to make the use of more elaborate equipment practicable, in permanent stations for example, such use was considered desirable.⁸ In fact, as will be shown below, instructions were issued by the chief surgeon, A. E. F., for all medical officers to so equip their prophylactic stations as to elevate them to a status on a par with emergency surgery treatment rooms.

INSTRUCTIONS CONCERNING VENEREAL PROPHYLAXIS

One of the earliest general orders published in the American Expeditionary Forces, had to do with the prevention of venereal disease. This order was as follows:

HEADQUARTERS, AMERICAN EXPEDITIONARY FORCES,

Paris, France, July 2, 1917.

General Orders, No. 6.

It is a vital necessity that each member of the American Expeditionary Forces maintain himself in the best physical condition.

A soldier who contracts a venereal disease not only suffers permanent injury, but renders himself inefficient as a soldier and becomes an incumbrance to the Army. He fails in his duty to his country and to his comrades.

The evil effects of venereal diseases and how to avoid them will be explained to the men by the medical officer of each command as early as practicable after landing in France and as frequently thereafter as may appear to be necessary. All soldiers of every organization will be present at the required bimonthly⁵ inspection by a medical officer.

The advice of medical officers will be supplemented by that of company commanders who, by reason of their close relation to the men, can exercise the greatest personal influence over them.

To the end that venereal disease may be minimized, prophylactic stations will be established at convenient places to be determined by the commanding officer and the surgeon.

All members of the American Expeditionary Forces are directed to report for treatment at some official prophylactic station within three hours after every exposure to venereal infection.

All officers are enjoined to use every available means to protect the men of their command from venereal disease.

⁵The use of the word bimonthly was in error: what was intended was semimonthly, as required by General Orders No. 17, W. D., May 31, 1912.—Ed.

The authorities having provided every necessary means to protect the men from venereal disease, one who contracts the same is guilty of a serious offense under the ninety-sixth article of war. He should be tried by court-martial for contracting venereal disease through neglect, thereby unfitting himself for active military duty against the enemy, and should be severely punished.

In view of the arduous character of service required of all soldiers in France, a sentence of forfeiture of pay, by court-martial, is regarded as a more appropriate punishment for the offense than confinement.

A copy of this order will be posted in the office of each company and detachment, and the commanding officer thereof will see that every man under his command understands it.

By command of Major General Pershing.

JAMES G. HARBORD,
Lieut. Col., General Staff,
Chief of Staff.

Official:

BENJ. ALVORD *Adjutant General.*

It will be noted that in this order a radical departure was made in the adoption of measures for the prevention of venereal disease: One who contracted a venereal disease was to be considered guilty of neglect, thus unfitting himself for active military duty against the enemy, and was to be tried by court-martial for such neglect. Another important feature of this order was the requirement that medical prophylaxis was to be taken not later than three hours following exposure. The value of this last mentioned feature is problematical since no exact method existed whereby a check could be made against a soldier's statement as to the hour of exposure in its relationship to the hour when the prophylactic treatment was taken.

Subjecting men to trial by court-martial for acquiring venereal disease created a disregard among some of the members of the American Expeditionary Forces for the medical prophylaxis. It was felt by some that, if a court-martial trial was to follow the occurrence of venereal disease and that the prophylactic treatment was not a perfect measure, then, and particularly when the prophylaxis was delayed, there was little use in submitting to it. To offset such a possibility the following instructions were issued in December 1917:⁸

* * * * *

7. Commanding officers of all troops will insist that men of their command whenever exposed to venereal disease will report to prophylactic stations as soon as possible after exposure and always within a period of three hours. Venereal prophylactic stations will be established by local commanders at convenient and inconspicuous places in each battalion and at or near various entrances to the camp; these stations will be placed under the charge of a competent noncommissioned officer of the Medical Department, and a well-instructed private will always be kept on duty to administer prophylaxis. There will be posted at all prophylactic stations copies of General Orders, Nos. 6, 34, this order, and other literature narrating the prevalence of venereal diseases and describing the proper methods of prophylactic treatment. Particular attention must be given to these stations, which should contain a waiting place protected against the weather, a clean sanitary treatment room with privacy, proper equipment, and technique to inspire confidence in the men, who should have impressed upon them the importance of early prophylactic treatment. The commanding officer of each camp will prescribe an entrance through which all men returning to camp from pass or leave must enter, providing at this entrance a sufficient guard. Men returning to camp will be questioned by the guard, and if exposure to venereal infection is acknowledged, the men will be directed by the guard to a prophylactic station. Officers are informed and men will be

told that there is a vital necessity for instituting early treatment if venereal disease develops, and these diseases must be reported to medical officers as soon as they are discovered or suspected.

8. Should men return to camp in an intoxicated condition they will be seized by the guard and taken to a prophylactic station where treatment will be administered by the noncommissioned officer in charge of the station. Cases of drunkenness should be subjected to prompt disciplinary measures.

* * * * *

In December, 1918, following an inquiry from General Pershing as to causes for an increase in the venereal rate for the American Expeditionary Forces, it was reported by the chief surgeon, American Expeditionary Forces, that one-third of all venereal diseases developing in the American Expeditionary Forces resulted from failure to take the medical prophylaxis; ⁴⁷ consequently, to force more men who exposed themselves to venereal disease to take medical prophylaxis therefor, a general order was issued by General Pershing in February, 1919, which required a separate punishment for failure to take the required prophylactic treatment. ⁴⁸

THE PROPHYLAXIS STATION AND THE ADMINISTRATION OF THE PROPHYLACTIC TREATMENT

The details concerning the administration of the venereal prophylactic treatment, furnished in instruction form with each venereal prophylactic unit, were as follows: ⁴⁶

1. A room was to be set apart in a convenient location; a trained enlisted attendant of the Medical Department was to be assigned to the duty of supervising the administration of the treatment; a supply of medicines and equipment of basins, etc., was to be provided.

2. The name, rank, and organization of the soldier reporting for the treatment, together with the day and hour of exposure and treatment, were to be entered on the venereal register and by the attendant for confidential record.

3. Following the emptying of the bladder, the genital organs were to be washed thoroughly with soap and warm water, and a 1 to 2,000 solution of bichloride of mercury.

4. A solution of silver salt (2 per cent protargol) was to be injected into the urethra by means of a syringe. The solution was to be retained for at least three minutes.

5. The entire genital organs were to be rubbed thoroughly with calomel ointment (30 per cent in benzoated lard), after which the penis was to be wrapped in a paper napkin.

No specific instructions were issued in the American Expeditionary Forces with the view to standardize the establishment of prophylactic stations and the administration of prophylactic treatment until after the signing of the armistice. These details were left to the initiative of medical officers concerned, the basis for their activities being the instructions supplied with the venereal prophylactic unit. However, a memorandum which was issued by a division surgeon to the medical officers of his division February 25, 1918, was, because of its completeness, published in the late spring of 1918 in the Manual of Military Urology, an official document for the use of the American Expeditionary Forces. The memorandum in question is as follows:

Memorandum No. 72.

HEADQUARTERS, ——— DIVISION, A. E. F.,
OFFICE OF CHIEF SURGEON,
February 25, 1918.

To surgeons of all organizations:

The following will govern in the establishment of venereal prophylaxis stations:

1. *Prompt establishment.*—Stations must be established promptly upon arrival in a new area, as the greatest danger of infection comes in the first day or two.
2. *Accessibility.*—Whenever possible, prophylaxis stations should be located on the ground floor of buildings or barracks. Where this is not possible, a sufficient number of signs directing soldiers to the station should be placed between the entrance to the building and the actual location of the station. In numerous instances, inspectors have found it very difficult to locate stations and sentries were unable to give the information.
3. *Privacy.*—It is essential that stations be located whenever possible in a separate room. Where this is impossible, a screen should be provided so that as much privacy as possible is secured for giving treatments.
4. *Hot water.*—It is essential that means be provided for having boiling water in these stations. This is necessary for boiling syringes after use and warm water and soap are necessary for bathing parts preliminary to the treatment.
5. *Personal supervision.*—The men detailed to give these treatments must give it their personal attention. It is forbidden to give the patients the means for treating himself and to send him to a neighboring toilet.
6. Blanks for recording treatments must be kept on hand at all times.
7. A copy of this memorandum to be furnished all medical officers in your command.

Lt. Col. Med. Corps, U. S. A.,
Chief Surgeon.

The Technique of Venereal Prophylaxis

I

THE DUTY OF THE ATTENDANT

1. A Medical Department attendant will be on duty at the prophylaxis station at all times. He will be definitely instructed in all details of the technique of prophylaxis by the surgeon who will inspect the practice of the attendant often enough to assure that the attendant performs his duty properly.

2. The prophylactic treatments will be given by the attendant in accordance with the following directions; a patient will not be permitted to administer the treatment to himself.

3. If, for any reason, the attendant is unable to administer the treatment in the proper manner, and in accordance with the prescribed method, he will state the circumstances on the prophylaxis card and give the reasons why the treatment could not be properly given.

II

PREPARATION OF THE PATIENTS

1. The patient must urinate immediately before the treatment is commenced. He will be placed in a sitting position with his trousers below the knees, and a basin placed below and between his thighs so as to catch all fluids and to protect his clothing and the surroundings.

2. A pint or more of warm water will be placed in the basin and the patient will be given a wipe of gauze or cotton with which to assist in the thorough washing of his genitals with soap and water as a preliminary stage of the treatment.

3. The attendant will then examine the patient for discharge from the urethra and sores on the penis. If either of these conditions are discovered a note recording the observation will be made on the prophylaxis card, but otherwise the treatment will be continued as prescribed. This note on the prophylaxis card will be reported promptly to the surgeon in charge of the prophylaxis station.

4. The attendant will drop from a bottle, on the penis, a sufficient quantity of liquid soap to permit a thorough washing, while the patient washes the penis with the wipe and the clean water in the pan. While the washing is continued the attendant will see that the foreskin is retracted and that all parts about the head and body of the penis, together with the scrotum are thoroughly washed.

5. After the washing with soap and water is finished, the attendant will pour slowly on the penis, from a bottle, a solution of 1 to 1,000 bichloride of mercury until one-half pint of the solution is used, during which time the patient will thoroughly wash all parts of the penis in the same manner as is directed above in using soap and water.

6. The gauze wipe used in the washing will be placed in a proper receptacle to be disposed of later by burning. The penis will be allowed to dry by evaporation, as it is not advisable to wipe off the bichloride solution.

III

INJECTION

1. The injection will always be given by the attendant. One dram of a 2 per cent solution of protargol will be drawn into the syringe. The attendant will hold the meatus between his thumb and finger of the left hand, pressing from top to bottom, and place the nozzle of the syringe in the meatus with the right hand. The solution will be slowly injected until the syringe is empty, while the attendant continues to hold the penis. The patient will then take hold of his penis and relieve the attendant from any further part in the injection.

2. The patient will then hold his penis for five minutes, being careful to press only on the extreme end so as to allow the fluid to come into contact with all parts of the urethra. The meatus should be held only tight enough to retain the fluid while allowing an occasional drop of the protargol to escape. The patient should also press gently on the urethra as so to move the protargol solution about and bring it in contact with all parts of the urethra. This precaution of not holding the meatus too tightly is very important, because the location of the infection is liable to be in the very end of the urethra, and compressing the urethra too tight prevents the solution from coming into contact with the very point where infection is most liable to occur.

3. After the time limit of five minutes has expired the pressure on the meatus is released and the protargol solution allowed to escape without pressure on the urethra to expel the last drop, which it is desired should remain.

IV.

INUNCTION

1. If the penis is not perfectly dry after the washings with bichloride solution, the patient will be given a newspaper towel with which to dry it thoroughly. The attendant will remove from the small container, by means of a small wooden spatula (2 or 3 inches long), one-half dram of a 33 per cent calomel ointment which he will smear over the surface of the penis while the patient retracts the foreskin and turns the penis so that the ointment can be applied to all parts. After the ointment is transferred from the spatula to the penis, the spatula will be placed in a proper retainer to be burned at some later time. A new spatula will be used for each case, and the old one will always be destroyed.

2. After the ointment is thus applied to all parts of the penis by the attendant the patient will carefully and thoroughly rub the ointment into all parts of the skin covering the penis, being very careful to withdraw the foreskin and to make the rubbing very thorough about the meatus, head, and neck of the penis. This rubbing should be continued until the ointment has disappeared, leaving only a greasy film on the skin of the penis.

3. While the ointment is being rubbed into the forepart of the penis any excess which remains will be rubbed toward the base of the penis and the scrotum.

4. After the inunction is completed and only a greasy surface remains, the foreskin will be drawn over the head of the penis to protect the ointment against being rubbed off.

5. The attendant will then provide a piece of toilet paper which the patient will wrap around the penis to prevent the ointment from being rubbed off and to protect his clothing.

6. The patient will be directed not to urinate within a period of four or five hours after the treatment.

7. Soap, water, and paper towel will be provided by the attendant to permit the patient to wash his hands, by which operation the treatment is completed.

V

MATERIALS

Syringes

1. The syringes will be sterilized by boiling whenever practicable; otherwise each syringe must remain in a solution of 1 to 1,000 bichloride of mercury for at least one hour after it has been used on one patient before it may be used on another.

2. One dozen syringes should be furnished to provide a capacity of one dozen prophylaxis treatments in one hour, when sterilization is effected by the antiseptic solution. When the syringes are sterilized by boiling, 10 minutes in boiling water is required for preparing a syringe to be used again after it has once been used.

3. Two vessels will be provided for holding the syringes, one for sterilized syringes ready to be used, and the other for used syringes awaiting to be sterilized. Each vessel should contain 1 to 1,000 solution of bichloride of mercury, some of which should be drawn into the barrel of the syringe.

4. The bichloride of mercury solution in the vessels containing the syringes must be changed every day.

Bichloride of mercury solution 1 to 1,000

1. The bichloride of mercury solution used for washing the penis, preparatory to the injection, should be kept in a long-necked bottle with a split cork so that the solution can be freely dropped. Several bottles should be filled so that a sufficient supply will always be at hand.

Liquid soap

1. Soap will be kept in liquid form in a long-necked bottle with a split cork so that the soap can be freely dropped.

Spatulas

1. The wooden spatulas will be kept in a clean closed vessel or a corked bottle of appropriate size.

Protargol solution

1. A sufficient supply of a 2 per cent protargol solution should be kept in a stock bottle. A small glass dish, holding not more than a few drams, from which the syringe will be filled, will be provided. Only a quantity sufficient for filling the syringe at one time should be poured out of the bottle into this small dish, which should be emptied and thoroughly cleaned after each period of treatment.

Ointment

1. The calomel ointment will be kept in a covered stock jar in which it is issued, or in smaller containers whenever indicated. A small covered service jar, with not more than 1 ounce capacity, will be used, from which the ointment required for each treatment will be taken. This service jar will be filled from the stock jar as often as required so that the stock jar will not be opened for each treatment.

Furniture

1. The prophylaxis treatment room should be well furnished with an appropriate table upon which the materials are placed, in keeping with the standard of a well-appointed surgical dressing room.

2. Toilet facilities, basin, and water should be provided to permit the attendant and patient to wash and sterilize their hands after each treatment.

3. A suitable vessel should be provided for the reception of the gauze or cotton wipes and spatulas after they are used, and from which they are removed to be burned.
4. A comfortable waiting room should be provided adjoining the treatment room in which patients awaiting treatment will be protected from the weather.
5. The police, order, and appointment of these rooms should be maintained in accordance with the standard of a well-conducted hospital.
6. The attendant should be as cleanly dressed and as neat in appearance as he should be for the performance of his duty as a competent ward orderly.

During the late months of 1918, and the early months of 1919, a series of factors obtained which eventuated in the standardization of the administration of the venereal prophylaxis in the American Expeditionary Forces, and fixed its importance on a higher plane, not only among the enlisted men, but also among responsible medical officers, than hitherto had been the case. The first of these factors was an increase of 30 per cent in the incidence of venereal diseases in the American Expeditionary Forces for the week ending October 30, 1918.⁴⁷ It will be recalled that, in discussing the influence of leave areas on the incidence of venereal disease in the American Expeditionary Forces, mention was made of the fact that an embargo existed on leaves throughout the summer of 1918 and until the middle of the following October. At this latter time the First and Second Armies were authorized to grant leaves up to a total of 9,100 per week, and the 78th Division 1,100 per week, a total of 10,200. The leave areas received approximately 8,000 men weekly beginning about the middle of October, 1918.⁴⁸

General Pershing, whose personal interest in the control of venereal disease in the American Expeditionary Forces was constant, in noting the reported increase in venereal disease directed the commanding general, S. O. S., A. E. F., on December 1, 1918, to give immediate and energetic attention to the venereal disease condition, with the view to discovering the cause of the increase and foci of infection, as well as fixing the responsibility in such instances.⁵⁰ As a consequence of these instructions to units showing an unduly high venereal disease rate the following form letter was sent the adjutant general, S. O. S., A. E. F.:

From: The Adjutant General, S. O. S.

To: Commanding officer,

Subject: Venereal disease.

1. Your attention is directed to the fact that the incidence of venereal disease reported from your command for _____ week ending _____ was _____ per 1,000 per annum, an unduly high rate.

2. You are directed to investigate at once and to make report promptly to this office upon the prevalence of venereal disease in your command, the reason for the increase in rates, and the enforcement of existing orders in regard to prostitution, venereal prophylaxis, and venereal disease.

Thus a system was initiated of requiring reports from all organizations whose incidence rate of venereal disease was disproportionately high in comparison with the incidence rate of the American Expeditionary Forces as a whole. This system not only tended to accentuate the gravity of a given venereal disease status in the organization concerned, but it also enabled the chief surgeon's office, A. E. F., to determine from the replies received in response to the above form letter how best generally to improve conditions as to venereal prophylaxis.

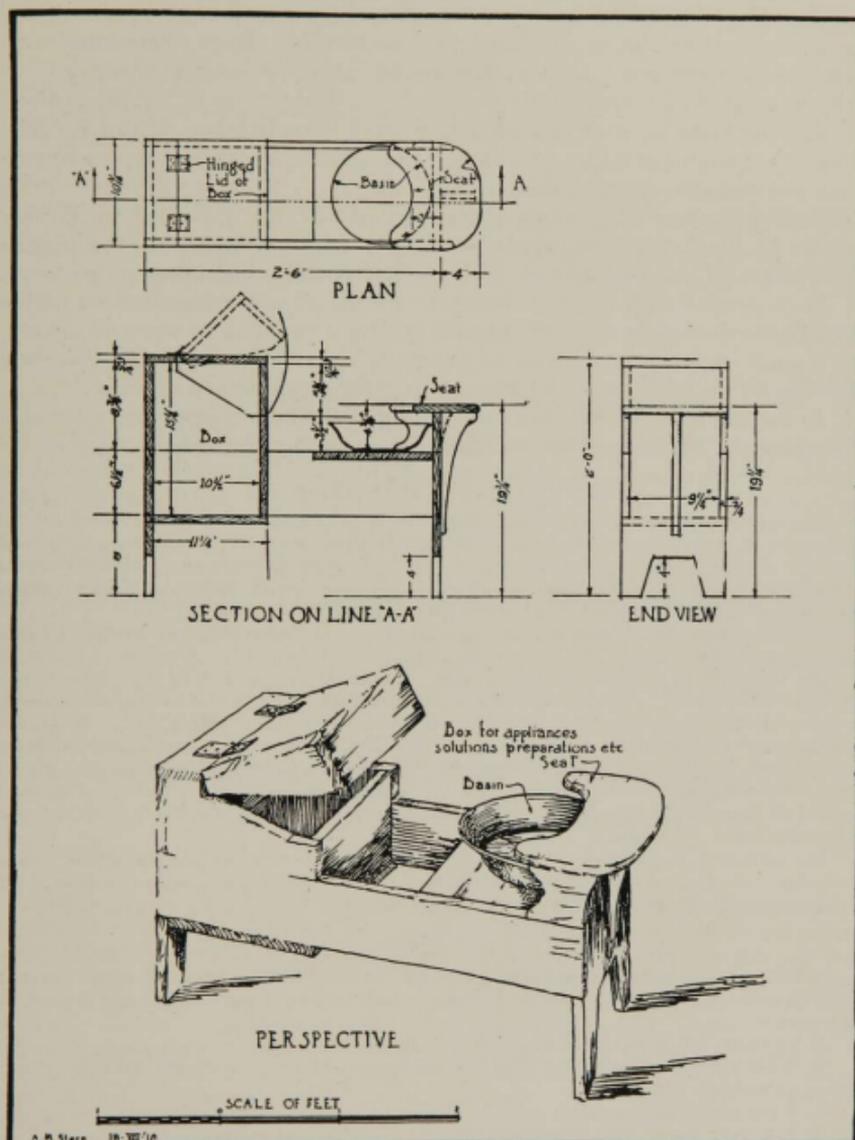


FIG. 115.—Improvised stand for the venereal prophylactic station

One of the measures adopted, in consequence of the necessity for improving the facilities for administering venereal prophylaxis, was the detailing, early in 1919, of three experienced medical officers to inspection duty throughout the American Expeditionary Forces in connection with venereal disease prevention.⁵¹ These officers, by visiting and inspecting the various places where our troops were located, were in an excellent position to remedy offhand deficiencies when such were noted and were locally correctable; otherwise, as in instances where personnel or material were necessary to perfect the administration of venereal prophylaxis, such a condition was made the subject of a special report by one of the inspecting medical officers.

In February, 1919, the chief surgeon, A. E. F., published in Weekly Bulletin 43, the fact that added precaution was necessary because of the increasing incidence of venereal disease, even among men who had taken prophylaxis. He recommended that medical officers follow up all men who admitted taking prophylaxis after more than three hours following exposure to venereal disease, and require such men to return to the prophylactic station on the two days following for an injection of a 1 per cent protargol solution twice daily.

In the same weekly bulletin there appeared the following advisory remarks concerning the effective administration of venereal prophylaxis:

EFFECTIVE VENEREAL PROPHYLAXIS

The safety of such men as do not succeed in controlling their animal reflexes by the application of common sense and a respect for moral law depends on the equipment and operation of the venereal prophylaxis stations by the Medical Department. Medical officers are expected to maintain this most important facility for the prevention of disease upon a high basis, as indicated in the following description of a standard station:

Venereal prophylaxis being a major operation, like catheterization, is entitled to professional consideration.

The station is to be clean and respectable. Foul-mouthed, loose talk and coarse joking are not to be tolerated. The equipment and surroundings of the station are to be such as to provide at least as much dignity and formality as prevails in a decent barber shop. Whenever possible, prophylaxis stations should be located on the ground floor of buildings or barracks. In any event, a sufficient number of signs directing soldiers to the station should be placed between the entrance to the building and the actual location of the station. Whenever possible an illuminated sign should be placed at the entrance of prophylactic stations as a guide after dark.

The service is to be rendered under as quiet and as nearly private conditions as are practicable. A screen should be provided so that as much privacy as possible is secured for giving treatments where a separate room is not available.

PROCEDURE

1. Verify man's name, organization, etc., by the identification tags. Require the man to expose external genitalia thoroughly by rolling shirts and allowing breeches and drawers to fall to knees.
2. The man will then urinate, and proceed as follows:
3. Wash genitalia thoroughly with one tablespoon of liquid soap and running water; all water should be hot.
4. Wash genitalia thoroughly with bichloride of mercury, 1 to 1,000, by allowing solution to flow over penis, with foreskin retracted, the hair, and surrounding surfaces.
5. The attendant must inject 1 dram (teaspoonful) of a 2 per cent protargol solution into the urethra; as the syringe is withdrawn, the patient is to close the opening of the penis with his thumb and forefinger and retain the solution five minutes by the clock (injection to be given by the attendant).
6. Dry; if impossible to have towels, use toilet paper.

7. Remove from the container by means of a small wooden spatula 2 to 3 inches long, one teaspoonful of the 33 per cent calomel ointment. Rub this thoroughly over the head of the penis, paying particular attention to the under surface of the penis, to the furrow under the head, and to the surface under the retracted foreskin; the rubbing in of the ointment to the parts indicated should continue for three minutes; after this is completed, rub the excess ointment over the whole of the remainder of the penis, hair, and surrounding surfaces. A small pea-sized bit of ointment should be placed in the urethral opening and left there. The foreskin is then to be drawn forward. The ointment is not to be wiped off.

8. Cover the penis with toilet paper and allow it to remain four hours; do not urinate during this time.

Syringes.—Syringes will be sterilized by boiling. Syringes must be kept in a solution of 1 to 500 bichloride of mercury after boiling. Two vessels will be provided for holding the syringes, one for sterilized syringes ready to be used, and the other for used syringes waiting to be sterilized.

Bichloride of mercury solution, 1 to 1,100.—The bichloride of mercury solution used for washing the penis, preparatory to the injection, should be kept in a bottle, 1½ gallons capacity, equipped with glass and rubber tubing.

Liquid soap.—Soap will be kept in liquid form in a bottle with a split cork so that the soap can be freely dropped.

Protargol solution.—A sufficient supply of 2 per cent protargol, freshly made, should be kept in a stock bottle. A small glass dish or a covered spit cup should be provided, from which the syringe is filled.

Calomel ointment.—The ointment is stock should be kept in a covered jar in which it is issued. A small covered service jar will be used, for which the ointment required for each treatment will be taken. A covered spit cup will be found convenient for this service.

NOTE.—These instructions are to be posted in venereal prophylactic stations: In addition to the prophylaxis slip, Form 77 M. D., which is to be sent to the organization to which the man belongs, a book will be kept at the station giving the same information.

Despite the corrective measures outlined above the prophylactic facilities in many places were inadequate, even so late as April, 1919; likewise, instances were many where the methods pursued in the administration of the prophylaxis were unsatisfactory. The following communications on this subject are of interest, for they show in detail not only how the situation appeared to the critical observation of General Pershing, but also what was being accomplished by the Medical Department, A. E. F., to remedy the deficiencies noted:

[Telegram]

H. A. E. F., April 8, 1919.

CHIEF SURGEON,

American Expeditionary Forces, Tours.

During my inspections, following points have been brought to my attention and should be remedied with all possible speed and vigor. All the following criticism and directions apply with emphasis to leave areas everywhere. Prophylactic stations are often not well organized, equipped, or administered, and this fact alone would bring discredit on the treatment rather than confidence in its use. The equipment should be on a par with that supplied for other functions of the Medical Department. Medicines should be prepared by the pharmacist and renewed at least every second day. Warm water for washing should always be on hand, to prevent delay in the administration of the treatment. Treatment should be under direction and supervision of thoroughly trained attendants and given absolutely according to directions posted in the treatment rooms. Attendants must be carefully selected from the most intelligent and reliable men of detachments and especially trained in administration of these treatments. Their appearance, deportment, and speech should always be such as to place prophylaxis treatment on a par with other medical surgical procedures, and their number should be sufficient to allow necessary reliefs. Cleanness of

stations and efficiency in their administration should be insured by minute daily inspections by the surgeon in charge. Separate rooms or small buildings should be provided where treatments can be administered in private, with separate accommodations for officers where possible. The number and distribution of stations should be such as to make prompt and convenient treatments always possible. The number at most points is entirely insufficient. Individual packets should be supplied to soldiers in convoy or other duties which may carry them out of touch with prophylaxis stations. This is not at present generally done. The physical inspections are not being systematically and efficiently carried out in cases of undiagnosed and untreated venereal disease among the troops arriving at certain stations. The education of commands through lectures by medical officers on personal hygiene is neglected at many posts. Lectures illustrated by diagrams and drawings are one of the most effective means of urging continence. Little or no attempt is made by surgeons to locate sources of infection. Every effort should be made in every case to trace and eliminate the source by cooperation with military police and civil authorities, and this is the surgeon's duty. Little attention is being paid at rest points for leave and troop trains, and houses of prostitution are in many cases not put out of bounds and no prophylaxis facilities are provided. Medical officers fully provided with facilities for administering prophylaxis should accompany all troops and leave trains.

PERSHING.

FRANCE, April 11, 1919.

From: Chief Surgeon, A. E. F.

To: Commander in chief, A. E. F.

Subject: Telegrams of April 8 referring to venereal prophylaxis.

1. As stated in a telegram of this date acknowledging the receipt of your telegram of April 8, the emphasis placed upon important points and the practical suggestions made in that telegram will be of great assistance to this office. During the past two months constant efforts have been made by correspondence and through inspectors to improve prophylactic stations in all sections and to put the treatment on a par with that of a surgical procedure. All urologists and commanding medical officers have been urged to make a survey of their districts and correct the faults discovered, also the supervisors have been especially instructed to inspect all stations and to insist that those found lacking in any respect be properly equipped and standardized. This is a matter, however, which demand continual attention and the constant changes in personnel, incident to the demobilization of many medical units and their replacement by others which have recently come from the States without adequate instruction, has made it very difficult to maintain a well-instructed personnel at these stations.

2. As regards the education of the soldier in the dangers of venereal disease and the great importance of continence, or at least of prophylaxis, trained lecturers have recently been brought over from the United States and are now in the field. Their lectures are illustrated by diagrams, photographs, and animated cartoons to make them more interesting and more impressive. These lecturers cover the fundamental, anatomical, and physiological facts, and the most common diseased conditions. Educational pamphlets, posters, etc., are being constantly prepared and distributed. A very large shipment was received from the United States and has been sent to the various centers. Fifteen moving pictures showing facts about venereal disease and prophylaxis are being exhibited every evening in various places throughout the A. E. F.

3. The leave areas have been given a great deal of attention, but they have been found very difficult to control. More prophylactic stations will be established, and those already in operation will be improved and brought up to the standard. More medical officers and investigators are also being sent to these districts.

4. This office has urged locating sources of infection of venereal diseases, but this has never been adequately carried out. In many places it seems to have failed on account of half-hearted cooperation on the part of the French. They did not approve of our methods and were not willing to help us in the discovery of foci. Renewed effort will be made.

5. The order has gone out to have all leave trains and troop trains provided with medical officers, trained attendants, and prophylactic facilities. Prophylactic stations have also been established on all hospital trains. Although steps have been taken in accordance with your

orders to place medical officers on leave trains, it is the opinion of this office that their presence will not be found to be of material value, but that prophylactic stations in charge of competent and trained attendants will suffice. These stations can be readily inspected by the officer in command of the train.

6. A copy of Circular 78 from this office and of the bulletin of February 3, 1919, is inclosed.

WALTER D. McCaw,
Brig. Gen., M. D., U. S. A.

Circular 78, referred to by the chief surgeon, A. E. F., in his letter quoted above, is as follows:

Circular 78:

AMERICAN EXPEDITIONARY FORCES,
CHIEF SURGEON'S OFFICE,
April 25, 1919.

1. The following regulations will govern the investigation of cases of venereal disease and the control of venereal prophylaxis.

2. All cases of venereal disease following failure to take prophylaxis will be investigated and the reason for the failure ascertained and recorded.

3. All cases of venereal disease which develops after having taken prophylaxis will be investigated and the cause of the failure of the treatment ascertained and recorded.

4. Medical officers, so far as possible, will collect all men at present in their charge who have had syphilis and explain to them the course to pursue after demobilization in order to insure a complete cure.

5. All men who have had chancroids since enlistment will have Wassermann tests done before returning to the United States. If the blood is found positive, they will be retained for one course of specific treatment. If the responsibility for this treatment being given on ship or in the United States will be assumed by the medical officer, the patient may be allowed to proceed with his organization.

PROPHYLAXIS STATIONS

Attendants.—The attendants will be selected from among the best men in the organization. A noncommissioned officer will be in charge of each station. The men will be instructed on the following things:

- (a) The meaning and method of obtaining surgical cleanliness.
- (b) Simple facts about pathogenic microorganisms with special reference to those causing venereal disease. This instruction will include laboratory demonstrations of cocci, bacilli, and spirochætae.
- (c) Simple descriptions of the anatomy and physiology of the male and female organs.
- (d) Descriptions of the ordinary symptoms and course of the three venereal diseases.
- (e) In the making of solutions of protargol and bichloride.
- (f) Method of prophylaxis and scientific reasons for each step.
- (g) Each section surgeon will form a central school at which all men having charge of the prophylactic stations will be trained.

(h) The importance of the work will be impressed on the attendants, and everything possible will be done to arouse their interest, pride, and a cooperative spirit in the work.

Technique.—The technique of administration of the prophylaxis will be on a par with that of a minor surgical procedure. Anything less than this will be faulty.

Stations.—Care will be exercised in the placing of stations; regard for privacy will be observed. At least one room will be given to the station, which will be painted white and made as inviting as possible. A waiting room for large stations is desirable. The general arrangement and cleanliness of the station will correspond to that of a modern surgical dispensary.

Running water will be installed wherever practicable. The most economical plan is to have several faucets arranged over a washing trough made of concrete or zinc; if available, porcelain sinks (individual) are preferred. When possible, individual booths will be

made by the erection of partitions or curtains. Near each faucet will be a bottle of liquid soap with a split cork. Warm water will be provided if possible. When a water system is not at hand, running water will be supplied by means of an elevated galvanized-iron can to which a pipe or hose is connected. In temporary stations where basins will be used, a sufficient supply will always be on hand to insure the cleanliness of the individual basins.

Washing possesses the following advantages:

- (a) It has been shown that soap is germicidal for the *Spirochæta pallida*.
- (b) It removes mucoid substances and allows better penetration of the calomel ointment.
- (c) It opens minute wounds or cracks in which microorganisms may have lodged and allows the calomel ointment to come in contact with them.
- (d) It mechanically removes a large portion of the organisms present.

Bichloride solution.—The washing with bichloride solution is essential and is necessary in connection with the washing with soap and water to destroy Ducrey's bacilli, since it has been shown that neither calomel ointment nor protargol solution is germicidal for this organism. The most satisfactory method for use of the bichloride is to have a large bottle, demijohn, or earthenware vessel holding not less than a gallon, with a rubber tube attached, placed on a wall bracket just above the trough. The bichloride solution will immediately follow the soap and water.

The following articles are the minimum requirements of a station:

1. A Primus oil stove for sterilization.
2. A stew pan or fish kettle with cover, for boiling.
3. A sterilizer for the sterilization of sponges. This may be made out of two tin buckets one slightly larger than the other so that the larger may be inverted over the smaller. A rack of some kind is placed on the bottom of the inner bucket so as to hold the sponges or other articles above the water.
4. A long clamp for the removal of the sterile syringes, wooden spatulas, and sponges from their respective containers, thus avoiding the necessity of the patient putting his hands in these containers.
5. A sufficient number, never less than 12, of good workable syringes.
6. A closed receptacle in which to keep the sterile syringes.
7. A number of wooden spatulas which will be made by the attendant. These are for the removal of the ointment from the jar.
8. A closed receptacle in which to keep the sterile wooden spatulas.
9. A glass jar or some kind of vessel for the sterile gauze sponges.
10. An adequate supply of wash basins, certainly not less than 10, if running water is not at hand.
11. Small glasses similar to ordinary medicine glasses in which protargol will be poured just prior to its being used.
12. A supply of gauze sponges.
13. One 8-ounce dark-colored bottle for the stock solution of protargol.
14. A supply of 30 per cent calomel ointment.
15. A supply of protargol or argyrol.
16. Some means of weighing or measuring the protargol so that small quantities of the solution may be made up, thus avoiding the necessity of using a whole ounce at one time.
17. A supply of bichloride tablets.
18. A small clock placed where the patient may see it.
19. A roll of paper.
20. A place for the patient to wash his hands.
21. A sufficient number of small towels 8 by 10" so that each patient may have a clean one.

Regulations.—1. The syringes will be sterilized by boiling and will be kept in a sterile vessel. Bichloride solution will not be used for this purpose.

2. The calomel ointment will be removed from the container by means of sterile spatulas.

3. Solutions of protargol will be a uniform strength of 2 per cent, will be made fresh each week, and will be kept in a dark bottle. The date of making solution will be written on bottle.

4. Protargol solution will never be left standing in an open glass.
5. Basins will always be sterilized with bichloride solution after use.
6. The bichloride will have a uniform strength of 1 to 1,000.
7. Cake soap will not be used.
8. When prophylaxis is given to any soldier who is not a member of the organization to which the station belongs, a duplicate prophylactic record will be sent on the following day to the man's organization.
9. The data on the prophylactic cards will be transferred to a book which will be kept for permanent record.

* * * * *

DIRECTIONS FOR GIVING PROPHYLAXIS—TO BE POSTED IN ALL PROPHYLACTIC STATIONS

1. Patient will urinate and proceed as follows:
2. Wash hands.
3. Roll up shirt and drop trousers and drawers to knees.
4. Pull back foreskin and wash head of penis very thoroughly with warm running water and liquid soap, great care being taken to cleanse under surface around "G string" and back of head. After this, wash shaft of penis and adjacent part of body. If there is no running water, a clean basin with clean water and liquid soap will be used. The basin, after use, will be washed with water and then partially filled with bichloride solution, 1 to 1,000, and allowed to stand for at least 15 minutes before being used again.
5. While foreskin is drawn back wash penis, particularly the head, with warm bichloride solution, 1 to 1,000. This is best done by allowing the solution to flow over it.
6. The attendant, without touching genitals, will inject slowly one teaspoonful of a 2 per cent solution of protargol or a 10 per cent solution of argyrol into the penis, and, as the syringe is withdrawn, he will direct patient to close the opening of the penis with the thumb and forefinger and retain solution for five minutes.
7. Pull back the foreskin; rub one teaspoonful of calomel ointment all over the head of the penis and the inner surface of the retracted foreskin, being careful to rub it on the under surface, around the "G string," and in the furrow behind the head. The rubbing of this ointment should continue for three minutes. After this the surplus ointment will be rubbed over the shaft of the penis.
8. The penis is then wrapped in toilet paper and the patient directed not to urinate for at least four hours.
9. If more than three hours have elapsed since exposure, the patient, after having taken the regular prophylaxis, will be directed to report twice a day for two days for an injection of 1 per cent solution of protargol. This will be held in 10 minutes.

WALTER D. McCAW,
Brig. Gen., Med. Dept., Chief Surgeon.

PROPORTION OF MEN EXPOSED TO VENEREAL DISEASE WHO FAILED TO TAKE
VENEREAL PROPHYLAXIS

The consideration of this subject can be divided roughly into two periods: That period prior to the signing of the armistice, and that subsequent thereto. During the first period, of 8,978 venereal diseases which occurred between August 22, 1918, and November 13, 1918, 3,070 were among men who failed to take medical prophylaxis following exposure, a percentage of 34.1.⁵² This was at a time when the greater number of men in the American Expeditionary Forces were with their organizations, under the disciplinary control of their respective commanding officers, and were familiar with the location of the facilities which had been provided for the administration of the venereal prophylactic treatment. On the other hand, of the 17,282 venereal diseases which were reported as having occurred between January 2, 1919, and May 21, 1919, 7,193 men who contracted venereal disease failed to take medical prophylaxis, a percentage of 41.6.⁵³

It was during the second period that the greatest efforts of all concerned in the prevention of venereal diseases were being concentrated on such prevention; however, leaves of absence now were being given freely, thus temporarily removing men from not only the disciplinary control of their organization commanders but also frequently from ready access to places where medical prophylactic treatment could be administered.

REASONS FOR FAILURE TO TAKE PROPHYLACTIC TREATMENT FOLLOWING EXPOSURE
TO VENEREAL DISEASE

Efforts were made by the Medical Department, A. E. F., to determine, among other things, the reasons for members of the American Expeditionary Forces failing to take medical prophylaxis following exposure to possible venereal diseases.⁵⁴ Such efforts necessarily were based upon two methods of procedure: To obtain the desired information by means of written replies to a formal questionnaire, or, as was done in one instance in one of the combat divisions,⁵⁵ directly questioning the men concerned and recording their verbal replies. In both methods, however, since the replies were confessional in nature and there was no possibility of checking up on them, any deductions made from the replies, by either method of questioning, are far from being exact.

Such studies showed, as might have been expected, that the preponderating number of faults, as regards failure to take the prophylaxis, were attributable to indifference of the men, and to alcoholism. For example, in a study of 92 instances where men failed to take prophylaxis and subsequently developed venereal disease, which study may be taken as representative, 75 gave reasons that plainly indicated the fault was theirs.⁵⁵ Of these 75 faults, 50 per cent were due to pure indifference; 25 per cent to alcoholism. In a small proportion of instances, the reason for not taking the prophylaxis showed ignorance on the part of the victims themselves or of the attendants in prophylactic stations. Because so much stress had been made in the various kinds of orders and instructions concerning venereal disease, on the necessity for taking prophylaxis prior to three hours following exposure to venereal disease, the impression had gained ground among the men that prophylaxis subsequent to three hours would be futile, thus accounting for a small number of failures to take prophylaxis. One other fact accounted for a small percentage of these failures to take prophylaxis; that is to say, unless a record had been made in a prophylactic station that prophylactic treatment had been given a man, and such a man developed venereal disease, even though he had administered prophylactic treatment to himself, he was charged with not having taken such treatment.

The successful application of remedial measures to conditions, the existence of which was made known by such analyses as those referred to above, can be no better exemplified than in the following partial report on the venereal problem of an organization of the American Expeditionary Forces, comprising men whose activities necessarily had to be individual, and whose location was in a very poor quarter on the outskirts of Marseille:⁵⁶

Failure to take Prophylaxis: The reason for this last, which is general throughout the A. E. F., has always been difficult to explain. It becomes a question largely of the personal equation. Nevertheless, attempts were made on a large scale in this base section to induce men to take prophylaxis.

In brief, several of the methods employed, with special reference to this camp, were these:

(a) *Lectures and motion pictures.*—The men were instructed in the evils of venereal disease, the penalties attached, as per G. O. 32, G. H. Q., A. E. F., c. s., etc., and the almost sure protection against these diseases which prophylaxis affords. Film shown: "Fit to Fight." Booklet entitled "Fit to Fight" also distributed to every man.

(b) *More prophylaxis stations.*—These were established not only at each camp, but at the most convenient sections of each camp. In addition, one was established in the heart of Marseille to give the men every opportunity of getting prophylaxis within the prescribed time limit.

(c) *Maps.*—Maps of the city were posted in each prophylaxis station, marking off very plainly the "restricted districts," and the location of each prophylaxis station. In addition, attention was called to these maps at formations.

(d) *Excessive venereal rate.*—Any organization developing a 2 per cent venereal disease rate or over was promptly confined; its commanding officer received an "inefficiency notation" to that effect in his "officer's record book."

(e) *Convoy.*—With the development of several cases among men while away on convoy, inquiry brought out the fact that these men frequently had no protection. On February 1, 1919, therefore, every convoy that left this park was equipped with individual prophylaxis tubes, sufficient for the number of men and the number of days they were to be absent. This matter was checked so that no convoy was permitted to leave until the pilot officer could show the certificate of receipt from the camp surgeon.

Even these measures failed to produce satisfactory results. Hence additional measures were adopted. These were in the main:

(f) *Weekly consultations.*—Weekly consultations in the base commander's office of all camp commanders and camp surgeons in Marseille.

(g) *Establishment of venereal camp.*—Venereal cases are kept in confinement here until cured. In accordance with G. O. 32, G. H. Q., A. E. F., c. s., men are not permitted to sail for the States until cured.

(h) *Limitation of pass privilege.*—To force the taking of prophylaxis, pass privileges were reduced to 20 per cent of organization strength. Passes were limited as much as possible to 10 o'clock passes. A soldier earned a 12 o'clock theater pass only by good conduct and good work.

(i) *Reporting at prophylaxis station on return from pass.*—All men returning from pass were made to report to the prophylaxis station for interview by the attendant there. The station is furnished with a roster each day of men on pass. As they return, they are interviewed by the attendant and checked off. Delinquents are reported. This method has worked out very satisfactorily, at least at motor reception park, Base Section No. 6. It was established on March 1, 1919. The venereal rate for February of 3.4 per thousand promptly dropped to 0.666 for March.

(j) *Frequent venereal inspection.*—These are held weekly instead of semimonthly. They are held at irregular intervals. Men strip to the waist and drop their trousers; they are examined at the same time for infestation with body vermin.

(k) *Equipment of prophylaxis stations.*—In addition to the above measures, all prophylaxis stations were thoroughly equipped with all conveniences for making the prophylaxis as agreeable as possible. Special troughs, stands, and irrigating devices were introduced. Our stations here were freshly painted. The attendants wear gowns.

(l) *Instruction of attendants.*—The attendants are all instructed and quizzed formally each week on the proper technique of administration to keep them thoroughly familiar with every detail.

EFFICACY OF VENEREAL PROPHYLAXIS

Because medical prophylaxis could not be administered in the American Expeditionary Forces ideally as to time and technique, necessarily an apparent high rate of "failures" was reported among cases of venereal disease following prophylaxis. Just what the extent of the "failures" was, however, can be no

more than estimated. In a careful study made by specially selected medical officers of 3,042 men with venereal disease assembled in various camps in the American Expeditionary Forces, it was found that 60.72 per cent of the men investigated claimed to have contracted venereal disease despite prophylactic treatment.⁵⁷ This percentage was reduced legitimately to 12.06, by reason of the fact that the cause for "failure" of the prophylaxis in a sufficient number of men could be ascribed to intoxication, incomplete, or hurried treatment, or treatment taken after three hours.

The following analysis of 142 instances of venereal disease, in a division of the American Expeditionary Forces, in which prophylaxis was reported to have failed is interesting as showing the usual causes for such "failures":⁵⁸

Group (b)—prophylaxis taken and failed, 142 cases: This is an interesting group of cases, for we know absolutely the efficiency of prophylaxis and in the vast majority of these cases there is shown to be an error that lies at the door of the Medical Department. A number were overtime men—i. e., over the three hours required—and failure was due to that. There was nothing to be gained by questioning each man of the 142 as to why in his individual case prophylaxis failed.

They were taken in groups, addressed as before to obtain their confidence, and asked if any had any reasons why his individual prophylaxis failed. This often brought forth many evidences of the ignorance of the individual and how the lectures he had received had failed of their purpose to carry the necessary information. Many felt that the solution of protargol was too weak or old (among them a druggist of seven years' practice). Another said he asked if he was to hold it (protargol) in for five minutes and got the answer "you hold it in a few seconds and get out; I want to go to bed." Two had received no lectures at all. Several expressed a repugnance for the publicity of the treatment room, while others had been sent into the back yard to inject themselves. Again another station had refused to treat "strangers" (it was a station of his own division), and it was next morning before he received one at his own company. One saw seven men treated in rapid succession with the same syringe without sterilization or even washing. One spoke of men being allowed by the attendant to fill out a prophylactic card and get on record, then omitting the prophylactic treatment.

A certain percentage were undoubtedly autogenous reinfections, as two such cases asked an explanation as to why their prophylaxis had failed. There were several cases contracted in leave areas, who spoke of long lines waiting at an insufficient number of prophylactic stations.

This group talking invariably brought forth the question that opened the road for obtaining information of the most startling character. It needs no further comment than the bare figures themselves—102 out of 142 patients (72½ per cent) were made to administer the treatment to themselves; 84 out of 142 patients (59.1 per cent) received no soap and water washing—9 of them had venereal sores; 14 out of 142 patients (9.8 per cent) received no mercury ointment application—4 of them had venereal sores.

Considered from the standpoint of the number of prophylactic treatments given, in its relationship to the number of "failures," it was found that in 242,000 prophylactic treatments administered throughout the American Expeditionary Forces only 1.3 per cent were failures.⁵⁸ In Base Section No. 1, of 27,000 prophylactic treatments, 0.8 per cent were failures; in 126,000 treatments in Base Section No. 2, 1.2 per cent were failures; 9,642 treatments given in the American Embarkation Center, Le Mans, were followed by 1.9 per cent of venereal disease.⁵⁸

The following consolidated table of venereal disease data, Motor Reception Park, Base Section No. 6, A. E. F., when considered in connection with the report of the antivenereal disease activities conducted thereat (vide p. 950),

though it concerns relatively small numbers, conclusively shows what could be accomplished when medical prophylaxis was administered properly and promptly.⁵⁶

TABLE NO. 47.—*Consolidated venereal disease data, Motor Reception Park, Base Section No. 6, A. E. F.*

Month	Aug- ust, 1918	Sep- tem- ber, 1918	Octo- ber, 1918	Nov- ember, 1918	Decem- ber, 1918	Janu- ary, 1919	Febru- ary, 1919	March, 1919	April, 1919	May, 1919
Total strength.....	500	600	2,419	2,796	2,497	2,314	2,335	1,500	827	415
Total prophylaxes.....	729	868	2,288	2,481	1,746	1,097	1,030	721	348	182
Total venereal disease developed after taking prophylaxis.....	5	10	11	12	11	4	3	0	0	0
Total venereal disease, developed after failure to take prophylaxis....	1	5	7	2	13	4	6	1	2	0
Total venereal disease per month....	6	15	18	14	24	8	9	1	2	0
Venereal rate per 1,000.....	12	21.6	7.04	4.03	9.6	3.4	3.8	.666	2.4	0
Per cent of efficiency of prophylaxis	99.27	99.42	99.45	99.16	99.45	99.68	99.84	100	100	100

COMPULSORY PROPHYLAXIS IRRESPECTIVE OF EXPOSURE TO VENEREAL DISEASE

To certain classes of men in the American Expeditionary Forces, medical prophylaxis was administered, upon their return to camp, without regard to possible exposure to venereal disease; the assumption being, since the men concerned were considered irresponsible, exposure to possible venereal disease had occurred while they were absent from camp. Two of the principal classes of men to whom prophylaxis thus was administered were colored soldiers employed as stevedores at the base ports,²³ and men returning to camp from leave intoxicated.⁸

In Base Section No. 1, A. E. F., the rate of incidence of venereal diseases among colored troops was extremely high, compared with the venereal disease incidence rate for white troops.²³ Various remedial plans were tried, but were found wanting. All pass privileges and restrictions which obtained in Base Section No. 1 included colored troops; however, because these proved ineffective additional measures were adopted. Among these the measures which proved most successful were the building of a wire stockade around the camps of the stevedores, and placing guards at the entrance thereto, thus affording complete control of the men themselves. Four-hour passes only were given to the stevedores, thus insuring their return to camp prior to the expiration of the three-hour limit, adopted in the American Expeditionary Forces for taking medical prophylaxis. Finally, upon the return from pass of the stevedores to camp, each was subjected to venereal prophylactic treatment without regard to exposure to venereal diseases.⁵⁹ This measure, instituted in December, 1917, materially decreased the incidence of venereal diseases among the colored troops in Base Section No. 1, as shown by the following table, which summarizes data by months, on venereal diseases for the period October, 1917, to March, 1919, inclusive, for troops stationed at St. Nazaire. The table shows also parallel ratios for white troops. In explanation of the fact that, despite the extraordinarily rigid control of the colored troops, their venereal disease incidence rate continued uniformly higher than that of the white troops, it was found that the majority of instances where venereal diseases occurred among the colored troops subsequent to the institution of the compulsory prophylaxis

were due to exposure while the stevedores were on the docks working, or were absent without leave from camp, and such exposures were not followed by the prophylaxis.²³

TABLE NO. 48.—*Venereal disease incidence rate per thousand, for white and colored troops at St. Nazaire, France*

Month	New cases		Strength of command		Rate per 1,000 per annum		Number of prophylactic treatments	
	White troops	Colored	White troops	Colored	White troops	Colored	White troops	Colored
1917								
October.....	67	66	3,966	607	202.68	1,304.76	2,074	91
November.....	81	56	7,107	1,807	136.80	371.88	885	398
December.....	44	59	4,282	2,830	123.24	250.20	539	111
1918								
January.....	8	62	3,777	5,613	25.32	132.48	523	289
February.....	16	61	4,330	5,908	44.28	123.60	766	502
March.....	14	23	6,472	4,773	25.92	57.84	882	759
April.....	25	25	8,800	8,137	34.08	36.84	1,078	1,178
May.....	24	33	8,410	7,398	34.20	51.96	2,709	2,469
June.....	51	26	7,340	7,471	78.12	41.76	2,244	2,288
July.....	51	20	15,392	9,223	39.24	26.04	1,579	3,317
August.....	45	42	18,583	11,230	29.04	44.88	1,315	2,904
September.....	14	55	16,320	12,426	10.32	53.16	1,344	3,290
October.....	25	71	29,118	16,775	10.32	50.76	1,607	3,264
November.....	48	76	27,303	12,536	21.12	72.72	1,812	2,388
December.....	81	125	36,049	13,526	27.00	110.88	1,742	1,713
1919								
January.....	90	110	38,042	15,270	28.08	86.52	1,588	3,030
February.....	115	51	44,666	14,832	28.44	41.28	1,840	2,376
March.....	77	39	47,834	14,959	19.32	31.32	3,280	4,772

The treatment accorded colored troops stationed in Base Section No. 1, subsequently was extended to colored troops engaged on similar work in Base Sections Nos. 2 and 5.⁶⁰

In August, 1918, the following requirements concerning the administration of venereal prophylaxis were instituted in Base Section No. 1;²⁴ Every enlisted man, upon returning from pass, was required to report to the guard house and there to be asked to sign a statement that he had not exposed himself to venereal disease during his absence on pass. If he was unwilling to sign such a statement, if he was under the influence of alcohol, or if for any other reason there was just cause for the belief that he may have been exposed to venereal disease, he was to be transferred to the most conveniently located prophylaxis station, and there to have venereal prophylaxis administered to him.

EFFECTIVENESS OF PROPHYLAXIS IN ITS RELATIONSHIP TO EACH OF THE THREE VENEREAL DISEASES

In a study made by the senior consultant in urology, A. E. F., of the records of 1,901 members of the American Expeditionary Forces suffering from venereal disease, claimed by the men afflicted to have followed the use of medical prophylaxis, the proportion of diseases was as follows:⁶⁰ Gonorrhoea, 907, or 50.3 per cent; chancroid, 689, or 38.4 per cent; syphilis, 205, or 11.3 per cent.

Among 969 venereal diseases, similarly studied, following failure to take venereal prophylaxis, the proportion of disease was as follows:⁶⁰ Gonorrhoea 523, or 54.1 per cent; chancroid, 315, or 32.4 per cent; syphilis, 131, or 13.5 per cent.

These relative proportions among men who had contracted venereal disease after using prophylaxis and among men who neglected to use prophylaxis being about the same, indicate that the prophylaxis as used by us in the American Expeditionary Forces was equally effective against the three diseases.

THE USE OF VENEREAL PROPHYLACTIC PACKETS

The general use of the prophylactic packet in the American Expeditionary Forces was not favored by the chief surgeon of these forces because it was not regarded as nearly so useful and safe as the use of prophylaxis at stations.⁶¹ However, certain classes of men in the American Expeditionary Forces were required to perform duties the nature of which necessitated their spending much time away from places where prophylaxis stations were established; for example, the members of truck trains and men serving on our railways. For such men as these the Medical Department, A. E. F., supplied, and advised the use of prophylactic packets, on occasions when exposure occurred and only when one of our venereal prophylaxis stations was not accessible.⁶² The prophylactic packets so issued consisted of collapsible gelatin tubes containing 32½ per cent calomel ointment, 1½ per cent carbolic acid, and 1 per cent camphor.⁶³

Because so many men were going on leave early in 1919, thus being subjected to exposure to venereal diseases at places where venereal prophylaxis stations were not always available, though, as has been seen above under leaves and leave areas, everything possible was done in the American Expeditionary Forces to lessen such opportunities, General Pershing, in an effort to neglect no proper means to get results, directed that prophylactic packets were to be made available and issued to such men as desired them.⁶⁴ Since the Medical Department, A. E. F., had been placing main reliance on prophylactic stations, and had been utilizing the prophylactic packets only in those instances where prophylactic stations were not accessible, as noted above, relatively few prophylactic packets were maintained in stock. The chief surgeon, A. E. F., estimated that fully a half million prophylactic packets would be required, for their unrestricted distribution, and since but one-quarter of this number was in France at the time, with no possibility of obtaining an adequate number for a long, but unknown time, he recommended that the issue of the packets be continued as formerly was the case; that is, to men going to places where prophylactic stations did not exist.⁶⁵

The use of the prophylactic packet did not protect men from trial by court-martial for failure to use prophylaxis in instances when they acquired venereal disease.⁶⁶

PROMULGATIONS FROM GENERAL HEADQUARTERS CONCERNING VENEREAL DISEASE PREVENTION

General orders and bulletins, concerning the prevention of venereal diseases, which were promulgated from General Headquarters, A. E. F., appeared in series form, and dealt in an increasingly comprehensive way, as the problems of venereal disease control developed, not only with disciplinary measures but also phases of social hygiene and treatment. Since these instructions usually considered more than one of the above mentioned topics, it is convenient to give them in group form. The first was General Orders, No. 6, H. A. E. F.,

July 2, 1917, which has been quoted on page 936. The most important part of this order in its present connection is the fact that soldiers who contracted venereal disease were to be tried by court-martial.

To obviate the possibility of men with venereal disease needlessly living in idleness and comfort, thus increasing the noneffective rate of the American Expeditionary Forces and otherwise placing a premium on the acquisition of such disease, the consultant urologist, A. E. F., in August, 1917, formulated a plan whereby men with uncomplicated venereal diseases would be treated in their organizations and while on a duty status.⁶ This plan was promulgated as follows:

HEADQUARTERS, AMERICAN EXPEDITIONARY FORCES,
September 9, 1917.

General Orders, No. 34.

I. 1. It shall be the constant endeavor of all commanding officers to develop among the members of this command those better qualities which are characteristic of high moral standards of living. With this in view, it is incumbent upon all officers, soldiers, and civilians attached to the A. E. F. to cooperate in every way possible in the efforts to insure temperance and to prevent the ravages of venereal disease with their disabling consequences.

2. In billets, barracks, and camps, constant efforts will be made to provide amusement, interest, and occupation for the soldiers and civilian employees of the command when off duty.

In connection with the instructions laid down in general orders of the War Department, now in force, there will be provided amusements, reading rooms, entertainments, opportunity for athletic sports, etc., whenever it is at all practicable.

While the chief responsibility for supplying opportunities for social récreation, physical and mental occupation, and the giving of advice against intemperance and licentious living rests with company officers, frequent lectures will also be given by Medical Officers on sexual hygiene and venereal diseases, in which continence shall be advised and illicit intercourse with women discouraged. The dangers of venereal diseases will be clearly presented and preventive measures discussed.

Physical inspection of all soldiers will be made twice a month as required by General Orders, No. 17, W. D., 1912.

3. All members of A. E. F., including attached civilians, on leave or on a duty status, upon arrival in Paris or other cities will report at once to the A. P. M. for a visé of papers as required by the regulations of the provost marshal service. The A. P. M. will cause each man to be given advice and warned as to the prevalence and dangers of venereal diseases.

In cities which men may visit from time to time on leave or on a duty status where official accommodations are not available, certain hotels will be designated by the provost marshal general where men will be required to reside when away from their commands.

4. Regimental infirmaries will be established at once with accommodations of 10 or 12 beds. These infirmaries will be furnished with the equipment regularly listed for these units and, in addition thereto, apparatus and supplies necessary for prophylactic measures and for the active treatment of venereal diseases, in order to retain all soldiers having venereal infection with their commands. Whenever possible soldiers affected with venereal disease will be retained on duty but denied all indulgences; they will be under constant supervision and receive daily inspection and suitable treatment from the medical officer assigned for their care. The syphilitic register will be carefully kept and all cases followed up, as far as practicable, as they would be in times of peace.

5. The Quartermaster Department will provide suitable accommodations, and the Medical Department apparatus, medical supplies, and equipment necessary to carry out treatment, which must be given early and followed persistently in order to effect a cure as soon as possible. Only cases presenting complications indicating the necessity of prolonged active hospital treatment will be transferred back from the regimental lines.

6. Special hospitals will be established from time to time, at places to be designated later, where these latter venereal cases will be received. If practicable, they will be in the vicinity of L. of C. shops or depots where the services of those men able to perform manual labor may be utilized, even during the time they are being subjected to hospital care. In the absence of shops or depots, these men will be employed on road building or other suitable occupation when pronounced by the medical officer physically fit to engage in the labor proposed.

7. The attention of all concerned is invited to General Order No. 6, C. S., these headquarters, and every man contracting venereal diseases will be brought to trial by court-martial in accordance with the provisions of that order. Every officer contracting venereal disease will be subjected to summary discipline by his immediate commander, who will at once report the case through proper channels to these headquarters.

8. Line and medical officers of the divisions and regiments will cooperate in every way possible with the municipal authorities in the area occupied by their commands so as to protect their commands from venereal diseases. In cases of venereal disease the soldier will be interrogated as to the source of infection, and, if possible, the name of the woman harboring the disease will be ascertained. If facilities exist for municipal hospital treatment for these prostitutes, steps should be taken with the civilian authorities to cause infected women to be taken to the hospital, there to receive care and treatment until they are no longer a menace.

By command of Major General Pershing.

JAMES G. HARBORD,
Lieut. Col., General Staff, Chief of Staff.

Official:

BENJ. ALVORD, *Adjutant General.*

In the summer and early fall of 1917, troops arriving in France from the United States gave evidence of having contracted venereal disease while on leave just before embarking in the United States. Furthermore, it was highly desirable that the troops arriving in France should be made cognizant of the seriousness of the venereal disease situation in the ports used by us there, as well as what methods were being practiced for the prevention of venereal disease. As regards the contraction of venereal disease by troops just prior to their departure from the United States, and the facilities for their treatment en route to the American Expeditionary Forces, General Pershing, on October 20, 1917, cabled War Department as follows: ⁶⁴

Reference prevention venereal disease, it is very necessary that commanding officers and medical officers of troops leaving United States be given explicit orders to take active measures in this matter. They should give attention to instruction of men in venereal diseases and their prevention. Incoming troops show evidence of contracting venereal disease while on leave just before embarkation. Equipment for treatment of venereal disease on transports inadequate. Cases developing at sea, especially syphilis, have often gone untreated. Transports should be thoroughly equipped for venereal work. Regiments have arrived here without proper equipment to establish prophylactic stations at their camps and for treatment of venereal disease. Officers do not seem to be sufficiently impressed with gravity of venereal situation in Europe or the especial danger to incoming troops. The great loss of effectives that has been produced in other armies by venereal disease should be impressed upon all our troops. Information, instruction, and advice by means of cards, leaflets, and posters as well as lectures delivered on shipboard would be very useful. Suggested this matter be given very full attention by the War Department and by medical officers and that every effort be made to impress upon our troops the seriousness of venereal danger in Europe. Have instituted very stringent regulations at all ports of debarkation. And am making every endeavor to obtain cooperation by French, but very difficult to get them to take serious view of the question.

In addition to these cabled instructions, whose main purport was to obviate the importation of venereal diseases into the American Expeditionary Forces, the following memorandum, which was based on similar instructions the commanding officer, Base Section No. 1, had been furnishing commanding officers of troops arriving on transports, was promulgated from General Headquarters, to make it applicable to all base ports, American Expeditionary Forces:⁶⁵

HEADQUARTERS AMERICAN EXPEDITIONARY FORCES.

For the commanding officers of all troops arriving on transports:

1. The commanding officer of troops will require a physical examination for the determination of the number of venereal cases in each organization before the troops on any transport are permitted to land.

The senior medical officer with troops should be required to present to the commanding officer of troops a tabulated statement giving the name of the organization, strength of command, and the number of venereal diseases, classified as syphilis, chancroid, and gonorrhea.

Upon receipt of this statement at the office of the base commander, the necessary instructions will be issued concerning their release from detention.

A nominal list of all cases of venereal diseases will be furnished by the surgeon directly to the commanding officer of each organization. After troops have landed all men reported on this list will be detained in camp under careful restriction as long as the organization remains in this base or until discharged from the venereal list by the surgeon.

2. The commanding officer of the naval vessel or transport will require the senior naval medical officer or the transport surgeon to make the same examination and reports concerning the crew. The members of the crew with venereal disease will be held in quarantine on board and not permitted to go ashore except by special permission of the base commander on recommendation of the base surgeon.

3. Attention is directed to G. O. No. 6, A. E. F., July 2, 1917, and G. O. No. 34, A. E. F., September 9, 1917, in regard to venereal diseases.

(A) General Order No. 6 invites attention to the following considerations:

(1) The necessity for each member of the A. E. F. to maintain himself in the best physical condition.

(2) The evil effects of venereal diseases, rendering the soldier inefficient and an embarrassment to the army.

(3) The requirement of bimonthly^c medical inspections.

(4) The establishment of venereal prophylactic stations at convenient places and the requirement of members of the A. E. F. to report to an official station for treatment within three hours after exposure.

(5) "The authorities having provided every necessary means to protect the men from venereal disease, one who contracts the same is guilty of a serious offense under the ninety-sixth article of war. He should be tried by court-martial for contracting venereal disease through neglect, thereby unfitting himself for active military duty against the enemy, and should be severely punished." Forfeiture of pay is regarded as a more appropriate punishment than confinement.

(6) A copy of G. O. No. 6 must be posted in the office of each company and detachment, and the commanding officer thereof will see that every man understands it.

(B) General Order No. 34 is an amplification of No. 6 and in addition requires:

(1) That constant efforts be made to provide amusement, interest, and occupation for the soldiers when off duty.

(2) That frequent lectures be given by medical officers on sexual hygiene and venereal disease, in which continence shall be advised and illicit intercourse with women discouraged. The dangers of venereal disease will be clearly presented and preventive measures discussed.

(3) That regimental infirmaries of 10 to 12 beds be established and equipped with apparatus and supplies necessary for prophylactic measures and active treatment of venereal diseases, in order to retain all soldiers having venereal diseases with their commands.

^c This should be semimonthly. See footnote, p. 936.

(4) That the syphilitic register be carefully kept and cases be followed up, as far as practicable.

(5) That special hospitals be established for the treatment of complications of venereal diseases.

(6) That line and medical officers cooperate with the municipal authorities in the area occupied by their commands so as to protect their commands from venereal diseases. The soldier should be interrogated as to the source of infection, and, if possible, the name of the woman ascertained. Steps should then be taken with the civilian authorities to cause the infected woman to be taken to the hospital and treated until no longer a menace.

4. Every man on board ship must be advised of the contents of the above general orders, the prevalence of venereal diseases in France, and the dangers incident to this infection before troops are allowed to land. Every man should be informed of the location of the venereal prophylaxis stations, and adequate prophylaxis facilities should be provided aboard ship for those who remain aboard after and those who may go ashore before the debarkation of the commands. Similar stations must be established in each organization as soon as they reach camp.

5. Prevalence of venereal disease in ports:

(1) There are many prostitutes in the licensed houses of prostitution in all ports and numerous licensed prostitutes outside of houses. These latter constitute "streetwalkers" and women who live in "semiprivate" quarters and boarders. They are registered, however, and are required to present themselves for inspection twice a week. Many of these licensed women have been discovered to have syphilis and gonorrhoea, by inspectors. Those sent to hospital were due to the fact that there were gross visible lesions of the disease present. The results of this inspection should be taken as an indication of the danger of venereal infection of prostitutes. The opportunity for transmitting venereal diseases in many cases, before their condition was detected, should be well remembered.

(2) There are numerous clandestine prostitutes in all towns who are not registered or inspected. The great increase in the male population in military centers induces women of the worst type to come to those places to supply the increased demand. Under such circumstances these women become more dangerous because of the great number of men they entertain. As one woman is officially reported to have received the attention of 57 men in one day, it may be easily appreciated that a very few infected women, or even one infected man, may be the cause of a great many venereal cases. The percentage of infections among these clandestine prostitutes must be very much higher than in the case of registered women, as they are not subjected to an inspection, which at least weeds out the worst cases. Questioning of infected men apparently shows this to be so, as a larger percentage of cases have their origin from sources outside of licensed houses of prostitutes.

By command of Major General Pershing.

ROBERT C. DAVIS, *Adjutant General*.

At the same time the above-quoted memorandum was published, a confidential circular was prepared for each soldier of the American Expeditionary Forces.⁶⁶ This circular directed the attention of our soldiers to General Orders, Nos. 6 and 34, H. A. E. F., 1917, and contained excerpts from these orders as well as brief references to the increased dangers from venereal diseases in Europe, the safety of absolute continence, and the urgent necessity for prompt prophylaxis in the event of exposure to possible venereal disease. Also a card was printed and given to all our soldiers.⁶⁷ On one side of the card was printed a plea for the soldiers to lead clean lives; to avoid intemperance and sexual temptations. On the reverse of the card were instructions as to venereal prophylaxis.

The situation, in so far as venereal-disease prevention is concerned, at St. Nazaire, the base port of Base Section No. 1, A. E. F., during the summer and early fall of 1917, was considered at length in preceding pages having to

do with the repression of prostitution and the prevention of venereal-disease contact through restricting the liberties of debarking troops and the troops permanently stationed in Base Section No. 1. As a result of this condition, the following order was issued with the purpose of placing houses of prostitution "off limits," stopping the sale of strong liquors to our men, and confining our troops to transports until facilities for their transportation to the interior of France could be so effected as to obviate their lengthy stay in camps at base ports:

HEADQUARTERS AMERICAN EXPEDITIONARY FORCES,
France, December 18, 1917.

General Orders, No. 77.

1. The following instructions, supplementary to General Orders, No. 34, and General Orders, No. 6, these headquarters, for the prevention of venereal diseases among the forces of this command are issued for the guidance and strict compliance of all concerned.

2. All commanding officers are directed to give personal attention to matters pertaining to the prevention of venereal disease. They will at all times support the medical officers charged with the management of prophylactic stations and assist in every way possible the prevention and eradication of venereal affections. No laxity or half-hearted efforts in this regard will be tolerated. It is expected that positive results will be obtained and that all supplementary means to aid in that attainment will be encouraged. The number of effectives in a command is an index of its efficiency and this depends upon the efficiency of the commanding officers.

PORTS OF DEBARKATION

3. At ports of debarkation, by earnest cooperation with the French authorities and, if necessary, by the use of a military secret service, every endeavor will be made to locate the habitations, rooms, or apartments and sections of town occupied by women engaged in prostitution. All such places will be considered "off limits;" they will be described and conspicuously posted in each company or detachment, and the visiting or frequenting of these places by members of the A. E. F. will be prohibited. The provisions of this paragraph should be enforced by local commanders at all other towns and places where troops are stationed or billeted when existing local conditions indicate the advisability of such action.

4. At ports of debarkation, the base surgeon of a section is charged with duties pertaining to all regulations designated to prevent venereal disease. He will act in cooperation with the urologist who may be designated from these headquarters to carry out the instructions of the commander in chief.

5. The base commander will require the commanding officer of arriving naval vessels or transports carrying troops to render a report of the physical condition of all those on board, listing those who have evidence of venereal disease. The troops and members of the crew will not be permitted ashore until this report is submitted. The physical examination necessary to ascertain this information will be made by the transport surgeon or senior medical naval officer as the case may be, or in the absence of either of those officers on any ship carrying troops, by a medical officer designated by the base commander. As soon as these lists are furnished, troops may be landed. All men reported as having venereal disease will be placed under restriction in camps and there will be detained, but no members of ships' crew with venereal disease will be permitted ashore. During times of detention, commanding officers will not issue passes or permission to enlisted men to leave transports for purposes of recreation. Men discovered as having venereal disease will be given intensive treatment and if complications exist will be sent to a hospital. Noncomplicated cases will accompany their organizations for treatment as contemplated by General Orders, No. 34.

6. While on transports, in port, or in camp, passes will be given transient troops only in very exceptional cases, and only in most unusual instances for more than three or four hours at a time. Should it seem advisable to authorize absences for a longer period, the commanding officers will assure themselves that men are warned of the dangers of venereal infections.

7. Commanding officers of all troops will insist that men of their command whenever exposed to venereal disease will report to prophylactic stations as soon as possible after exposure and always within a period of three hours. Venereal prophylactic stations will be established by local commanders at convenient and inconspicuous places in each battalion and at or near various entrances to the camp; these stations will be placed under the charge of a competent noncommissioned officer of the Medical Department, and a well-instructed private will always be kept on duty to administer prophylaxis. There will be posted at all prophylactic stations copies of General Orders, Nos. 6, 34, this order, and other literature narrating the prevalence of venereal disease and describing the proper methods of prophylactic treatment. Particular attention must be given to these stations, which should contain a waiting place protected against the weather, a clean sanitary treatment room with privacy, proper equipment, and technique to inspire confidence in the men, who should have impressed upon them the importance of early prophylactic treatment. The commanding officer of each camp will prescribe an entrance through which all men returning to camp from pass or leave must enter, providing at this entrance a sufficient guard. Men returning to camp will be questioned by the guard and if exposure to venereal infection is acknowledged, the men will be directed by the guard to a prophylactic station. Officers are informed and men will be told that there is a vital necessity for instituting early treatment if venereal disease develops and these diseases must be reported to medical officers as soon as they are discovered or suspected.

8. Should men return to camp in an intoxicated condition they will be seized by the guard and taken to a prophylactic station where treatment will be administered by the noncommissioned officer in charge of the station. Cases of drunkenness should be subjected to prompt disciplinary measures.

9. An accurate list of all men suffering from venereal disease will be kept in each organization. Regimental commanders and commanding officers of independent units will direct their medical officers to make daily reports to the surgeon of the proper base section, giving in each the number of new venereal cases reported during the preceding twenty-four hours. All men so reported will be confined to the limits of the camp except when employed on military duty, and intensive treatment followed out.

10. Upon the departure of regiments or other organizations from ports of debarkation, the senior medical officer of the base section will report by telegraph to the surgeon, Lines of Communication, and to the chief surgeon, A. E. F., the designation and strength of the organization, name of the commander, and the number of cases of venereal disease discovered or contracted by its personnel during the stay of the organization at the port of debarkation. These reports will be filed at these headquarters with the personal records of organization commanders, and will be used as a basis in determining the commander's efficiency and the suitability of his continuing in command.

INTEMPERANCE

11. Commanding officers at all places where our troops may be located will confer with the local French authorities and use every endeavor to limit to the lowest possible number the places where intoxicants are sold. It is desired that these authorities be assisted in locating nonlicensed resorts, which should be reported immediately to the proper authority for the necessary action.

12. Soldiers are forbidden either to buy or accept as gifts from inhabitants whisky, brandy, champagne, liquors, or other alcoholic beverages, other than light wines or beer. The gift or retail sale of these by inhabitants in the zone of the army is forbidden by French law. Commanding officers will see that all drinking places where alcoholic liquors named above are sold are designated as "off limits," and the necessary means adopted to prevent soldiers visiting them.

13. It will be the duty of local commanders, field officers, and medical officers to cooperate with the provost marshal's office and put forth every exertion to insure a high percentage of effectives in their various commands.

14. Commanding officers at ports, either in person or through some responsible representative, will deliver to each organization commander and to every casual passenger in the service of the United States, upon arrival at port of debarkation, a sufficient number of copies of this order, General Orders, No. 6, and General Orders, No. 34, and other approved literature on this subject, so that all may have ample information and that there may be no excuse for noncompliance with existing regulations.

15. Though this order is intended particularly for ports of debarkation, it should be interpreted in general as applying to all stations where troops are stationed.

Camp, regimental, battalion, and company commanders will be held to a strict accountability for the fullest compliance with the requirements of this order.

By Command of Major General Pershing.

JAMES G. HARBORD,
Brigadier General, Chief of Staff.

Official:

ROBERT C. DAVIS, *Adjutant General.*

The stringent provisions of this excellent order, specially its provision that the "venereal reports be filed at these headquarters with personal records of organization commanders, and will be used in determining a commander's efficiency and suitability of continuing his command," produced the desired impression and stimulated both line and medical officers to keep down the venereal rates in their organizations.⁶

The following bulletin, as will be seen, specifically placed all houses of prostitution "off limits" to members of the American Expeditionary Forces, contained information concerning the prevalence of venereal diseases at the time of its issue, and strongly urged members of the American Expeditionary Forces to practice continence.

Bulletin No. 54.

G. H. Q., AMERICAN EXPEDITIONARY FORCES,
France, August 7, 1918.

1. The disturbance of normal social conditions caused by war tends to a breakdown of normal standards and an increase of immorality and venereal disease. Verified statistics of actual experience in the present war show that a great danger of venereal infection confronts both the civil population and the Army.

2. To combat this danger, full dissemination of the facts about venereal disease and rigid enforcement of regulations are essential.

3. Attention of all members of the A. E. F. is directed to the information and regulations governing the prevention of venereal disease contained in G. O., Nos. 6, 34, and 77, 1917, and in this order. All officers will see that these regulations are completely understood and carried out throughout their commands. Failure in this will be serious evidence of inefficiency.

(a) *Facts about venereal disease.*—The greatest source of venereal infection is the "regulated and inspected" house of prostitution. The methods of inspection are grossly ineffective. The women in these resorts are not free from infection. They frequently stay daily with a score or more men, each thus passing the infection from one man to those following him. There are numerous cases of soldiers contracting both syphilis and gonorrhoea at these houses. The placing of "regulated" houses of prostitution "off limits" at one seaport reduced venereal infection to one-eighth the previous rate.

Venereal infection is highly prevalent among unregistered "clandestine" prostitutes, and exists to-day to an increasing degree in social classes hitherto little suspected. The practice of illicit indulgence in sexual intercourse will almost inevitably lead to venereal infection sooner or later.

In the majority of cases drunkenness precedes and leads to exposure to venereal infection.

Failure to submit to prompt prophylaxis increases the percentage of incapacitating infection. The effectiveness of prophylaxis depends upon the promptness with which it is employed. Within the first hour the failures are only one-tenth of 1 per cent, second hour one-half of 1 per cent, and after three hours from $1\frac{1}{2}$ to 7 per cent. The average rate of failure for the A. E. F. of 2 per cent indicates that in many organizations the prompt submission to prophylaxis is not enforced.

The methods of regulation adapted under the general orders referred to above have steadily reduced the venereal rate from 84 new cases per thousand per year in 1916 to 29 in the A. E. F. to-day.

The contraction of venereal disease incapacitates for service and often produces permanent impairment of health. It is a breach of duty to the country, Army, and fellow soldier.

(b) *Continence*.—Sexual continence is the plain duty of members of the A. E. F., both for the vigorous conduct of the war and for the clean health of the American people after the war. Sexual intercourse is not necessary for good health, and complete continence is wholly possible. Careful studies show that only a relatively small proportion of members of the A. E. F. habitually indulge in sexual intercourse.

Commanding officers will urge continence on all men of their commands as their duty as soldiers and the best training for the enforced sexual abstinence at the front. Instruction, work, drill, athletics, and amusements will be used to the fullest extent in furthering the practice of continence.

(c) *Leaves*.—All-night and week-end leaves are a fertile source of infection, multiplying contacts and delaying prophylaxis. Such leaves will be denied as much as possible.

(d) *Drunkness*.—The provisions of existing orders relating to the sale of intoxicants to members of the A. E. F. will be uniformly and strictly enforced. Cases of drunkness will be dealt with by prompt disciplinary action.

(e) *Prophylaxis*.—All means will be adopted to enforce the uniform and early use of prophylaxis.

(f) *Courts-martial*.—Courts-martial will be sufficiently severe in dealing with cases of venereal infection to deter men from willful exposure. The records of all sentences imposed will be carefully examined and compared and lax courts and officers held strictly accountable.

(g) *Treatment*.—The importance of early treatment is so great that officers will urge their men to report for examination on any suspicion of disease.

(h) *Houses of prostitution*.—Throughout the A. E. F. all houses of prostitution, as well as saloons indulging in the improper sale of intoxicants to members of the A. E. F., will be designated as "off limits." Commanding officers will adopt the necessary means and disciplinary measures to prevent soldiers from visiting them.

(i) *Apprehension of clandestine prostitutes*.—By cooperation with the French police, military and civil authorities, every effort will be made to repress clandestine prostitution and streetwalkers and employ every available means under the French law to have all such women sent away.

(j) *Reports*.—Reports of conditions in contravention of the purposes of this order will be made by military police and all officers concerned.

4. The C. in C. enjoins upon all members of the A. E. F. the strictest observance of sexual continence. His position on this question is stated as follows in a letter appointing representatives to a British-American conference on the subject:

"I have heard with great satisfaction of the recent decision of the British War Office that the licensed houses of prostitution are to be put out of bounds in the B. E. F. Many of us who have experimented with licensed prostitution or kindred measures, hoping thereby to minimize the physical evils, have been forced to the conclusion that * * * abolition as distinguished from regulation is the only effective mode of combating this age-long evil. I have the greatest hope that the results of the conference which you have called will be far-reaching in their effect. This menace to the young manhood in the Army forces and to the health and future well-being of our peoples can not be met by the efforts of each Government working apart from the others * * *. The gravest responsibility rests on those to whom the parents of our soldiers have intrusted their sons to the battle, and we fail if we neglect any effort to safeguard them in every way.

"We have the common ground of humanity; we have the well-considered conclusions of the best scientific minds on our side, and from the fact that, in this war of nations in arms, the soldier is merely a citizen on war service, we have all the elements which will force cooperation between military and civilian authorities. With our nations cooperating hand in hand, * * * we have the brightest prospects of winning the victory.

By command of General Pershing.

JAMES W. McANDREW, *Chief of Staff.*

Official:

ROBERT C. DAVIS, *Adjutant General.*

EDUCATING THE AMERICAN EXPEDITIONARY FORCES CONCERNING VENEREAL DISEASES AND THEIR PREVENTION

Until the early part of the year 1919 chief reliance had been placed on company officers and medical officers for giving advice to the enlisted men of the American Expeditionary Forces directed against intemperance and licentious living. Frequent lectures were given by medical officers on sexual hygiene and venereal disease, in which continence was advised and illicit intercourse with women discouraged.²² However, in the latter part of 1918, the chairman of the Commission on Training Camp Activities in the United States, and the officer in charge of antivenereal disease work in the Surgeon General's Office, visited France and investigated the venereal disease situation there. These investigators expressed the opinion that our antivenereal campaign overseas embraced all practical and possible varieties of activities, but that the existing scheme could be strengthened materially by the help of certain officers experienced as special investigators and instructors, who were then available in the United States. Accordingly, on January 6, 1919, the chief surgeon, A. E. F., requested General Pershing to send a cabled request to the War Department for the assignment of the officers desired overseas.⁶⁸

On March 3, 1919, 10 officers of the Sanitary Corps, trained investigators in venereal disease control, and 3 medical officers, experienced lecturers on venereal diseases, arrived in France from the United States.⁶⁹ The investigators were assigned to places where the incidence of venereal disease was seemingly most difficult of control; the trained lecturers were supplied with animated cartoons representing venereal diseases.⁷⁰

A motion-picture film, "Fit to Fight," which had been shown to our troops in France, was changed so as to make it pertinent to armistice conditions.⁷¹ It was renamed, "Fit for America," 15 sets of it being constantly exhibited, so that by the middle of May, 1919, nearly half a million of our men had seen it.⁷⁰

An educational bureau was established where new educational material was being received in the spring of 1919 from the United States, and whence the new material was distributed. A special set of motion-picture films was selected in Paris for the purpose of instructing our men as to venereal diseases.⁷⁰ Fifteen of these were purchased and were distributed to medical officers in the different sections of the American Expeditionary Forces.

SEGREGATION OF VENEREAL DISEASES IN SPECIAL CAMPS

The organization of the division of urology, A. E. F., provided for keeping and treating men with uncomplicated venereal diseases within their organizations, thus permitting a better control of them from the standpoint of both discipline and treatment.⁸³ So long as the combat divisions were in training areas

or in very quiet sectors, little difficulty was experienced in treating men afflicted with venereal disease at their respective regimental infirmaries; however, when an active sector was occupied by a division it proved impracticable to sustain this method of treatment, and it became necessary to organize venereal labor camps in which all men with venereal diseases, who had been receiving treatment at regimental infirmaries could be segregated.⁶ In the early summer of 1918 a plan was instituted whereby men with uncomplicated venereal disease were placed in a divisional field hospital for scabies and there employed as a labor unit.⁷²

In the Services of Supply, A. E. F., several factors obtained which eventuated in the institution of segregation camps for men with venereal disease. This was particularly true at places where men were being received in large numbers for the purpose of forwarding them elsewhere. For example, at the First Depot Division, St. Aignan, many casual men were reporting during the summer, 1918, among whom much venereal disease was being detected.⁷³ During July, 1918, a venereal labor camp was established where all men with venereal disease were isolated. Such infectious men with uncomplicated venereal disease were required to perform light labor while undergoing treatment; whereas, men requiring hospital treatment were placed in specially provided venereal wards of the camp hospital.

VENEREAL SEGREGATION CAMP, BASE SECTION NO. 1

In Base Section No. 1, A. E. F., a segregation camp for men with venereal diseases was established at about the same time as the establishment of a similar one at St. Aignan.⁷⁴ The question of the establishment of venereal segregation camps had been under consideration for some time and was finally discussed with the base commander, as a practical means of restraining men with venereal disease. The objects intended to be accomplished by this segregation were (1) the reduction of the incidence rate of venereal disease in Base Section No. 1 by restraining men with venereal disease from spreading it to others, and by the deterrent effect of such restraint upon those who are liable to become infected; (2) to reduce the time lost from work by men who had contracted venereal disease; (3) to reduce the time lost on sick report (noneffective) because of venereal disease by the establishment of a uniform system of diagnosis and treatment by a personnel specially trained and qualified as urologists. These objects would have to be accomplished without interfering with the intensive military training of general and special troops.⁷⁴

On July 23, 1918, it was directed that a venereal segregation camp be established by the following memorandum:

Memorandum No. 133.

SERVICES OF SUPPLY,
HEADQUARTERS, BASE SECTION NO. 1, FRANCE.

1. There will be established at Camp No. 1, St. Nazaire, under the supervision of the camp commander, a camp for the segregation of enlisted men suffering from venereal disease. This camp will be isolated and a special guard provided.

2. Enlisted men belonging to organizations stationed at or in the vicinity of St. Nazaire, Montoir, Savenay, and Nantes who have a venereal disease in an infectious stage, but are not sick in hospital, will be sent to this camp, and will be held until they are declared by a medical officer to be no longer infectious. Men discharged from hospitals at the place named still in an infectious stage will be disposed of in the same manner.

3. The commanding officer of Camp No. 1 is charged with the preparation and enforcement of regulations governing this camp. Attention is called to the requirements of General Orders, 77, H. A. E. F., series 1917.

4. This order will become effective July 31, 1918. A copy will be posted on the bulletin board of every company, unit, or detachment, and will be read to all units by an officer at three formations.

By command of Brigadier General Walsh.

PH. J. LAUBER,
Lieut. Col., I. G., Acting Adjutant General.

Memorandum No. 141.

SERVICES OF SUPPLY,
HEADQUARTERS, BASE SECTION NO. 1,
France, August 7, 1918.

Enlisted men sent to the venereal segregation camp, established by Memorandum No. 133, Base Section No. 1, July 23, 1918, will take with them their equipment, bedding, and clothing.

Service records of such men will be forwarded to the commanding officer, Camp No. 1, St. Nazaire, direct, accompanied by a letter stating whether or not the man has been tried by court-martial on account of having venereal disease.

By order of Colonel Sewell.

PH. J. LAUBER,
Lieut. Col., I. G., Acting Adjutant General.

With a view to establishing segregation camps at other troop centers so as not to take special troops from their training, and for other purposes, the following memorandum was written to the base commander:

SERVICES OF SUPPLY,
OFFICE OF THE SURGEON, BASE SECTION NO. 1,
France, July 30, 1918.

For: Base commander, Base Section No. 1, S. O. S.

The following recommendations are made as to the method of handling the venereal situation in this section:

1. That the provisions of Memorandum 133, Hq., Base Section No. 1, July 23, 1918, be extended to apply to all organizations in Base Section No. 1.

2. (a) That in addition to the venereal segregation camp established by Memorandum 133, Base Section No. 1, c. s., other venereal camps be established in the following localities: Coetquidan, Meucon, St. Maixent, Angers, Saumur, Thouars, St. Jean de Monts, and in other localities where troops of the American Expeditionary Forces are stationed or may subsequently be stationed. These camps will be isolated and a special guard provided. In camps where the personnel is insufficient to furnish adequate guard, the venereal cases will be sent to the nearest detention camp.

(b) Enlisted men who have a venereal disease in an infectious stage, not sick in hospital, will be sent to the venereal segregation camp nearest to their station. Men discharged from hospitals with a venereal disease still in an infectious stage will be discharged on duty status and sent to the nearest venereal segregation camp. These cases will remain in the venereal segregation camp until pronounced noninfectious by the surgeon.

(c) The commanding officer of a camp or station where a venereal segregation camp is located is charged with the preparation and enforcement of regulations governing this segregation camp. The men in these camps segregated because of venereal disease will be worked as much as is consistent with their physical condition, in groups under guard and while not at work will be confined within the bounds of the segregation camp.

(d) The surgeons of the camps where venereal segregation camps are located will be responsible for the treatment of the cases of venereal disease therein, for the keeping of all records, and for the sanitation of the camp.

* * * * *

CHAS. L. FOSTER,
Colonel, Medical Corps, U. S. A.

The following report of the assistant base urologist on the activities of the venereal clinic of the segregation camp at St. Nazaire, though it contains details as to treatment that are not germane, gives an idea of the general operation of all these camps: ⁷⁴

SERVICES OF SUPPLY,
OFFICE OF THE SURGEON, BASE SECTION NO. 1,
France, November 28, 1918.

From: Assistant base urologist, Base Section No. 1, S. O. S., France.

To: Surgeon, Base Section No. 1, S. O. S., France.

Subject: Report of venereal department of Camp Hospital No. 11, and segregation camp of Camp No. 1, Base Section No. 1, S. O. S., France.

1. The administration of the venereal department of Camp Hospital No. 11 and segregation camp of Camp No. 1, is divided into two parts—the examination and treatment of patients and the working of patients. An experienced urologist with two assistants is in charge of the treatment. The patients are divided into two companies; one is composed of gonorrhoeal infections, while the second is composed of combined cases of syphilis and chancroids. Each company is under the charge of an assistant. As the majority of the hospital cases belong to the latter company they are treated by the assistant who has charge of the syphilitics and chancroids.

2. The other half of the administration has only to do with the stockade or working patients, and is under the charge of a line officer. As patients are listed as either hospital or stockade, those who are in the stockade are fit for active duty. This officer receives a daily report of admissions to and discharged patients from the stockade so that he knows just how many are available for work. Also a list is made of special vocations so that should a carpenter or a painter be required he can be obtained. It is worthy of note that, except upon Sundays and bath days, 100 per cent of these patients are worked.

3. In the hospital wards there are 96 beds available, while in the stockade there is room for 400 patients. The arrangement of the hospital wards is such that the more severe complicated cases are together so that special attention can be given them. They are in the same building in which are located the treatment rooms. The receiving room, treatment rooms, and laboratory are in the same building so that upon admission, a patient's particulars, history, complete examination, and preliminary treatment are routine.

4. In order to obtain a closer idea of the routine followed, patients of the three classifications, namely, gonorrhoea, syphilis, and chancreoid will be followed.

5. A patient with gonorrhoea is admitted in the receiving room. There is obtained his name, organization, previous occupation, etc. A medical officer takes his history, which includes the past history and present trouble, so far as symptoms, date of exposure, and date of appearance of discharge are concerned. A general physical examination and special genito-urinary examination are made. A microscopical diagnosis is made in each case either from a smear obtained from the urethra or from the urine. A differential diagnosis between an acute and chronic lesion is made. Should the condition be a chronic one, the patient is sent to the stockade and receives his treatment either early in the morning or at night, or both, so that it will not interfere with his work. This is under the direct supervision of the medical officer in charge.

6. As the routine treatment for chronic gonorrhoea consists primarily of irrigation, prostatic massage, and dilatation, it is frequently not necessary to be treated daily. A list is made of those patients so that each one receives his treatment at regular intervals. A record is kept of the microscopical findings of the prostatic massage specimens and in this way an exact account of the progress of the case is recorded. As the case progresses, urethral smears are obtained after provocative injections of silver nitrate, and the disappearance of the gonococci followed by the microscope. A patient is discharged as soon as two negative smears at weekly intervals are obtained. Two points are worthy of mention here. Frequently these cases are of months' duration before admission. The complications of chronic gonorrhoea such as prostatitis and seminal-vesiculitis are extremely obstinate so that the time shown in the office report of 40.8 days average away from their organizations is below average. The second point is that up to date only one case of gonorrhoea has recurred.

7. However, if the case is an acute gonorrhoea, the patient is immediately put to bed so that complications may be prevented. He is placed upon a proper diet and receives extensive local treatment. The few days lost from work is more than compensated for afterwards. In extremely grave cases, local treatment is omitted so that complications of the posterior urethra may be prevented. In this way acute gonorrhoea is frequently limited to the anterior urethra so that danger of prostatitis, seminal-vesiculitis, and epididymitis are lessened. Acute uncomplicated cases of gonorrhoea are in hospital on an average of 10 days. They are then transferred to the stockade.

8. Acute complicated cases require longer rest for complications such as phimosis, paraphimosis, acute prostatitis, and seminal-vesiculitis and epididymitis. These are frequently obstinate and due to lack of attention. Local applications of heat are used whenever possible. Surgical procedures are not instituted unless necessary. As soon as possible irrigations and massage are started. These patients remain in hospital for an average of 20 days, for care must be taken to prevent a recurrence. During this period work would only emphasize the symptoms and prolong the infections. They are then transferred to the stockade.

9. The most serious lesions upon the penis is a chancre or primary syphilis. All sores are regarded as chancres until they are proven to be otherwise by repeated examinations, both microscopical and blood. In dealing with uncomplicated chancres the treatment is simple. A patient is admitted with a "sore." He goes through the preliminary general examination, but more attention is given to the glands, reflexes, and throat for evidence of syphilis. The majority of these chancres are immediately diagnosed. This is extremely important, for a positive dark field is of more value than a positive Wassermann, because immediate treatment can be instituted. A positive Wassermann requires from three to six weeks after the appearance of the lesion, and valuable time is lost. Uncomplicated chancres do not require rest, and remain away from their organizations for an average of 11.6 days.

10. Chancres complicated with chancroids are diagnosed in the same manner. Complication renders rest imperative. Buboec are frequent, many of which need incision. Acute syphilitic treatment is the same. Local applications are used to prevent the growth of the lesion, and frequent cauterization is necessary. Local applications of heat to the groin are used to prevent buboec. Experience has taught that work is the reverse of good judgment. If necessary a small incision is used in opening the bubo, which is then thoroughly washed with saline and finally injected with iodoform solution. These cases require daily attention and frequently are dressed several time per day. Skilled attention has reduced the number of days in hospital to 10 days.

11. A more detailed description of the antisiphilitic treatment may be made. This form of treatment is universal throughout the A. E. F., so that a patient transferred from the organization to another one continues to receive the same routine treatment. It is an intensive course, for the idea involved is to obtain the quickest results possible with the least damage to the patient. In this way men are more quickly available for work. As each patient has a syphilitic register, each medical officer who treats him after he has been discharged from the segregation camp can accurately follow his case from the start.

12. The preliminary treatment is intravenous and is composed of novarsenobenzol and cyanide of mercury. This form of mercury is soluble so that its intravenous use is not harmful. It is given daily for a period covering 21 days, except upon every fifth day, when novarsenobenzol is administered. The novarsenobenzol is given in increasingly larger doses so each patient's tolerance for arsenic may be established. After the 21 days have passed, the novarsenobenzol is given once a week with a weekly intermuscular injection of gray oil which replaces the cyanide. Gray oil is an insoluble form of mercury and is therefore injected into the deep muscles of the buttock. The first course is completed after the forty-first day. The almost complete negative reaction following novarsenobenzol is attributed to the good physical condition resulting from the regular life and training.

13. Routine urinalysis is done at least once a week upon these patients, for nephritis is one of the chief complications caused by both arsenic and syphilis. If albumin is found, the urine is more frequently examined so that the nephritis may be controlled. Frequent examinations of the teeth are necessary, for salivation may follow the intensive mercurial treatment

14. If repeated negative dark field examinations are obtained, the lesion is diagnosed as chaneroid. The most frequent complication of chaneroid is bubo either upon one or both sides. The treatment is again absolute rest, for suppuration of buboes may be prevented by rest and local applications. The lesion is cauterized and dressed daily or more frequently if necessary. If the bubo suppurates, it is opened with a small incision.

15. At first these patients were worked, but the number of buboes which developed were alarming. A very marked decrease was noticed just as soon as rest was instituted. Another interesting point has been observed and that is the recurrence of buboes following healing when the patients are immediately started working. Under the most favorable condition the treatment of chaneroids has in the past been anything but satisfactory, so that the results which have been obtained are encouraging. Before a patient with a chaneroid is discharged, the negative dark field examinations are checked by Wassermann blood tests.

16. The results which have been obtained so far are as follows: All venereal patients in an infectious state are isolated. The early diagnosis of syphilitic lesions has greatly diminished the number of days away from duty. The total number of days in hospital has been greatly reduced for all patients. The total number of days away from organization is below that of the British, French, and Canadian armies. The moral effect of segregation has undoubtedly been felt among the white troops.

CLAUDE D. PICKRELL,
Captain, Medical Corps, U. S. A.

The monthly reports for the segregation camp at St. Nazaire show that in September, 1918, the patients were detained on an average of 36 days; in October, 34.1 days; in November, 29.2 days. In December the average period was only 21.8 days. All patients except those confined to hospital were placed upon a working status. Starting in October, the report shows that 100 per cent of these patients were worked except upon Sundays and bath days. The average number of patients were: September, 1918, 414; October, 415; November, 164; December, 262.⁷⁴

The segregation camp in Nantes was not as large as the one at St. Nazaire. The patients were derived from the Nantes region. For all classes of venereal disease segregated there, its report shows an average of 27 days for October, 1918, during which patients were away from their organizations; 37 days for November, and 35 days for December. All patients who were not confined to hospital worked full hours. In October, 99 were on full duty; in November and December, 65 and 81, respectively.⁷⁴

At Coetquidan the segregation camp reported 17 days for October, 17 days for November, and 15 days for December, for men away from their organizations. This was the smallest of the three camps. Its strength for the patients was 47 in September, 65 in October, 52 in November, and 39 in December.⁷⁴

It was the the intention to establish segregation camps in all training areas in Base Section No. 1, so that men whose organizations were undergoing intensive training could receive the benefit of treatment by specialists in urology, and thus would not lose time from training. These plans had been formed and were to be placed in operation as needed, but the signing of the armistice prevented their realization.⁷⁴

Segregation for venereal disease acted as a preventive of exposures, for the rate dropped from 2.42 per thousand in August to 0.86 per thousand in September, 1918, among the white troops in the District of St. Nazaire. Base Section No. 1 had derived another advantage in having established venereal segregation camps previous to the embarkation of troops for the United States, for its

camps were in working order when General Orders, No. 215, H. A. E. F., November 25, 1918, was issued ordering them established in all base ports.⁷⁴

Chief among the results obtained by the venereal segregation camps may be mentioned the complete segregation of patients with venereal disease during the infectious stages, the man power which was saved for the Government, and the accuracy of records which were made for the patients, especially those having syphilis.⁷⁴

The routine examination by dark field illumination of every venereal ulcer resulted in the early diagnosis and vigorous treatment of many cases of syphilis before the appearance of any secondary manifestations and possibly the rapid cure of such cases. This was of advantage both to the Government and the soldier.⁷⁴

The following tables show some of the results obtained at the venereal segregation camp, St. Nazaire, Base Section No. 1, A. E. F.⁷⁴

TABLE NO. 49.—Patients discharged from venereal segregation camp to duty, showing total number of days of treatment for venereal diseases, St. Nazaire, Base Section No. 1, A. E. F.

Diagnosis	Number of days of treatment	Number of patients	Average number of days
<i>September, 1918</i>			
Gonorrhoea:			
Acute, noncomplicated.....	77	2	38.5
Acute, complicated.....	379	8	47.3
Chronic.....	1,127	25	45
Chancroids:			
Complicated.....	1,159	25	46.3
Noncomplicated.....	289	13	22.2
Primary syphilis:			
Complicated.....	133	5	26.6
Noncomplicated.....	71	5	14.2
Secondary syphilis.....	104	8	13.
Tertiary syphilis.....	83	4	20.7
Total.....	3,422	95	36
<i>October, 1918</i>			
Gonorrhoea:			
Acute, noncomplicated.....	1,435	44	32.6
Acute, complicated.....	1,109	26	42.6
Chronic.....	9,936	243	40.8
Chancroids:			
Complicated.....	2,042	63	32.4
Noncomplicated.....	609	37	16.4
Primary syphilis:			
Complicated.....	505	23	21.9
Noncomplicated.....	123	11	11.1
Secondary syphilis.....	220	17	12.9
Tertiary syphilis.....	210	10	21
Total.....	16,189	474	34.4
<i>November, 1918</i>			
Gonorrhoea:			
Acute, noncomplicated.....	1,053	33	31.9
Acute, complicated.....	1,051	25	42
Chronic.....	2,499	64	39
Chancroids:			
Complicated.....	713	23	31
Noncomplicated.....	787	49	16
Primary syphilis:			
Complicated.....	277	13	21.3
Noncomplicated.....	101	11	9.1
Secondary syphilis.....	65	5	13
Tertiary syphilis.....	65	3	21.6
Total.....	6,611	226	29.2

TABLE NO. 49.—Patients discharged from venereal segregation camp to duty, showing total number of days of treatment for venereal diseases, St. Nazaire, Base Section No. 1, A. E. F.—Con.

Diagnosis	Number of days of treatment	Number of patients	Average number of days
<i>December, 1918</i>			
Gonorrhoea:			
Acute, noncomplicated.....	940	31	30.3
Acute, complicated.....	366	10	36.6
Chronic.....	653	19	34.4
Chaneroids:			
Complicated.....	1,443	57	25.3
Noncomplicated.....	1,011	64	15.8
Primary syphilis:			
Complicated.....	440	30	14.6
Noncomplicated.....	62	6	10.3
Secondary syphilis.....	376	26	14.5
Tertiary syphilis.....	155	7	22.1
Total.....	5,446	250	21.8
<i>January, 1919</i>			
Gonorrhoea:			
Acute, noncomplicated.....	1,565	60	26
Acute, complicated.....	911	21	43.3
Chronic.....	847	39	24.3
Chaneroids:			
Complicated.....	1,725	63	27.3
Noncomplicated.....	788	58	13.5
Primary syphilis:			
Complicated.....	214	17	12.5
Noncomplicated.....	234	21	11.1
Secondary syphilis.....	346	22	15.7
Tertiary syphilis.....	50	2	25
Total.....	6,680	303	22
<i>February, 1919</i>			
Gonorrhoea:			
Acute, noncomplicated.....	1,015	35	29
Acute, complicated.....	1,800	44	40.9
Chronic.....	1,123	35	32
Chaneroids:			
Complicated.....	980	70	14
Noncomplicated.....	1,550	62	25
Primary syphilis:			
Complicated.....	110	10	11
Noncomplicated.....	282	24	11.7
Secondary syphilis.....	225	15	15
Tertiary syphilis.....	120	5	24
Total.....	7,205	300	24
<i>March, 1919</i>			
Gonorrhoea:			
Acute, noncomplicated.....	3,701	90	41.1
Acute, complicated.....	935	21	44.5
Chronic.....	2,488	82	30.3
Chaneroids:			
Complicated.....	2,287	100	22.8
Noncomplicated.....	1,943	41	47.3
Primary syphilis:			
Complicated.....	1,186	31	38.3
Noncomplicated.....	609	12	50.7
Secondary syphilis.....	744	22	33.8
Tertiary syphilis.....	347	14	24.8
Total.....	14,240	413	34.4

TABLE No. 50—Average number of working days lost in hospital for each class of venereal disease, St. Nazaire, Base Section No. 1, A. E. F.

Diagnosis	Number of days	Number of patients	Average number of days
<i>October, 1918</i>			
Gonorrhoea:			
Acute, noncomplicated.....	440	44	10
Acute, complicated.....	320	26	20
Chronic.....	0	243	0
Chancroids:			
Complicated.....	945	63	15
Noncomplicated.....	0	37	0
Primary syphilis:			
Complicated.....	230	23	10
Noncomplicated.....	0	11	0
Secondary syphilis.....	0	17	0
Tertiary syphilis.....	100	10	10
Total.....	2,235	474	4.7
<i>November, 1918</i>			
Gonorrhoea:			
Acute, noncomplicated.....	119	33	3.6
Acute, complicated.....	514	25	20.5
Chronic.....	0	64	0
Chancroids:			
Complicated.....	460	23	20
Noncomplicated.....	105	49	2.1
Primary syphilis:			
Complicated.....	92	13	7
Noncomplicated.....	0	11	0
Secondary syphilis.....	28	5	5.6
Tertiary syphilis.....	42	3	14
Total.....	1,360	226	6
<i>December, 1918</i>			
Gonorrhoea:			
Acute, noncomplicated.....	55	31	1.7
Acute, complicated.....	119	10	11.9
Chronic.....	0	19	0
Chancroids:			
Complicated.....	815	57	14.3
Noncomplicated.....	30	64	.47
Primary syphilis:			
Complicated.....	157	30	5.2
Noncomplicated.....	0	6	0
Secondary syphilis.....	92	26	3.5
Tertiary syphilis.....	140	7	20
Total.....	1,408	250	5.6
<i>January, 1919</i>			
Gonorrhoea:			
Acute, noncomplicated.....	126	60	2.1
Acute, complicated.....	406	21	10.3
Chronic.....	39	39	1
Chancroids:			
Complicated.....	648	63	10.2
Noncomplicated.....	10	58	.17
Primary syphilis:			
Complicated.....	86	17	5
Noncomplicated.....	0	21	0
Secondary syphilis.....	26	22	1.18
Tertiary syphilis.....	0	2	0
Total.....	1,341	303	4.4
<i>February, 1919</i>			
Gonorrhoea:			
Acute, noncomplicated.....	70	35	2
Acute, complicated.....	572	44	13
Chronic.....	0	35	0
Chancroids:			
Complicated.....	744	62	12
Noncomplicated.....	30	70	0.4
Primary syphilis:			
Complicated.....	149	24	6.2
Noncomplicated.....	0	10	0
Secondary syphilis.....	35	15	2.3
Tertiary syphilis.....	0	5	0
Total.....	1,600	300	5.3

TABLE No. 50.—Average number of working days lost in hospital for each class of venereal disease, St. Nazaire, Base Section No. 1, A. E. F.—Continued

Diagnosis	Number of days	Number of patients	Average number of days
<i>March, 1919</i>			
Gonorrhoea:			
Acute, noncomplicated.....	306	90	3.4
Acute, complicated.....	459	21	21.8
Chronic.....	290	82	3.5
Chancroids:			
Complicated.....	565	41	13.7
Noncomplicated.....	299	100	2.6
Primary syphilis:			
Complicated.....	45	12	3.7
Noncomplicated.....	54	31	1.7
Secondary syphilis.....	65	22	2.9
Tertiary syphilis.....	0	14	0
Total.....	2,053	413	4.9

TABLE No. 51.—Daily average number of men with venereal disease on a duty status in the segregation camp, and the percentage actually worked, St. Nazaire, Base Section No. 1, A. E. F.

	Average daily number of men in segregation	Average daily number of men available for work (excluding Sundays)	Average daily number of men worked (excluding Sundays)	Percentage of available men worked (excluding Sundays)
<i>1918</i>				
September.....	401.20		* 220.23	* 54.89
October.....	415.40	315.13	260.94	82.80
November.....	164.17	141.63	141.63	100.00
December.....	262.39	210.51	210.51	100.00
<i>1919</i>				
January.....	322.77	277.00	277.00	100.00
February.....	675.93	563.40	563.40	100.00
March.....	786.80	680.32	680.32	100.00

* These figures include venereal patients in hospital and in segregation camp.

VENEREAL SEGREGATION CAMP, BASE SECTION NO. 5

Following the signing of the armistice, when thought was given to the return of our troops to the United States, the chief surgeon, A. E. F., recommended, on November 15, 1918, that officers and enlisted men returning to the United States from overseas be subjected to a physical examination previous to embarkation, and that all found to be affected with venereal disease in a communicable stage be detained and placed in segregation camps.⁷⁵ Such a measure was directed by general orders, G. H. Q., A. E. F., on November 25, 1918,⁷⁶ and since the required pre-embarkation physical examination was made at the American Embarkation Center, Le Mans, and at the base ports in France, these were the places where the largest venereal segregation camps were located. The venereal segregation camps in Base Section No. 1 already have been considered, but only from a pre-armistice standpoint. The venereal segregation camp at Camp Pontanezen, Brest, the port of Base Section No. 5, A. E. F., came into being in consequence of General Orders, No. 215, G. H. Q., A. E. F., November 25, 1918; therefore its activities essentially were those of an embarkation camp. A description of it is on the following page.

METHOD OF HANDLING PATIENTS WITH VENEREAL DISEASE

The method of handling venereal diseases at Camp Pontanezen was not always the same. When the quarantine camp was opened December 6, 1918, all men with venereal disease discovered among transient troops at Camp Pontanezen were sent to this quarantine camp for isolation and treatment; on the other hand, among permanent troops at Pontanezen and the other camps in and about Brest, all ambulatory cases of venereal disease were being treated in the organization.⁷⁷ For several weeks the venereal diseases at the quarantine camp were treated during the forenoon and a clinic for about 90 diseases among the permanent troops of Camp Pontanezen was held at Camp Infirmary No. 1 near the east gate of Pontanezen Barracks. However, in February, 1919, when the quarantine camp was given the name of segregation camp, and steps were taken to furnish it with personnel sufficient to operate it as a separate unit, orders were issued by the camp surgeon for all men with uncomplicated venereal diseases found at Camp Pontanezen be sent to the segregation camp. All men requiring hospital treatment for venereal disease continued to receive such treatment at Camp Hospital No. 33 and at other hospitals in and about Brest. It was not until June, 1919, when a hospital for the treatment of venereal diseases was opened at the segregation camp, that all men with venereal disease, whether from permanent or transient troops, and whether ambulatory or bedridden, were isolated and given treatment at the segregation camp. As soon as this hospital was opened the base surgeon, Base Section No. 5, issued orders that all men with venereal disease found in the base section were to be sent to this camp.⁷⁷

SEPARATE PLOTS FOR MEN WITH VENEREAL DISEASE, AND ENLISTED PERSONNEL

The segregation camp was subdivided into plots, each plot for persons of a designated status.⁷⁷ All white troops with venereal disease were quartered in one plot; colored troops with venereal disease received a separate tented area; and the enlisted personnel on duty at the camp had a separate plot for quarters and amusement grounds.

ADMISSIONS AND DISCHARGES

All admissions and discharges were made through one central office located in the administration building.⁷⁷ Venereal patients admitted with a definite diagnosis were assigned immediately to the venereal plot where, in a suboffice, record was maintained of their status and their treatment. Venereal suspects, sent for observation and diagnosis, were placed in a separate area known as the reception park, where the usual procedures adopted for establishing an affirmative or negative diagnosis were carried out before definite admission as a venereal patient was made. Upon discharge, patients were returned to their organizations, if the same were in Camp Pontanezen or vicinity, or to the casual camp at Fort Bougoen, through the port of Brest, if their organizations had embarked. A receipt was always given for a patient admitted, and a receipt was always received for each patient discharged.

CLASSIFICATION OF VENEREAL PATIENTS

All venereal patients were classified under one of three headings:⁷⁷ Class A—men with acute venereal disease who were able to move about but who were not physically fit for performing even light duty. These patients were marked "Sick—N. L. D." (not in the line of duty) and drew no pay for the period during which they were so classified; class B—patients not completely recovered, but who were able to perform light duty; class C—patients capable of performing full duty and who were assigned to various labor details throughout the camp. Class B and C patients were placed on a full-duty status and received pay.

POSITIVE DIAGNOSES

Positive diagnoses always were obtained before a course of treatment was begun.⁷⁷ All patients received the personal attention of a medical officer at least once daily, with the exception of syphilitics who were in the latter part of their course of treatment.

Gonorrhoea.—Gonorrhoea was positively diagnosed only when a urethral smear was shown to contain gonococci, following which these measures were employed:⁷⁷ Men with very acute gonorrhoea were kept in bed. Each such man was instructed to drink at least eight glasses of water daily, and to keep his bowels open. Upon reporting for treatment all men were instructed to urinate immediately, whereupon they received an intraurethral injection. The fluid, which consisted of acriflavine, was injected twice daily. This injection, retained for a period of five minutes, was continued twice daily until subsequent urethral smears showed a disappearance of gonococci. When such a disappearance had occurred, irrigations of one of the following solutions were used until the discharge ceased: Nitrate of silver from 1-5,000 to 1-10,000 strength; protargol one-fourth to one-half per cent; permanganate of potash from 1-3,000 to 1-10,000 strength. A patient was discharged when three successive urethral and prostatic smears proved to be negative for gonococci.

Chancroid.—A dark-field examination always was made of an ulcer to determine objectively the presence of *Spirochaeta pallida*.⁷⁷ When an ulcer first was treated it received only a cleansing with clean water. Then a dark-field examination was made. If the examination was negative, and the appearance of the ulcer indicated probable chancroid, a diagnosis of chancroid was made and a definite line of treatment was instituted. Each chancroid patient was ordered to cleanse his ulcer with soap and water every two hours. Twice daily equal parts of water and hydrogen peroxide were applied, and the pus containing secretions and crusts was removed. Then, unless contra-indicated, the first curative treatment consisted of the application of powdered crystals of copper sulphate for a period of 15 minutes, after which wet dressings of a saturated solution of boric acid were applied until the resulting slough separated. Then upon order of a medical officer who had just examined the ulcer, an attendant administered one of the following agents: Iodoform emulsion, 10 per cent; acriflavine, 1-1,000 solution; novarsenobenzol, 1-1,000 solution.

Syphilis.—Treatment was instituted for syphilis invariably as follows: In the primary stage when supported by a dark-field examination positive for *Spirochæta pallida*; in secondary and tertiary stages when clinical signs, together with a positive Wassermann and positive history, and in certain cases of secondary syphilis with a positive dark-field examination supporting the diagnosis. The drugs used were novarsenobenzol (billion); cyanide of mercury, 1 per cent solution in ampules of 1 c. c. (dose 0.01); gray oil, 40 per cent; intravenous injections were made as well as local applications to the chancre. The first course of treatment covered a period of 42 days and consisted of 8 administrations of novarsenobenzol, 6 of cyanide of mercury, and 6 of gray oil. The second course was given after an interval of 30 days from the first course. It covered a period of 30 days and consisted of 5 administrations of novarsenobenzol and 5 of gray oil. This treatment always was given regardless of the outcome of the Wassermann test.

LABOR DETAILS

As related in a preceding paragraph, all men with venereal disease were classified as A, B, or C patients. After the urologist had classified him, a patient was placed in a company which consisted only of patients of the same classification. Officers being treated for venereal disease were utilized in administering these companies. A company usually consisted of about 25 men, and the officer in charge was held responsible for the necessary discipline, detail, and general administration of his company. Company streets and definite areas of the segregation camp were assigned to venereal officer patients for maintenance of sanitary measures and general police. The companies were utilized in furnishing labor for all building and construction activities in the camp.⁷⁷

SEGREGATION CAMP HOSPITAL

The segregation camp hospital, which was opened June, 1919, was located near the center of the segregation camp and functioned as a distinct unit of the camp.⁷⁷ Its personnel consisted of one captain, Medical Corps, who was in charge, together with two captains, Medical Corps, as assistants, one registrar (Sanitary Corps officer), one property and supply sergeant, one sergeant in charge of the office, one druggist, and the usual staff of ward masters and attendants, the number of which varied according to the demands. There were five hospital barracks capable of accommodating 200 patients at a minimum. A fire station, medical supply depot, kitchen, and large portable sterilizer were part of the equipment. Patients were admitted to this hospital from the segregation camp and elsewhere in Base Section No. 5. Operations, necessary in genitourinary treatment, were performed, and with its full equipment and its provisions for the care of bed patients the institution functioned in every respect as a hospital.⁷⁷

LABORATORY

Because of the importance of laboratory findings as aides in making proper diagnoses, a laboratory was planned from the beginning when it was appreciated that treatment of many venereal patients would be required.⁷⁷ The treatment building as planned and built provided the necessary room. From

time to time equipment was received, consisting chiefly of microscopes and accessories. The routine examinations made were of smears for gonococci, and dark-field examinations for *Spirochæta pallida*. No equipment was available for making Wassermann tests; therefore, blood samples were sent to the base laboratory in Brest.

GUARD AND STOCKADE

Patients who had been sentenced by court-martial to confinement were isolated in a stockade maintained directly under the supervision of the Marine Corps guard of the segregation camp.⁷⁷ This stockade accommodated 35 prisoners and was inclosed by barbed wire; it was completely illuminated at night. The marine guard also maintained 12 guard posts in and around the segregation camp and allowed no one to enter or to leave the area without a pass signed by the commanding officer of the segregation camp. This guard was billeted in the area occupied by the prison stockade.⁷⁷

MESS

In providing messing facilities for the men quartered in the segregation camp area, measures had to be taken to provide a separate mess for each group of men.⁷⁷ The groups, individual members of which ate at a separate mess, were syphilitics, men with chancroids, gonorrhœa patients, and the Medical Department of the camp. A kitchen of the same type as the troop kitchens found in billeting areas of Camp Pontanezen was built. Special galleys through which persons passed to receive their food were set aside, one galley for each of the groups named above. All men used mess kits, received their food as they filed through the galley, and passed into a cement-floored mess hall which was divided into compartments, a portion segregated for the use of the group. After completion of the meal, all mess equipment was sterilized in boiling water contained in large French cauldrons. Separate cauldrons were set aside for the use of each group; each class used separate wash water entirely. All patients were marched to and from mess in military formation, in charge of officer patients, who maintained order and discipline during the meal hour. The officer patients dined at tables in a mess hall set aside for them. The personnel necessary to operate the kitchen and do kitchen police and similar duty was provided by the medical detachment of the camp; members of other groups never were allowed to have anything to do with the handling of food or utensils.

SANITATION

Special efforts were made to maintain a proper police.⁷⁷ Eight latrines of the dirt-pit type were located in convenient and appropriate places throughout the camp; each latrine accommodated 24 men at one time. The seats were scrubbed daily with soap and water; the interior sprayed with crude oil, and the seats with 3 per cent cresol solution. Each plot was given its lavatory, equipped also with cold showers; in addition, a main bathhouse, provided with 10 showers, was in operation, and patients were required to take at least two hot showers each week. From the time the kitchen was established, there

was a sullage drain, and in June, 1919, a sullage system to drain the entire segregation camp was established. Garbage was kept on a concrete rack and removed or incinerated daily. At one end of the kitchen was an inclosure used for incineration and as a washhouse for kitchen utensils. The drain from this washroom led into a grease trap, which in turn opened into a cesspool, whence a sullage drain led. Kitchens, latrines, and similar structures were inspected frequently by the chief of the medical service who acted as sanitary officer; daily inspections of food and conditions of the mess also were made by this officer. In conjunction with the drainage department of the camp surgeon's office, all stagnant water and possible breeding places for flies or mosquitoes in close proximity to the area were drained and sprayed with oil.

MAINTENANCE OF MORALE OF SEGREGATED PATIENTS

Owing to the marked depression of morale among these patients, due principally to a delayed departure for home, a policy was adopted based upon the honor system.⁷⁷ As soon as new companies were formed for the various battalions, they were assembled and given a talk by the commanding officer, who stated what he expected of the patients and explained the attitude which would be adopted toward them while in camp. They were informed that, although they had contracted a venereal disease, they would not at any time be treated in any fashion that would bring discredit to them as individuals. Medical treatment was considered first and foremost. They were told that although they had contracted a venereal disease, which of itself was evidence of an immoral act, in order to return to the United States they must follow out all instructions given them.

When the segregation camp was established, a wall tent was staked and used as a club or lounging room. A small canteen was erected and operated therein. Due to repeated disasters to the tent from wind and rain, the Young Men's Christian Association authorities were prevailed upon to furnish material for a permanent building. This they did; a large suitable hut was erected and known as "Butler hut," after the commanding general. It was furnished with admirable interior and exterior decorations. At a later period, when the segregation camp was expanded to include certain areas of Camp Pontanezen, a larger and more spacious hut, capable of accommodating 2,000 men and known as "Vermont hut," became incorporated in the segregation camp and was utilized for amusement and educational purposes. The "Butler hut" was set aside for educational purposes. Here, lectures upon citizenship and interesting topics of the day were given frequently, together with lectures upon more specific subjects by educational workers, each lecture having more of a practical than a theoretical character and being planned and given for its educational value. Concerts and special programs were arranged for each night in the "Butler hut" and in order that all might enjoy the recreation so furnished, special nights were set aside for each battalion. An athletic officer was appointed and baseball games, volley-ball matches, and tennis tournaments were arranged. Each recreation hut was provided with a moving-picture outfit operated by a Delco lighting system.⁷⁷

Although the honor system was the prevailing policy, strict military regulations always were enforced, battalions falling in for reveille and marching in company and battalion formations to and from mess, although in the segregated area of the camp proper, and strict attention was asked and compelled of each man to be in correct and neat military attire. Every Sunday morning an inspection and review of the entire provisional regiment was made either by the commanding officer or—as was frequently the case—by an invited general officer passing through or visiting this section. The base commanding general and camp commanding general at all times showed a direct interest in the camp and frequently held these reviews, where, if possible, a band was arranged to be present.⁷⁷

Classes of an educational character were extremely popular and no doubt helped considerably in producing a desired morale among the patients. It was a camp maxim that every patient, as far as possible, should leave the camp with a better military appearance than when he entered it. If an enlisted man brought his rifle with him, that rifle habitually was inspected daily by the commanding officer of the company and again at each Saturday inspection. As evidence of the success of such methods in producing a good morale, intense interest and cooperation was given by the officers and the men themselves in any duty that they were asked to perform, and everywhere it was evident that each person was endeavoring to cooperate to his full capacity.⁷⁷

At no time during the life of the camp was barbed wire of any character used as a means of confinement for men whose only reason for being in the camp was to secure treatment for venereal disease; however, stockade was provided for general prisoners undergoing treatment. Although guards were placed at intervals on the outskirts of the camp, and written passes, properly stamped by the camp headquarters, were required by patients passing the guard, it was quite an infrequent occasion for a patient to absent himself from the camp proper. No man was ever court-martialed for being absent without leave from its confines, nor was any one ever tried for drunkenness, breach of discipline, or similar offenses.⁷⁷

The medical officers on duty were instructed to educate the patients regarding their condition.⁷⁷ Before patients were discharged, medical officers in charge of battalions gathered their respective patients together before their departure and gave them personal talks relative to their conditions and gave each man about to be discharged a slip on which was printed the treatment which had been taken and what future treatment was advised. Any questions that were troubling the men were answered and every effort was made to encourage the men regarding their future careers.

EXPANSION OF THE SEGREGATION CAMP

The capacity of the segregation camp previous to June, 1919, was about 1,500. During June, when the segregation camp hospital was opened, the base surgeon, Base Section No. 5, directed that all venereal patients in the base section were to be sent to the segregation camp for treatment.⁷⁷ This necessitated an increase in the capacity of the segregation camp. Toward the latter part of June detachments of venereal patients, varying from 25

to 100 patients per detachment, were received by the camp from isolated points in France where American activities had been discontinued. Early in July all of the venereal patients in the Army of Occupation were received from hospital trains. All of these additions to the camp required extensive additions to the treatment facilities; therefore, the camp was reorganized somewhat in order to facilitate the treatment of such large numbers of patients.⁷⁷

All patients were formed into battalions, of which, on July 22, 1919, there were six. These battalions were then formed into a provisional regiment. The administration of this regiment was carried out according to Army Regulations, with officer patients as regimental commander, battalion commanders, company commanders, adjutants, and the like. The regimental commander was made directly responsible to the commanding officer of the segregation camp.

In order to facilitate the medical treatment of the patients, medical officers were placed in charge of each battalion.⁷⁷ In the area occupied by the battalion three medical-treatment buildings were erected, one for the treatment of gonorrhoea, completely equipped with irrigators, and troughs with adequate drainage; another for medical officer's examining room, and still another for the treatment of venereal ulcers. The building which had served as a treatment building during the earlier months of the camp was set aside for a laboratory, a room for the examination of new patients, a discharge office, administration office of the genitourinary department, and as the main office of the genitourinary chief.

Despite the erection of six sets of treatment buildings, congestion still existed, chiefly owing to the fact that patients were sent outside of the segregation camp on labor details for duty in Camp Pontaneze proper.⁷⁷ The congestion resulted from the fact that these labor details returned to the segregation camp for their noon meal, after which they received another treatment and then went out on the detail again. The treatment of these patients thus was concentrated too much into the space of one or two hours of the day.

The expansion of the segregation camp so extended it as to envelop troop kitchen No. 15. Request was made and granted that this kitchen be set aside for the use of the segregation camp, additional kitchen facilities being required to accommodate the large increase in patients.⁷⁷ The original camp kitchen, which was located at practically the center of the segregation camp, was converted into a large administration and treatment building for chronic venereal diseases which comprised the greater number of venereal patients being treated. By utilizing and remodeling this kitchen and mess hall, patients could file through each alley into spacious treatment buildings at the rate of 4,000 gonorrhoea patients and 2,000 ulcer patients in one and one-half hours. These buildings were provided with concrete floors, and an elaborate drainage system was in use. Each department had a complete equipment of the necessary genitourinary supplies, there being 200 urethral irrigators in the gonorrhoea department for one room alone. One room was set aside for making urethral and prostatic smears. Here it was possible to handle as many as 1,000 smears in one day. At one end of this building was placed a laboratory, completely equipped, and

provided with the necessary personnel for conducting purely research work on chancroids alone. By this arrangement of the building, it was possible for a large number of venereal patients to be employed outside on labor details, to return, pass through the alley, have a medical examination made, pass urine into glasses for the medical officer to examine, and have the proper treatment prescribed for them. Only chronic venereal patients who were being given a treatment of a daily routine character were sent through this building. Class A patients, with acute venereal disease, or having slight complications, were kept for treatment in the battalion area where the medical treatment buildings erected for each battalion were set aside especially for them. This gave a positive assurance that all patients with acute disease received 2, 3, 4, or 5 treatments, if necessary, each day. Where congestion formerly existed, it was positively assured that all patients of this type were not neglected.⁷⁷

The prison stockade, which was located within the confines of the segregation camp, was enlarged also in order to accommodate the large influx of cases which required confinement under guard. It was doubled in capacity.⁷⁷

While an increase of patients did not call for a corresponding increase in clerical force, nevertheless a certain amount of such increase resulted; therefore, a large admittance and discharging office was established close to the main entrance of the segregation camp and adjoining the main treatment building.⁷⁷ At the other end of this main treatment building, the main clerical force was established in offices, and offices for the commanding officer and adjutant were located. The building which hitherto had been used as the main administration building was converted into quarters for the commissioned personnel on duty at the camp. As a result, there was a beautifully situated plot near the entrance to the camp set aside entirely for quarters for officers.

Details were furnished from the segregation camp, not only for its own internal use but also for sanitary police and other duties in and around Camp Pontanezen proper.⁷⁷ Two officers were detailed for duty as "detail officers in charge." The rosters of the various details were made from the "classification of patients" list, and men were allotted to various details, an officer patient being in charge of each detail.

Officer patients were utilized in other ways also.⁷⁷ Those officer patients belonging to the Engineer Department were given engineer duties in the camp. One such officer acted as the segregation camp representative of the camp engineer of Camp Pontanezen. This greatly facilitated securing the necessary outside construction materials and the quick dispatch of the construction being carried out in the camp.

COMPARATIVE INCIDENCE OF VENEREAL DISEASE

For comparison of the incidence of venereal disease as it occurred in the various sections and larger organizations of the American Expeditionary Forces, the period comprising the weeks ending September 18, 1918, and June 25, 1919, have been selected: The weekly report of venereal diseases, giving the strength of each organization reported upon, was put into effect the latter part of August, 1918;⁵² consequently, figures antedating that time can not be used as it is possible to do with subsequent figures. During June, 1919, the numerical strength of the American Expeditionary Forces had been so reduced, by reason of repatriation of these forces that, by the end of that month, relatively few remained in France. However, the period chosen comprises the fall of 1918,

during which our combat troops were actively engaged at the front, where relatively slight opportunity existed for contact with venereal disease; also, included within this period is the armistice, during which the movement of our troops from the zone of the armies to the Services of Supply, thence homeward, was effected. Furthermore, during the winter of 1918-19 and the spring of 1919, what with the establishment of a liberal leave policy and the occurrence of a greater possibility of infective contact with venereal disease by reason of the proximity of a greater number of our troops to cities and towns than had obtained during the period of hostilities, a greater incidence of venereal disease naturally was to be expected. Such a time as the armistice, then, proved to be a real test of the quality of our organization for the prevention of venereal disease, as exemplified in Table No. 52, which shows the weekly incidence of venereal disease by section and organization for the period under consideration. In this table, because of the changes made from time to time in the required system of reporting the incidence of venereal diseases, certain seeming hiatuses appear. These may be explained as follows: In the combat organizations, during 1918, weekly reports of venereal disease frequently were not made;⁵² the beginning of some sections and organizations and the ending of others occurred within the limits of the period considered.

TABLE 52.—Incidence of venereal diseases by weeks in base sections and organizations of the A. E. F.⁷⁸

Week ending—	Sections											
	Advance Section			Intermediate Section			Base Section No. 1			Base Section No. 2		
	Strength reported on	Cases	Annual rate per 1,000	Strength reported on	Cases	Annual rate per 1,000	Strength reported on	Cases	Annual rate per 1,000	Strength reported on	Cases	Annual rate per 1,000
1918												
Sept. 18	622,076	232	19.39	183,429	183	51.88	74,057	35	24.58	73,590	102	72.08
25	522,638	257	25.57	227,236	238	54.46	86,618	55	33.02	57,697	82	73.90
Oct. 2	481,133	264	28.53	211,477	249	61.23	91,355	62	35.29	83,247	140	87.46
9	448,121	262	30.40	221,070	189	44.46	91,028	57	32.56	97,012	179	95.94
16	417,195	263	32.78	219,279	258	61.18	109,297	65	30.92	114,496	125	56.77
23	484,154	254	27.28	237,154	287	62.93	108,593	81	38.79	101,746	12	6.13
30	475,512	349	38.17	233,935	268	59.57	112,760	77	35.51	108,680	129	61.72
Nov. 6	412,103	261	32.93	226,532	314	72.08	98,845	117	61.55	116,844	206	91.68
13	501,513	326	33.80	235,000	349	77.22	109,991	76	35.93	78,756	107	70.65
20	445,279	275	32.11	267,146	306	59.56	92,886	62	34.71	96,964	105	56.31
27	560,824	293	27.17	270,527	301	57.86	99,481	130	67.95	128,763	159	64.21
Dec. 4	393,892	238	31.42	246,406	249	52.55	103,755	136	68.16	106,846	172	83.71
11	294,031	245	43.33	198,300	219	57.43	106,282	117	57.24	105,414	162	79.91
18	207,286	123	30.86	164,595	140	44.23	98,942	105	55.18	98,619	150	79.09
25	202,367	157	40.34	169,271	176	54.07	96,213	91	49.18	85,962	92	55.65
1919												
Jan. 1	202,439	162	41.61	161,005	160	51.68	95,667	107	58.16	114,105	160	72.92
8	186,770	108	30.07	154,543	167	56.19	104,012	128	63.99	84,090	90	55.65
15	148,824	139	48.57	134,151	193	74.81	90,051	78	45.04	97,884	102	54.18
22	167,402	95	29.51	117,114	132	58.61	85,637	163	98.98	101,742	212	108.35
29	147,296	121	42.72	143,105	216	78.49	104,260	129	64.34	103,623	173	86.81
Feb. 5	148,832	162	56.60	110,921	137	64.23	100,191	78	40.48	96,237	92	49.71
12	140,176	137	50.82	142,054	411	51.61	106,237	84	41.12	101,817	114	58.22
19	121,212	98	42.04	157,137	151	49.97	119,635	142	72.29	130,759	84	33.40
26	154,411	150	50.51	114,911	147	66.52	119,302	62	31.51	112,123	96	44.52
Mar. 5	187,707	83	22.99	101,797	106	54.15	102,302	95	41.29	90,872	129	73.82
12	134,344	107	41.42	102,101	93	47.36	88,478	66	38.79	122,114	85	36.20
19	134,343	107	41.42	119,747	93	40.39	97,598	66	35.16	141,719	96	35.22
26	130,515	95	37.85	93,179	76	42.41	107,512	63	30.47	125,375	108	44.79
Apr. 2	121,107	89	38.21	89,538	118	68.53	83,190	50	31.25	115,861	83	37.25
9	169,626	128	39.24	88,053	72	42.52	64,159	35	28.37	114,030	80	36.48
16	195,641	160	42.53	82,764	93	58.43	87,137	52	31.03	108,160	85	40.87
23	212,973	171	41.75	78,452	71	47.06	99,897	50	26.93	90,140	119	68.65
30	148,099	119	41.78	80,054	82	53.26	82,492	107	67.45	85,511	110	66.89
May 7	131,576	125	49.80	77,309	73	49.10	109,779	74	35.05	80,804	96	61.78
14	120,385	152	65.66	80,235	69	44.72	93,044	62	34.65	71,208	76	55.50
21	98,246	171	90.51	43,457	18	21.54	72,505	82	58.81	54,602	92	87.62
28	56,741	36	32.99	59,896	90	78.14	77,111	90	69.69	52,081	91	90.86
June 4	28,900	30	53.98	48,738	27	28.81	71,157	84	61.39	48,872	117	124.49
11	22,247	29	67.78	41,276	21	26.46	79,252	101	66.27	40,534	99	127.90
18	18,252	40	113.96	37,951	64	87.69	65,809	213	168.31	35,953	196	283.48
25				24,372	40	85.34	70,282	165	122.08	16,878	81	249.56

TABLE 52.—Incidence of venereal diseases by weeks in base sections and organizations of the A. E. F.—Continued

Week ending—	Sections											
	Base Section No. 3			Base Section No. 4			Base Section No. 5			Base Section No. 6		
	Strength reported on	Cases	Annual rate per 1,000	Strength reported on	Cases	Annual rate per 1,000	Strength reported on	Cases	Annual rate per 1,000	Strength reported on	Cases	Annual rate per 1,000
1918												
Sept. 18.....	10,186	19	97.00	7,333	9	63.82	4,987	16	166.83	2,889	18	323.99
25.....	9,396	16	88.55	4,433	7	82.11	7,213	24	175.02	4,083	25	318.39
Oct. 2.....	16,610	17	53.22	3,961	5	65.64	9,635	13	70.16	4,787	7	76.04
9.....	12,764	8	32.59	3,085	6	101.13	10,292	6	30.31	2,182	7	166.82
16.....	12,783	3	12.20	3,370	5	77.15	9,293	29	162.80	6,078	13	111.22
23.....	39,646	62	81.32	3,823	4	54.41	11,845	13	57.07	7,415	18	126.23
30.....	9,634	33	78.12	3,780	7	96.30	12,949	27	108.43	8,968	48	278.32
Nov. 6.....	33,348	54	84.20	4,498	7	80.92	13,168	17	67.13	9,169	18	102.08
13.....	34,859	46	68.62	6,516	4	31.92	15,772	19	62.64	9,328	13	72.47
20.....	3,498	22	327.04	8,006	7	45.47	12,723	15	61.31	8,483	26	159.38
27.....	35,762	27	39.26	5,014	14	145.19	18,938	19	52.17	14,555	61	217.93
Dec. 4.....	8,815	10	58.99	4,688	0	0	15,540	16	55.54	5,997	9	91.82
11.....	879	7	414.11	4,610	12	135.36	17,565	16	47.37	8,971	25	144.91
18.....	4,213	3	37.03	9,234	9	50.68	34,350	34	51.47	7,909	35	230.12
25.....	12,287	9	38.09	8,875	9	52.73	26,584	29	56.73	7,232	29	208.52
1919												
Jan. 1.....	1,966	0	0.00	8,611	15	90.58	37,175	44	61.55	6,410	23	186.58
8.....	1,344	4	154.76	7,369	14	98.79	17,100	23	69.94	9,498	27	147.82
15.....	1,966	0	0.00	7,218	8	57.63	30,740	13	21.99	8,611	23	138.89
22.....	3,683	7	98.83	6,120	12	101.96	33,151	24	37.64	8,146	35	223.42
29.....	2,497	3	62.47	5,683	14	128.10	34,821	39	58.24	8,596	10	60.49
Feb. 5.....	1,705	2	61.00	6,601	9	70.90	32,832	33	52.27	8,423	32	197.55
12.....	2,570	4	90.93	6,017	11	95.06	36,146	37	53.25	13,911	23	85.98
19.....	4,957	1	10.49	5,588	7	65.14	40,089	52	67.45	15,162	31	106.32
26.....	5,224	14	139.36	4,587	5	56.68	40,136	44	57.01	23,485	18	39.86
Mar. 5.....	5,235	12	119.20	5,762	8	72.20	57,441	36	32.59	20,150	19	49.03
12.....	6,080	8	68.42	4,219	3	36.98	58,479	29	25.79	19,400	17	45.57
19.....	5,436	10	95.66	3,848	6	81.08	66,989	76	58.99	12,313	18	76.02
26.....	3,936	8	105.69	3,772	7	96.50	70,464	65	47.97	26,484	17	33.38
Apr. 2.....	3,898	3	40.02	3,827	8	108.70	64,936	44	35.22	17,238	9	27.15
9.....	3,957	12	157.70	3,612	0	0	61,195	52	44.19	14,686	20	70.82
16.....	3,909	2	26.61	3,455	1	15.05	76,171	80	54.61	14,186	22	80.64
23.....	3,063	1	17.32	3,864	6	80.75	54,767	64	60.77	13,913	16	59.80
30.....	4,041	1	12.87	.....	.....	.....	65,738	63	49.82	10,809	4	19.24
May 7.....	3,130	3	49.84	.....	.....	.....	76,814	51	34.52	15,868	12	39.32
14.....	3,105	1	16.75	.....	.....	.....	90,953	66	37.73	8,383	20	121.17
21.....	2,966	2	35.06	.....	.....	.....	105,277	79	39.02	13,472	52	200.71
28.....	2,969	2	35.03	.....	.....	.....	109,867	94	44.49	7,065	40	294.41
June 4.....	2,776	0	0.00	.....	.....	.....	119,346	68	29.63	4,727	19	209.01
11.....	2,448	3	63.72	.....	.....	.....	107,670	89	42.98	7,682	31	209.84
18.....	.....	.....	.....	.....	.....	.....	100,020	87	45.23	.....	.....	.....
25.....	.....	.....	.....	.....	.....	.....	89,559	88	51.09	.....	.....	.....

Week ending—	Sections											
	Base Section No. 7			Base Section No. 9			District of Paris			Arrondissement of Tours		
	Strength reported on	Cases	Annual rate per 1,000	Strength reported on	Cases	Annual rate per 1,000	Strength reported on	Cases	Annual rate per 1,000	Strength reported on	Cases	Annual rate per 1,000
1918												
Sept. 18.....	3,279	5	79.29	.....	.....	.....	8,354	14	87.14	.....	.....	.....
25.....	8,446	15	92.35	.....	.....	.....	15,924	33	107.76	.....	.....	.....
Oct. 2.....	8,530	15	91.44	.....	.....	.....	14,176	33	121.05	.....	.....	.....
9.....	14,816	17	59.67	.....	.....	.....	19,766	52	136.80	.....	.....	.....
16.....	3,755	7	96.94	.....	.....	.....	19,188	27	73.17	.....	.....	.....
23.....	15,780	7	26.42	.....	.....	.....	16,935	37	113.61	.....	.....	.....
30.....	14,636	26	92.37	.....	.....	.....	19,006	63	172.37	.....	.....	.....
Nov. 6.....	5,426	4	38.33	.....	.....	.....	9,754	19	101.29	.....	.....	.....
13.....	22,087	31	72.98	.....	.....	.....	16,052	42	136.06	.....	.....	.....
20.....	11,762	24	106.10	.....	.....	.....	8,004	67	435.28	.....	.....	.....
27.....	11,903	28	122.32	.....	.....	.....	8,552	47	285.78	.....	.....	.....
Dec. 4.....	11,009	17	80.30	.....	.....	.....	8,061	19	122.57	.....	.....	.....
11.....	10,576	15	73.75	.....	.....	.....	7,792	31	206.88	.....	.....	.....
18.....	12,652	30	123.30	.....	.....	.....	9,426	19	104.82	.....	.....	.....
25.....	11,232	25	115.74	.....	.....	.....	15,954	47	153.19	.....	.....	.....

TABLE 52.—Incidence of venereal diseases by weeks in base sections and organizations of the A. E. F.²⁸—Continued

Week ending—	Organizations									Total A. E. F.		
	Division troops			American embarkation center, Le Mans			First replacement depot			Strength reported on	Cases	Annual rate per 1,000
	Strength reported on	Cases	Annual rate per 1,000	Strength reported on	Cases	Annual rate per 1,000	Strength reported on	Cases	Annual rate per 1,000			
1918												
Sept. 18										990,180	633	33.24
25										943,684	752	41.44
Oct. 2										924,911	805	45.26
9										920,136	783	44.25
16										914,704	795	45.19
23										1,025,091	775	39.31
30										999,860	1,027	53.41
Nov. 6										929,687	1,017	56.88
13										1,029,883	1,013	51.15
20										954,751	909	49.51
27										1,154,319	1,079	48.61
Dec. 4	373,973	70	9.73							1,278,082	936	38.08
11	555,226	173	16.20							1,323,112	1,024	40.24
18	553,047	265	24.92							1,430,400	942	34.24
25	489,084	160	17.01							1,451,255	906	32.46
1919												
Jan. 1	455,741	196	22.36							1,412,391	1,050	38.66
8	121,799	57	24.34							1,355,225	1,001	38.41
15	167,749	73	22.63							1,390,969	988	36.94
22	172,836	82	24.67							1,388,604	1,014	37.97
29	136,457	62	23.63							1,400,374	1,116	41.44
Feb. 5	165,574	113	35.49							1,398,136	996	37.04
12	113,918	35	15.98							1,333,639	870	33.92
19	142,537	103	37.58							1,429,961	959	34.87
26				208,942	71	17.67				1,373,684	968	36.64
Mar. 5				160,907	76	24.56				1,342,842	795	30.79
12				134,667	54	20.85				1,256,839	787	32.56
19				140,647	65	24.03				1,306,182	855	34.04
26				121,645	71	29.35	25,583	57	115.86	1,235,636	900	37.88
Apr. 2				120,576	58	25.01	25,134	29	60.00	1,175,185	807	35.71
9				114,939	66	29.86	23,114	20	44.99	1,126,639	751	34.66
16				101,557	58	29.70	22,121	28	65.82	1,097,119	814	38.58
23	116,462	79	35.27	90,631	79	45.33	20,724	29	72.77	1,041,873	837	41.77
30	121,240	71	30.45	73,981	54	37.96	20,214	17	43.73	916,683	743	42.15
May 7	67,193	40	30.96	97,265	69	36.89	22,256	36	84.11	925,237	721	40.52
14	73,758	32	22.56	95,804	107	58.08	22,894	9	20.44	882,821	724	42.65
21	61,737	61	51.38	99,683	151	78.77	21,359	8	19.48	754,663	814	56.09
28	20,843	29	72.35	112,080	96	44.54	21,055	17	41.99	667,610	690	52.95
June 4	20,995	18	44.58	144,470	154	55.43	20,352	8	20.44	670,837	643	51.37
11				110,770	113	53.05	19,591	13	34.51	584,463	624	55.52
18				67,860	102	78.16				482,742	845	91.02
25				26,666	72	140.40				253,282	482	98.96

PROSTITUTION IN ITS RELATIONSHIP WITH THE AMERICAN FORCES IN GERMANY ^d

At the beginning of the occupation, prostitution in American occupied territory was regulated by the Germans under the Prussian law. The essential provisions in this law were as follows:

Professional prostitutes were required to appear for examination at certain places and on certain days. If found to be affected with syphilis, chancroid, or gonorrhoea, they were compelled to undergo medical treatment. In order to facilitate this medical treatment, it was the custom to designate certain public consultation hours. If the persons affected with any of the above diseases did not visit the physician during these consultation hours with sufficient frequency, or if suspicion existed that they carried on their trade in spite of their disease, they were immediately removed to hospital, where they were confined until a cure had been effected. There were, of course, local rules

^d Abstracted from report from the officer in charge of civil affairs, A. F. G., to the chief of staff, A. F. G., March 4, 1920. Subject: Report on military government. Copy on file, Historical Division, S. G. O.

and customs for the purpose of carrying out the provisions of this law, all of which were unsatisfactory in obtaining any diminution in prostitution and its results. Under this law, it was the practice of the Germans to arrest a woman on the bare suspicion that she was a prostitute. She was often deprived of her liberty for many days, while an exhaustive laboratory investigation was made to determine her state of health. During this period she was also subjected to questioning by the police, for the purpose of obtaining if possible an admission that money had been received from men with whom she had consorted. If during the questioning the answer was "Yes," she was then brought to trial and practically invariably convicted of carrying on the trade of prostitution without a license. If she said "No," even under severe police pressure, she was then ipso facto not a professional prostitute. In either case, she was examined medically before being placed before a judicial tribunal for trial. In either case, also, if found diseased by the medical examiner, she was sent to hospital for treatment and kept confined until cured. If a pecuniary transaction was admitted and if sent to hospital, she might be kept there for weeks or even months and, when released, brought before a civil court, which always inflicted severe punishment. No consideration was given to the fact that the woman may have been confined in hospital for a long period of time. In case of a woman who denied the taking of money and who was found to be diseased, she was treated in hospital until cured and then released unconditionally. If found not diseased, she was released in a similar manner, after the few days necessary for the examination. It may be readily understood that only the very young and unsophisticated women made admission of their financial dealings and were punished, and that the older, better informed and more dangerous ones made persistent denials and so escaped punishment. After serving sentence of confinement for practicing prostitution without a license, the woman came under what is called "Control"; i. e., she was required to report regularly for examination to the Kreisarzt or his representative. By this system, very young girls, frequently 14 or 15 years of age, who possibly by other methods might be saved from this kind of life, were practically forced into it; old, hardened, sophisticated women, often suffering from dangerous chronic diseases, were not under any surveillance or control except in the case of positive laboratory findings. This dependency upon a laboratory diagnosis had a twofold danger. First, any married woman infected by her husband, innocent herself of any wrongdoing, might be arrested upon suspicion or false accusation of a spiteful neighbor and deprived of her liberty for months at a time in a prison hospital, and this without ever having been before a judicial tribunal of any kind. This happened not once, but many times, during the period of American occupation. Second, a professional prostitute, affected with a chronic, incurable gonorrhoea, if the laboratory diagnosis was negative, was set free to resume her trade unmolested for the time being. It is a well-known fact that laboratory findings in chronic gonorrhoea will be positive at times only. From the beginning of the occupation until October 18, 1919, the Third Army made use of this German civil procedure, merely adding the expedient of deporting, without trial, such persons as seemed undesirable and bringing them before a military court if they returned. This order of deportation, however, was not effective, for the reason that it consisted merely of the words "expelled from American territory," written on some part of a personal *Ausweis* (pass). It was expected that the

German police on duty at the railway station, instructed to that effect, would promptly turn back any persons coming into American occupied territory with such an *Ausweis*. The practical fact, however, was that the German police merely glanced at the *Ausweis* and seldom read, or perhaps could not read, the English words thereon. Late in 1919, the military authorities adopted the procedure of issuing this order in writing to each person deported. This was in effect, however, for only a short time before the regulations of October 18, 1919, which regulations changed the whole course of procedure. In spite of tremendous activity, however, under the German civil methods of procedure, large numbers of arrests and large numbers of persons sent to hospital for treatment, the venereal rate of the army slowly but steadily increased from the week of January 17, 1919, when it was at the remarkably low figure of 9 per 1,000 per annum, to the extremely high figure of 422.65 per 1,000 per annum on October 21, 1919.

Although the proceedings already outlined as those of the German civil procedure were carried out vigorously, numerous prophylactic stations were provided and the use of prophylaxis was urged. The German civil hospital in Coblenz became so overcrowded with women suffering from venereal disease that it was unable to perform its functions in regard to other diseases. Hospital accommodations therefore were set up by the Landrate of the various Kreise, either at the chief town of the Kreis or in a neighboring town, under orders from the office of civil affairs, A. F. G. Orders were also issued requiring that all women arrested in any Kreis and found to be suffering from venereal disease should be confined in hospital and treated in the Kreis in which arrested. Constant vigilance was required, however, to prevent both the military authorities and the civil officials from sending cases of this kind to the Coblenz hospital. On account of the overcrowding of the Bürger Hospital of Coblenz, it became necessary to establish quarters for these women in some other place, and to relieve the burden which was interfering with the proper work of the hospital. In the latter part of July, 1919, after considerable pressure exerted by the office of civil affairs, the bürgermeister selected the building of the Staatsarchiv, and removed a sufficient number of the records therein to provide dormitories and proper treatment rooms for 61 patients. The hospital was established against the desires and wishes of the civil authorities and in spite of all obstacles they could place in the way of getting the necessary premises, the apparent desire being to induce the military authorities to provide hospital accommodations for this purpose. Place after place was suggested by them and rejected by other civil authorities or by the army, as unsuitable or undesirable. Pressure was continued, however, until the Staatsarchiv was selected and fitted up for the purpose. The place was prepared and formally opened on August 14, 1919. From this date until the end of November following, it received and cared for 347 cases of venereal disease, distributed as follows:

Disease	August	September	October	November	Total
Gonorrhœa.....	140	70	53	27	290
Syphilis.....	11	2	5	6	24
Chaneroid.....				1	1
Syphilis and gonorrhœa.....	8	14	7	2	31
Chaneroid and gonorrhœa.....			1		1
Total.....	159	86	66	36	347

There remained on November 30, 1919, the following cases: Gonorrhœa, 22; syphilis, 7; chancroid, 4; syphilis and chancroid, 10; total, 43.

The following points with regard to these figures are to be noted: The marked and steady diminution in the total number of cases; the marked and steady diminution in the cases of gonorrhœa; the increase in the proportion of the cases of syphilis and the remarkably small number of chancroidal infections.

During the operation of this hospital, the great difficulty was to keep the women properly employed. The large majority of the inmates were perfectly able to do any kind of manual work. There was not, however, enough work in the hospital to keep them all busy, and it was difficult, in the presence of this idleness, to maintain discipline and order. Some occupation was provided by turning one of the rooms into a reading room and providing books and reading matter for the patients. Many attempts were made to obtain sewing and other employment, but without result, all who had such work to give out refused to give it to the hospital, on account of the supposedly dangerous maladies with which the patients were affected. Attempts were also made to give lessons in English to such of the inmates as desired them. This also had to be discontinued, on account of the small number who were desirous of doing this work. A series of readings was arranged for, but was discontinued for the reason that only a few of the inmates cared to attend. These readings were not religious nor instructive, but intended merely to be interesting or amusing. Religious services, Catholic through the German authorities, and Protestant through the Salvation Army, were held later.

Realizing that the methods in use were not producing any effect on the venereal rate, nor reasonably protecting the army from venereal infection, the following regulations were put into effect on October 18, 1919:

HEADQUARTERS AMERICAN FORCES IN GERMANY,
Coblenz, Germany, October 15, 1919.

Civil Affairs Bulletin No. 34.

VAGRANTS AND JUVENILES

1. There is hereby created a court for vagrants and juveniles. The court shall consist of one officer and shall be appointed by the officer in charge of civil affairs, Coblenz. The territorial jurisdiction of the court shall be coextensive with the zone of American occupation.

2. A vagrant within the meaning of this order is:

(a) Any person whose usual place of abode is outside of the zone of American occupied territory, present therein without visible means of support.

(b) Any woman who solicits or has illicit sexual intercourse with any person serving the United States or any associated government.

3. A juvenile offender within the meaning of this order is any person under the age of 16 years who violates a law of war or any order of the American military authorities.

4. Any male person found guilty as a vagrant shall be punished by imprisonment for not less than two and not more than six months.

5. Any woman found guilty as a vagrant:

(a) Shall be punished by indeterminate imprisonment for not less than two months nor more than six months.

(b) She shall, immediately following conviction, be examined by a physician designated by the chief sanitary officer, office of civil affairs, A. F. in G., and if found infected with venereal disease shall be confined in the hospital for treatment until released from such hospital by authority of said chief sanitary officer. Time of confinement shall be counted as a part of the sentence of imprisonment.

6. Vagrants under such terms and conditions as the court may prescribe may be released from imprisonment by order of the court, provided no woman in the hospital under treatment for venereal disease shall be so released. A vagrant whose usual place of abode is outside the zone of American occupation may be ordered deported, and the sentence of imprisonment suspended during his or her absence therefrom.

7. A juvenile offender on conviction may be sentenced to pay a fine of not exceeding 5,000 marks and to imprisonment not exceeding six months, or to both such fine and imprisonment. On conviction, such an offender, according to his age and circumstances and the nature of the case, may be delivered by order of the court into the custody of civil authorities, for such confinement as the court may direct, in a reformatory or industrial school, or into the custody of his parents or guardian. Periodical reports will be required by the court at such times as the court may order, as to the conduct of any juvenile offender delivered into the custody of civil authorities, parents, or guardians.

8. No sentence or order of the court shall be put into effect until approved by the authority appointing the court.

By command of Major Allen.

WM. W. HARTS, *Chief of Staff.*

Official:

S. G. TALBOTT, *Adjutant General.*

RECAPITULATION

1. Reliance was placed at first on: (a) Medical examination of women; (b) hospitalization of women suffering from venereal disease; (c) prophylaxis for men; (d) antifraternization regulations. Later was added: (e) Deportation of undesirable persons. On October 18, 1919, were added: (f) Prostitution made a crime; (g) vagrancy court established and operated for purpose of making proof of actual prostitution unnecessary.

2. Deductions. 1, (a) and (b) would not protect against venereal disease; 2, (c) did not add sufficient protection, as statistics showed that half the men contracting venereal disease had taken prophylaxis (probably improperly, since properly taken it insures almost complete immunity); 3, (d) prevented only the better class of women from associating with soldiers, and did not prevent the worst class of dissolute women from so doing; 4, (e) helped but little, because deported persons returned with slight interference, as was shown by investigation of German police methods at railway stations.

The activities of the vagrancy court undoubtedly diminished the number of exposures to venereal disease, and it is a fact that the venereal rate slowly but steadily decreased after its establishment. This may possibly be said to be *post hoc* and not necessarily *propter hoc*, but it is fair to assume that the large number of women in the jail and hospitals, and the large number deported must necessarily mean a lessened number of such women in the streets and in cafés, and many observations of reliable persons indicate that this was the case. On September 27, 1919, the antifraternization order was rescinded, with the hope that this would induce the soldiers to associate with the better classes of the civil population. Thereafter, no woman was arrested and subjected to the humiliation of a physical examination except after trial and conviction in a court presided over by an officer specially qualified and selected for this duty.

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- (25) Memorandum No. 155, Hdqrs. Base Section No. 1, August 31, 1918.
- (26) Memorandum No. 213, Hdqrs. Base Section No. 1, October 16, 1918.
- (27) American Expeditionary Forces, commander in chief's report; activities of G-1, part 8, Vol. 3. Copy on file, Historical Section, the Army War College, Washington.
- (28) G. O. No. 6, G. H. Q., A. E. F., January 6, 1918.
- (29) Letter from the chief, Leave Areas Bureau, April 10, 1919, to the commanding general, S. O. S., A. E. F. Subject: Report on Leave Areas Bureau. On file, Historical Branch, the Army War College, Washington. File No. 74-19.7.
- (30) G. O. No. 139, G. H. Q., A. E. F., August 24, 1918.
- (31) G. O. No. 14, G. H. Q., A. E. F., January 18, 1919.
- (32) Final report of the chief, Leave Areas Bureau, Hdqrs. S. O. S., A. E. F., June 15, 1919, to the commanding general, S. O. S., A. E. F. Appendix I. On file, Historical Section, the Army War College, Washington. File No. 74-19.7.
- (33) Final report of the chief, Leave Areas Bureau, Hdqrs., S. O. S., A. E. F., June 15, 1919, to the commanding general, S. O. S., A. E. F. On file, Historical Section, the Army War College, Washington. File No. 47-19.7.
- (34) *Ibid.*, Appendix XIX.
- (35) Memorandum from Maj. Hugh H. Young, M. C., November 11, 1917, to the chief surgeon, A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (36) Memorandum for the chief of staff, Hdqrs., S. O. S., A. E. F., April 22, 1919, from the chief surgeon, A. E. F. On file, A. G. O. World War Division, Medical Records Section. File No. 726.1.
- (37) Telegram from General Pershing, April 8, 1919, to the chief surgeon, A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (38) Telegram from the chief surgeon, A. E. F., April 10, 1919, to the adjutant general, G. H. Q., A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (39) Telegram from the adjutant general, G. H. Q., A. E. F., April 10, 1919, to the chief surgeon, A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (40) G. O. No. 17, W. D., 1912.
- (41) Annual Report of the Surgeon General, U. S. Army, 1909, 57.
- (42) Annual Report of the Surgeon General, U. S. Army, 1912, 65.
- (43) *Ibid.*, 69.
- (44) Annual Report of the Surgeon General, U. S. Army, 1913, 65.
- (45) Annual Report of the Surgeon General, U. S. Army, 1917, 69.
- (46) Manual for the Medical Department, U. S. Army, 1916, par. 958.
- (47) Letter from the chief surgeon, A. E. F., December 5, 1918, to the commanding general, S. O. S., A. E. F. Subject: Increase in venereal disease. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (48) G. O. No. 32, G. H. Q., A. E. F., February 15, 1919.
- (49) Letter from the chief surgeon, A. E. F., December 21, 1918, to the commanding general, S. O. S., A. E. F. Subject: Venereal disease. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (50) Telegram from General Pershing, December 1, 1918, to the commanding general, S. O. S., A. E. F. Copy on file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (51) Letters from the Commanding General, S. O. S., A. E. F., March 12, 1919, to Colonels Henry Page, Paul Hutton, and Howard Jackson, M. C. Subject: Duties of supervisors of venereal disease control. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (52) Weekly Bulletin No. 36, office of the chief surgeon, A. E. F., December 16, 1918.
- (53) From consolidated weekly venereal reports, office of the chief surgeon, A. E. F. Copies on file, A. G. O., World War Division, Medical Records Section. File No. 726.1.

- (54) Ashburn, P. M., Col., M. C.: Factors Making for a Low Venereal Record in the American Expeditionary Forces. *Journal of the American Medical Association*, 1919, lxxiii, No. 25, 1824.
- (55) Weekly Bulletin No. 55, office of the chief surgeon, A. E. F., April 28, 1919.
- (56) Report of Medical Department Activities, Motor Reception Park, Base Section No. 6, A. E. F., June 1, 1919, by Capt. L. R. Effler, M. C., camp surgeon. On file, Historical Division, S. G. O.
- (57) Walker, George, M. D.: Venereal Disease in the American Expeditionary Forces. Medical Standard Book Co., Baltimore, Md., 1922, 16, 17.
- (58) *Ibid.*, 31, 32.
- (59) Letter from the surgeon, Base Section No. 1, A. E. F., December 15, 1917, to the chief surgeon, Lines of Communication, A. E. F. Subject: Report on venereal situation, St. Nazaire. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (60) Walker: *Loc. cit.*, 30.
- (61) Memorandum to the commanding general, S. O. S., A. E. F., March 1, 1919, from the chief surgeon, A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (62) Letter from the chief surgeon, A. E. F., February 7, 1919, to the surgeon, Motor Reception Park No. 701, Base Section 1, A. E. F. Subject: Venereal Report. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (63) Manual of Military Urology for the American Expeditionary Forces, 1918, 16.
- (64) Cable No. 235-S, par. 2, October 20, 1917, to A. G. W. A. R. from General Pershing.
- (65) Letter from the chief surgeon, A. E. F., December 11, 1917, to Col. Clyde S. Ford, M. C., surgeon, Base Section 1, A. E. F. Copy on file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (66) Confidential circular to soldiers of the United States Army, H. A. E. F., November 15, 1917.
- (67) Memorandum to the adjutant general, A. E. F., December 14, 1917, from the chief surgeon, A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (68) Letter from the chief surgeon, A. E. F., January 6, 1919, to the commander in chief, A. E. F. Subject: Control of venereal diseases. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (69) Telegram from the adjutant general, A. E. F., March 3, 1919, to the chief surgeon, A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (70) Memorandum from Col. George Walker, M. C., May 15, 1919, to the chief surgeon, A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (71) Third indorsement from the chief surgeon, A. E. F., January 27, 1919, to the adjutant general, S. O. S., A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (72) Fourth indorsement, chief surgeon's office, First Army, A. E. F., July 18, 1918, to the chief surgeon, A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (73) Report of Medical Department Activities, 41st Division (First Depot Division), A. E. F., undated, by Col. O. G. Brown, M. C. On file, Historical Division, S. G. O.
- (74) Report of Medical Department Activities, Base Section 1, A. E. F., undated, by Col. Charles L. Foster, M. C. On file, Historical Division, S. G. O.
- (75) Memorandum for the assistant chief of staff, G-1, S. O. S., A. E. F., November 15, 1918, from the chief surgeon, A. E. F. On file, A. G. O., World War Division, Medical Records Section. File No. 726.1.
- (76) G. O. No. 215, G. H. Q., A. E. F., November 25, 1918.
- (77) Report of Medical Department activities, Camp Pontanezen, Brest, undated, prepared by 1st Lieut. George R. Cowgill, San. Corps, under the direction of Col. M. C. Stayer, M. C. On file, Historical Division, S. G. O.

CHAPTER XII

PREVENTION OF LOUSE INFESTATION ^a

Generalities concerning lice—that is, biological considerations of them, their modes of infestation, and the diseases they may transmit—have been discussed in the first section of this volume. Here, only the means employed for the prevention of louse infestation in the American Expeditionary Forces will be considered.

When our troops first went to France in 1917, we were advantageously situated in that we could profit by the experiences of our Allies in so far as louse infestation was concerned. In point of fact, the chief surgeon, A. E. F., as early as June 29, 1917, reported to the commander in chief on this subject.¹ In this report mention was made of the measures which had been adopted by the British. These measures tended to show that the British had been more successful in their disinfection through the provision of baths and laundry facilities for their men in the field than by disinfection by means of chemicals locally applied.

Our plan of attack was then directed along three lines: The provision of means for maintaining body cleanliness; laundries and steam disinfestors; chemical repellants. Since time was required for instituting means for maintaining body cleanliness—that is to say, baths, laundries, and disinfestors—it was essential that other agencies be utilized meanwhile.

PHYSICAL INSPECTION

Under normal conditions, the periodical physical inspections, to determine the possible existence of louse infestation, if the interval separating the inspections is not too prolonged, are of value in preventing the spread of louse infestation in a particular group of men. This presupposes a sanitary control of the habitations of the men concerned, and the availability of means for maintaining not only personal cleanliness but the cleanliness of clothing as well. With this in view, semimonthly physical inspections of members of the American Expeditionary Forces were required.² In addition thereto War Department instructions required that all enlisted men be made thoroughly familiar with the life habits of lice, their appearance, and means of ridding oneself of them, in order that they might recognize their presence at any time.³

In so far as the troops that were more or less permanently located in the American Expeditionary Forces were concerned, physical inspection for the detection of louse infestation was of considerable value. In respect to the combatant organizations, however, these were frequently so moved about or

^a The prevention of louse infestation, more especially disinfection, was made the duty of the Quartermaster Department, A. E. F. However, there was an inevitable division of duties between this department and the Medical Department concerning the question of louse infestation. For this reason, it is impossible to record herein such facts regarding the prevention of louse infestation in the American Expeditionary Forces as are considered desirable for the present volume without duplicating to an extent the history of the Quartermaster Department. Accordingly, the chapter as it now appears was submitted to the Quartermaster General for his examination and approval. The publication herein by the Medical Department of statements relative to Quartermaster Department activities has the approval of the Quartermaster General.—*Ed.*

were engaged in holding trenches or in actual, open combat, that opportunities for physical inspections for the purpose outlined above were not regularly existent. Then, too, with this latter class of troops, facilities for maintaining personal cleanliness could not be made adequately available. Inevitably such a high degree of louse infestation resulted among them as to render any preventive means futile, and to necessitate the universal application of disinfection measures.

INSECTICIDES

On October 1, 1917, the chief surgeon, A. E. F., directed the purchasing officer of the Medical Department, A. E. F., to procure a large supply of drugs for use in making N. C. I. powder, and materials for compounding a substance known as "vermijelli."⁴ Both these preparations had been in use in the British Army. N. C. I. powder consisted of naphthalene, 96 per cent; creosote, 2 per cent; and iodoform, 2 per cent. Vermijelli was made of crude mineral oil, 9 parts; soft soap, 5 parts; water, 1 part.

The powder was to be supplied to the troops at the rate of 1 ounce per week, for use as a dusting powder in the opening of clothing at the neck. The vermijelli was for use on the seams of the clothing.⁴

Difficulty was experienced in obtaining these insecticides. In this connection, the following letters are of interest:

HEADQUARTERS LINES OF COMMUNICATION,
AMERICAN EXPEDITIONARY FORCES,
OFFICE OF THE CHIEF SURGEON,
October 30, 1917.

From: The chief surgeon, L. of C.
To: The chief surgeon, A. E. F.
Subject: Delousing mixture.

1. In reference to our conversation about supplies, for delousing purposes I wish to inform you that I have twice attempted to order these supplies, but it seems that the British have changed their formulæ several times and the orders have been held up.

2. October 1, 1917, an order was placed with the purchasing officer for 56,000 kilos of N. C. I. powder, described in "Sanitation in War," by Major Lelean, R. A. M. C., consisting of naphthalene, 96 per cent; creosote, 2 per cent, and iodoform, 2 per cent; and for 30,000 liters of "vermijelli," consisting of 9 parts crude mineral oil, 5 parts soft soap, and 1 part water.

3. The following cable was received by the purchasing board from London in reference to this order:

"We discontinued this mixture 18 months ago; difficult to obtain; now using mixture crude naphthalene creosote soft soap. This proved better than old formula. Could supply 10 tons quickly. Directions requested. British War Office."

4. I then placed an order with the purchasing board for 3 tons of the mixture indicated and to-day a wire has arrived from Lieutenant Colonel Lyster, London, which reads as follows:

"British do not use mixture mentioned. Order in from purchasing officer for 3 tons of this mixture. Am suspending order pending further details. Letter to-day."

5. I await further instructions in this matter.

F. A. WINTER,
Colonel, Medical Corps, U. S. A.

[First indorsement]

A. E. F., C. S. O., *France, November 2, 1917.*

To surgeon, L. O. C., A. E. F.

1. It is suggested that the matter be suspended until the letter mentioned in paragraph 4 is received. It may contain information of value.

By direction of the chief surgeon.

(Signed) M. W. IRELAND,
Colonel, Medical Corps.

[Second indorsement]

A. E. F., OFFICE OF THE CHIEF SURGEON, L. of C.,
France, November 6, 1917.

To: The chief surgeon, A. E. F.

1. I am forwarding you herewith two letters from Lieutenant Colonel Lyster, M. C., one dated October 29 and the other November 5, 1917, for your information.

2. As soon as a definite formula has been agreed upon please inform this office, so that I may obtain a supply for the medical supply depot.

(Signed) F. A. WINTER,
Colonel, Medical Corps, U. S. A.

WAR OFFICE,

Adastral House, Victoria Embankment, October 29, 1917.

From: The liaison officer, London.

To: The purchasing officer, A. E. F., France.

Subject: Delousing mixture.

With reference to your letter inclosing copy of Order No. 152 for 3 tons delousing mixture, I have learned upon making inquiries requested in the letter of the 22d October, 1917, from the chief surgeon, L. of C., A. E. F., that the mixture mentioned in both that letter and your order, namely, crude naphthalene, creosote, and soft soap, is not at present in use by the British, and they apparently have not been using it. They state that they have used a mixture of 80 per cent crude naphthalene which carried a variable quantity of creosote and 20 per cent soft soap. This mixture has been in use with the British Army in the Tropics. In France, for the same purpose, a mixture has been in use composed of 50 per cent Oxford grease and 50 per cent naphthalene.

I am promised further details within a day or two by the British experts on the technical advisory board with reference to this mixture and other materials used for the same purpose.

I have asked also for a list of articles now in use by the British for disinfection, and a statement as to those articles now regarded as obsolete, but which were formerly used for this purpose.

Order No. 152 has in consequence been suspended, and a cablegram has been sent this day to the chief surgeon, L. of C., to that effect. As soon as the exact British equivalent for this delousing mixture is ascertained the information will be cabled you.

W. LYSTER,
Lieutenant Colonel, Medical Corps.

WAR OFFICE,

Adastral House, Victoria Embankment, E. C. 4, November 5, 1917.

From: Liaison officer, U. S. Army.

To: Purchasing officer, Med. Dept., Hdqrs., A. E. F., France.

Subject: Delousing mixture.

In connection with your letter of October 23 and order for 3 tons of delousing mixture concerning which I sent you a cable, I have obtained the following information:

I stated in the cable that the exact combination asked for in your letter had not been used by the British. They have used a combination of naphthalene and soft soap; the naphthalene in its crude state carrying some creosote; the use of this, however, has been limited to the Tropics. The nearest approach to the article you ask for that has been used by the British in France is a combination of Oxford grease and soft soap; the Oxford grease being the residuary body following distillation of low-grade petroleum and probably carrying some sulphur and roughly being analogous to ichthyol.

The A. D. M. S. sanitation, who has been for three years the chief sanitary authority in the British armies in France, is at present in London for some weeks. Having met this officer when making a study of British sanitary methods in France early in the spring, I called upon him here and have been offered facilities for obtaining valuable information, the result of British experience in France along these lines. It seems that a number of measures which have been in vogue and are written up have been scrapped as obsolete, and this officer offers to give us a description of all sanitary methods employed at present which have survived the test of experience. Consulting him on the point that you mention, he agrees with Colonel Horrocks that they have not been using the mixture you ask for. He states further that N. C. I. powder, naphthalene, creosote, and iodoform, the latter in 1 per cent strength, and vermijelli grease, a combination of soft soap and mineral oil residue, would be the agents of choice for the purpose for which you have asked the delousing mixture. The N. C. I. powder he states is irritating to individuals with an idiosyncrasy for iodoform. He is of the opinion that it would probably be equally efficient without this latter drug. After all, the naphthalene is the agent to be relied upon in the combinations mentioned. The vermijelli grease is used by rubbing it along the seams of the clothing.

However, these measures are entirely subsidiary to the main scheme of disinfection as now practiced by the British and can not be depended upon to take the place of their system of laundries and clothing disinfection. Should the chief surgeon desire information on this line, I would be glad to send over the result of my interviews with the A. F. M. S. sanitation, B. E. F. This officer will be here for several weeks yet and I shall be glad to bring up any question unofficially that the chief surgeon or yourself care to present.

I have just learned over the telephone from the British purchasing officer for the Medical Department that the order for the 3 tons of mixture which was supposed to have been held up has been sent through to be accomplished. The British purchasing officer tells me that he has filled this order for Oxford grease, which can be obtained in practically unlimited amount. The N. C. I. powder mentioned above will give some difficulty in obtaining, due to the scarcity of naphthalene, and also will be very much more expensive than the Oxford grease. In your order as asked for it was necessary to obtain refined naphthalene and then add creosote. In the Oxford grease, this combination exists in nature in the articles used to compound it.

WM. LYSTER, *Lieut. Col., M. C.*

[Third indorsement]

A. E. F., *C. S. O., France, November 20, 1917.*

To surgeon, L. O. C., A. E. F.

1. Upon receipt of this paper, a telegram was sent to Lieut. Col. W. J. L. Lyster, asking him to consult with the A. D. M. S. sanitation, B. E. F., whom he reported as present in London, and to give a memorandum to this office in which the preventive methods pursued by the British would be explained.

2. It appears from Lieutenant Colonel Lyster's report, attached hereto, that N. C. I. powder and "vermijelli" are the two remedies used. It is requested that you give an order for a supply of these two remedies.

3. Any further literature sent to this office by Colonel Lyster will be promptly forwarded for your information.

A. E. BRADLEY,
Brig. Gen., N. A., Chief Surgeon.

On November 13, 1917, the liaison officer of our Medical Department in London forwarded to the chief surgeon, A. E. F., a memorandum on the prevention of lice infestation which comprised data obtained by him on a visit to the British front, and notes furnished him by the assistant director of medical services, sanitation, British Expeditionary Force.⁵

That part of the memorandum in question which pertains to disinfection by means of insecticides is as follows:

Chemical agents used on the person.—As a means of prevention of parasites, several chemicals are in use. They are probably of some value when persons are in contact with infested individuals or occupying billets very recently vacated by infested troops. For this purpose N. C. I. (naphthalene, creosote, iodoform) is used. This is sprinkled inside the neck of the shirt and allowed to pass over the body, half an ounce to an ounce per capita.

* * * * *

To summarize, the main factors in keeping troops free from vermin are personal cleanliness, accomplished by bathing and frequent washing of the clothes; but little help in this is given by the use of chemical agents, and their use is rather discouraged by the British authorities as producing a false sense of security. The large and complex plan represented by laundries experience shows is necessary, if troops become infested.

On November 22, 1917, the chief surgeon, Lines of Communication, A. E. F., requested the Medical Department purchasing officer to renew the order of October 1 for N. C. I. and vermijelli.⁶ And on December 8, 1917, a purchase order for several hundred thousand 1-ounce containers, for distribution of the powder and grease to individuals, was made.⁷

These insecticides were procured and were partially distributed to our troops,⁷ but their use seemingly was desultory until after the signing of the armistice when, in conjunction with the use of other chemical agents, N. C. I. powder was more or less systematically used as an adjuvant to the mechanical means then instituted to rid the American Expeditionary Forces of louse infection.⁸

In February, 1918, a member of the medical research committee of the American Red Cross in Paris urgently recommended to the chief surgeon, A. E. F., that as a lice-repellent measure, a practical trial be given to the impregnation of underclothing with an emulsion of cresol and soft soap. This recommendation was based on the experiments of Bacot, entomologist to the Lister Institute, London, wherein Bacot treated underclothing with a 5 per cent solution of a compound consisting of crude carbolic acid, 55 per cent, and soft soap, 45 per cent. He found a 5 per cent solution sufficiently strong to cure nits as well as lice, and its effectiveness to have a durability of somewhat over a week. The clothing was soaked in the solution for an hour or so, wrung out, dried, then worn.

Members of the medical research committee wore underclothing so treated for several weeks without noticing any ill effects from the chemical impregnation.⁹

The chief surgeon, A. E. F., directed the trial of the method, as described above, in the 1st Division,¹⁰ and in that division an investigation, to extend over a period of at least two months, was begun.¹¹

Whether or not the experiment was conducted is unknown. Certain it is that whatever the difficulties met in carrying it out, no record of such is discoverable; furthermore, no general use was made of this measure in the prevention of lice infestation in the American Expeditionary Forces.

BATHING

In considering the bathing facilities that were provided for the American Expeditionary Forces, it will be necessary to make mention of the laundering and the disinfection of our soldiers' clothing, since, in the improvement of

plans for the prevention of louse infestation, bathing was but the first step in our ultimate process of disinfestation. However, details concerning the various methods of disinfestation will be given subsequent consideration; laundries have been described. (See p. 645.)

BATTALION BATHS

No comprehensive plans for providing bathing facilities for our combat troops in France were made until September, 1917. On the 4th of that month the chief surgeon, A. E. F., foreseeing the necessity of some such provisions prior to the advent of the coming winter, advised the chief quartermaster, A. E. F., that bathing facilities should be provided in the training areas used by our troops, the baths to be in suitable buildings or shelters and arranged so as to facilitate the exchange of soiled for clean clothing.¹² A few days later, General Headquarters, A. E. F., authorized the construction of a bathhouse for each battalion area.¹³ This bathhouse was to measure approximately 26 by 22 feet, and was to contain a dressing room, and a bathroom proper, with from 8 to 12 shower heads. Each room was to have a concrete floor. As it proved, this plan could not be realized; however, as substitutes, the Quartermaster Department acquired during the succeeding two or three months a number of portable bathing equipments, each comprising 1 heater, 1 tank, and 12 shower heads.¹⁴ These equipments were for issue, on requisition, at the rate of one for each battalion of combat troops, and, being portable, possessed one advantage over the bathing facilities originally planned in that a battalion to which one was issued could move it from place to place as exigencies of a given situation demanded.

In the French Army, use had long been made of such a portable bath equipment, and upon its adoption by our Army it came to be known as the French model of shower bath.¹⁵

The French model portable shower bath was made in several sizes, dependent upon the number of its shower heads.¹⁶ As mentioned above, the unit we selected comprised 8 to 12 shower heads. Frequently, it was designated the Ch. Blanc shower, from the name of its designer. Its essential elements comprised a small reservoir, a heating stove, and the piping system; and since water normally was added to its reservoir by means of a hand pump there was no restriction as to place of establishment. In detail, its component parts, as shown in Figure 116, were as follows: A reservoir, on a tripod made of angle iron, whose elevation was about 8 feet; a water heater (operating on the water-jacket principle) on a small tripod within the base of the larger tripod; a pump to force water from a receptacle on the ground level, or from a stream, to the reservoir; piping to connect the reservoir and heater; and the heater and shower heads.

After the bath had been assembled the reservoir was first filled. This filled the water jacket of the heater which the reservoir fed. A fire was then started in the stove, and within 10 or 15 minutes the water had reached a temperature of 40° or 42° C., at which the showers were ready for use. Under a proper balancing of the double maintenance of water supply from the reservoir, and a regular fire, the distribution of the water continued at the above tem-

THE "SECOUR AUX SOLDATS" WATER HEATING APPARATUS.

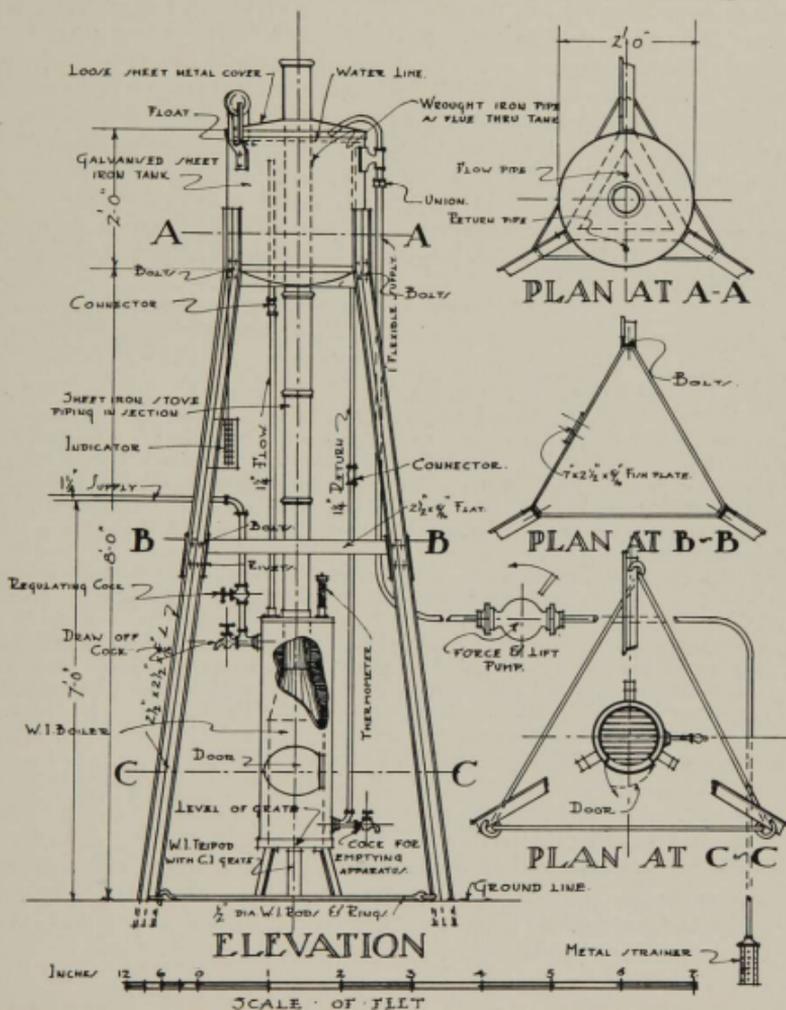


FIG. 116

perature. The regulation of the amount of fire in the heater necessitated the close attention of one man, whose function also was to watch the indicator of the reservoir which showed the level of water. An additional man was required to operate the water pump.

Early in January, 1918, a further step was taken in perfecting the bathing facilities of our troops. Prior to that time the baths were available to the combat troops only in the troop areas; that is to say, when divisions left the training areas for service in the line, some through purpose or misunderstanding did not take the baths forward with them. This led to the promulgation from General Headquarters, A. E. F., of the following:¹⁷ "Organizations moving into the zone of the advance will take with them their portable showers, to be installed in suitable shelters with the least possible delay after arrival. Engineer troops, when available, should make the necessary installations." Then, too, it proved that, though the troops had baths available, in the absence of means for keeping their clothing clean at the front, the baths were of no avail in the promotion of personal cleanliness. This condition prompted the chief surgeon, A. E. F., to address the commander in chief, A. E. F., on the subject, as follows:

HEADQUARTERS, AMERICAN EXPEDITIONARY FORCES,
OFFICE OF THE CHIEF SURGEON,
France, January 8, 1918.

Memorandum for: The commander in chief.

Subject: Facilities for bathing and for laundry.

1. The lack of those facilities for the use of our forces has been very embarrassing from almost the time of the first arrival of our troops and it has resulted in a deplorable lack of personal hygiene on the part of many of our men, for which they can not be blamed. Many of them are dirty and infested with lice, with no means at hand to correct these evils. This is particularly true of the 42d Division; not only are facilities wanting, but the scarcity of fuel oftentimes prevents the heating of water for bathing of hands and faces or for the washing of clothes.

2. The question of providing facilities has been taken up with the Quartermaster Department from time to time during the past six months and repeatedly recommended as urgently necessary.

3. Means should be provided for bathing and for laundering, and the proper authorities notified that steam disinfectors may be obtained from the Quartermaster Department on requisition. The use of the latter would be but of transient service, however, unless the men are given some provisions permitting personal cleanliness.

4. If it is possible to expedite in any way the providing of facilities to correct existing conditions, it is urged that it be done.

A. E. BRADLEY,
Brig. Gen., N. A., Chief Surgeon.

Meanwhile, the Quartermaster Department, A. E. F., was striving to devise ways and means that would permit the attainment of personal cleanliness, over and above that which the baths would permit. Accordingly, certain recommendations had been made by the chief quartermaster, A. E. F., to the commander in chief, A. E. F., which were adopted and announced as follows:

Memorandum for: C. Q. M., A. E. F.

JANUARY 6, 1918.

Subject: Policy with reference to laundry work.

1. The following recommendation has been approved by the C. in C., and is furnished for your information:

- (a) That laundry work be done for troops in the zone of the advance.
- (b) That such laundry work be done without charge to the soldier.

(c) That no attempt be made to return to the soldier the identical garment turned in by him for laundry.

(d) That complete clean outfit of clothing be issued to front line troops after leaving the trenches and utilizing the bathing facilities authorized by G. O. 38, HAEF.

(e) That no laundry work be done for troops not serving in the zone of the advance.

2. Please prepare and submit draft of a general order to cover the matter.

By order of the C. in C.

J. A. LOGAN, Jr.,
Chief, A. S. G. S.

Copy for C. Q. M., L. of C.

DIVISIONAL BATHS

To carry out this policy and the instructions of General Orders, No. 13, which issued from General Headquarters, A. E. F., on January 21, 1918, the commander in chief directed the commanding general, Lines of Communication, to provide increased bathing facilities for troops at the front as follows:

GENERAL HEADQUARTERS, AMERICAN EXPEDITIONARY FORCES,

January 25, 1918.

From: C. in C., C. S., G. S.

To: Commanding general, Line of Communications.

Subject: Increased bathing facilities.

1. It will be necessary for you to supply facilities on a larger scale than hitherto authorized for bathing and issue of clean clothing to troops relieved from tours of duty in the trenches, in order to carry out instructions contained in memorandum from the C. in C. (A. S. G. S.), January 6, subject "Policy in reference to laundry work," and by G. O. No. 13, G. H. Q., A. E. F., 1917.

2. The C. in C. has therefore approved the establishment of baths and clothing issue plants, as per plans attached, in number not to exceed 5 for each division at the front, such bathing establishments to be utilized in accordance with outline of bath system, inclosed herewith.

3. It will be understood that both plan of bathhouses and bathing system are to be utilized only so far as permitted by local conditions, distribution of troops in rest billets, and utilization of existing buildings to the fullest extent.

4. The Q. M. Corps has been authorized to procure the necessary mechanical apparatus, consisting of boilers, water tanks, hose, and shower heads, and you should advise these headquarters at the earliest date of the quantity of such equipment you will require. Pending procurement of this special apparatus, it is believed that the arrangements of showers shown on this plan will provide the most efficient utilization of the shower-bath apparatus now available.

5. Your attention is also invited to the greatly increased quantity of clothing over and above the established reserves of the divisional train, which will be necessary for issue to troops coming out of the front lines, and you will take immediate steps to have the necessary quantities available.

By order of the C. in C.

W. D. CONNOR,
Colonel, General Staff, N. A., Chief of Section.

BATHHOUSES AND BATHING SYSTEM

1. *General.*—The plan outlined is ideal and offered with the understanding that existing buildings and facilities are to be utilized to the highest degree to obviate new construction.

Bathing and clothing issue units, each to consist of 3 Adrian barracks, each approximately 98 feet by 28 feet, utilized as (1) bathhouse; (2) clothing stock issue room; (3) dressing room. Each such unit estimated to have a capacity of 2,200 men per 24 hours, operating continuously. Five units required for each division to bathe 11,000 men in 24 hours.

2. *Explanatory notes on sketch plans.*—(a) Bathhouse proper to be equipped with 10 benches, each $2\frac{1}{2}$ feet wide by 12 feet long, and with 4 shower heads, 3 hot and 1 cold, inclosed in a covered runway, 4 feet wide by 7 feet 6 inches high, with intervals between showers as shown. (b) Stock and issue room to be equipped with counters and tills as shown. (c) Dressing room to have such number of benches as may be necessary. (d) Sorting room to be simply an open shed.

3. *Method of operation.*—Soldiers coming from the trenches will be marched into bathhouse by squads of 4, taking places on benches, each one of which provides ample space for 4 men. Squad No. 1 will be stripped and start bathing, followed at once by squads 2, 3, etc. Bathing to consist of one-half minute in a preliminary hot shower, two minutes for soaping and scrubbing in space filled with steam from the shower, one-half minute in second hot shower, two minutes for second soaping and final scrubbing, one-half minute in hot shower, one-half minute for rinsing in hot shower, and quick passage through cold shower. After the process is in operation, the men will emerge at intervals of one-half minute into the drying space, and after drying themselves will take such of their equipment as is not to go to the disinfectant and laundry or to the salvage depot, and pass into the issue house. From the time the first squad, stripped, starts for the bath until they pass into the issue room should be about 10 minutes and, as the succeeding squads will follow them at intervals of two minutes, it is obvious that, if squad No. 1, on leaving the bench, is immediately replaced with a new squad, the latter will have approximately 20 minutes in which to get off their wet clothes and prepare to bathe. Once the process is in operation, 120 men per hour will pass in and out of the bathhouse, and if the time allowed for each process of the bath is checked with a watch, it will be seen that very generous time for thorough bathing and scrubbing has been allowed.

Passing to the issue room, the men will proceed around the room, drawing the prescribed articles of clothing as they go, the clothing being arranged by sizes in tills and a sufficient number of issue clerks being assigned to prevent congestion. From the issue room the men will pass into the dressing room, put on clean clothes, and proceed to rest billets.

As soon as a squad leaves the bathhouse, their discarded clothing will be collected and passed through opening into an open-air shed, where it will be sorted into (a) that needing serious repair; (b) that needing only minor repair and laundry. Class (a) will be shipped to salvage depot without further handling; class (b) passed to laundry.

4. *Equipment.*—(a) For bathhouse and clothing issue unit: One boiler, upright, quick-steaming type, 10-horsepower, mounted on wheels for mobility; one steam pump, $1\frac{1}{2}$ -horsepower, mounted with boiler; one water tank, wooden, cylindrical, dimensions 6 feet by 4 feet, 500 gallons capacity; suction hose for drawing water; steam hose; lumber for sides and top of shower bath, for shelving in issue room and for benches; four shower heads; three Adrian barracks, 98 feet by 28 feet.

5. *Mechanical operation of shower baths.*—Water is pumped into tank and steam jets led into bottom of same. Through steam hose, hot water from top of the tank is led to the hot showers and cold water from the bottom for cold shower.

6. *Capacity of issue room.*—It is estimated that tills of the size shown on the plan, viz, 5 feet by 3 feet by 4 feet, will accommodate the following quantities of clothing:

Breeches, wool (6 tills).....	2, 520	Shoes, field (8 tills).....	3, 072
Coats, service (12 tills).....	2, 688	Stockings, wool (4 tills).....	6, 720
Drawers, winter (5 tills).....	3, 480	Undershirts, wool (4 tills).....	3, 840
Shirts, flannel (5 tills).....	2, 700		

Total, 44 tills, which leaves ample room for spreading out sizes for easy handling and for other articles that it may be necessary to carry.

7. *Personnel.*—Believed necessary for operation 24 hours continuously.

(a) For each bathing and issue unit: 18 bathhouse attendants; 24 issue clerks; 6 dressing-room attendants; 3 engineers; 6 sorters for discarded clothing. Total per unit, 24-hour day, 57.

The plan for bathhouses and the outline of bathing systems were for distribution to quartermasters of division,¹⁸ to facilitate the inauguration of bath-

ing arrangements for troops going to the front, in so far as this was permitted by local conditions, by the distribution of troops in rest billets, and by the utilization of existing buildings to the fullest extent. The plan was not generally utilized, for it must be remembered that our system, as described above, for bathing at the front was based on trench warfare; however, opportunity was afforded to a number of divisions to establish bathing plants based on this plan, notably the 3d, 6th, 26th, 42d, and 77th Divisions.¹⁹

OPERATIVE CONTROL OF BATHS

On February 16, 1918, a table showing the distribution of staff duties in the American Expeditionary Forces was promulgated by General Headquarters, A. E. F.²⁰ Therein, laundries and baths and the disinfection of clothing were assigned to the Quartermaster Corps, A. E. F. The provision of original equipment and the installation of portable baths, however, were assigned to the Engineer Corps by General Orders, No. 32, G. H. Q., A. E. F., February 18, 1918. Because of the lack of a definite understanding as to what department then was charged with the operation of the bathing plants at the front, the chief quartermaster, A. E. F., presented the situation in the following communication to the chief surgeon, A. E. F. The chief surgeon's indorsement thereto follows:

414. 44-S

AMERICAN EXPEDITIONARY FORCES,
HEADQUARTERS, SERVICES OF SUPPLY,
OFFICE OF THE CHIEF QUARTERMASTER, A. E. F.,

April 19, 1918.

Memorandum for: Chief surgeon, A. E. F.

1. Attention has been called to the lack of any definite understanding as to what department is charged with: (a) Operation of disinfecting machinery; (b) operation of bath establishments authorized for troops at the front. It would appear desirable that this uncertainty be cleared up.

2. Disinfecting machinery has been purchased in England by the Q. M. Corps on the request of the Medical Corps to the extent of 24 Thresh horse-drawn disinfectors and 20 Foden-Thresh steam-propelled disinfectors. This apparatus has been or is being distributed under the direction of the Medical Corps. So far as is known the Thresh disinfectors are now being operated by Medical Corps personnel, and the Foden-Thresh by M. T. S. personnel.

3. Inquiry was made of the chief surgeon on January 30 as to whether it was desired that the Q. M. Corps make further purchase of disinfecting apparatus, and reply was had that no definite answer could be made until advice was received from the United States as to whether such machinery was being shipped. In the absence of any further information from the Medical Corps, no further purchases have been made by the Q. M. Corps.

4. Disinfecting apparatus in connection with hospitals, either base, field, or evacuation, will naturally be operated by the Medical Corps personnel of the hospital, while disinfecting machinery intended for the delousing of soldiers' clothing at the front will naturally be used in connection with troop baths and laundries, and as the operation of laundries is a Q. M. function, it would seem logical to have the other two related activities operated under the same officer and by the same unit.

5. Under G. O., No. 32, G. H. Q., 1918, paragraph 5, provision and construction of baths are assigned to the Corps of Engineers, but inasmuch as G. O., No. 31, G. H. Q., 1918, assigns "laundries," "baths," and "disinfection of clothing" to the Q. M. Corps, it is to be presumed that the Q. M. Corps will have to supply the necessary personnel to operate the baths when erected.

6. It is therefore suggested, if agreeable to the Medical Corps, and approved by the C. in C., that—

a. The procurement and operation of disinfecting apparatus in connection with hospitals be understood to be a function of the Medical Corps.

b. The procurement of disinfecting apparatus for the delousing of clothing apart from hospitals be understood to be a function of the Q. M. Corps, and that the distribution and operation of such machinery be a function of the Q. M. Corps.

c. The supply of all laundry machinery, including that for hospitals, and the provision of the necessary personnel for its operation be understood to be a function of the Q. M. Corps.

d. The operation of baths, when provided and erected by the Corps of Engineers, as authorized, be understood to be a function of the Q. M. Corps.

e. Inasmuch as all these activities have to do with the preservation and rehabilitation of clothing, they be incorporated as functions of the Salvage Service, organized under the

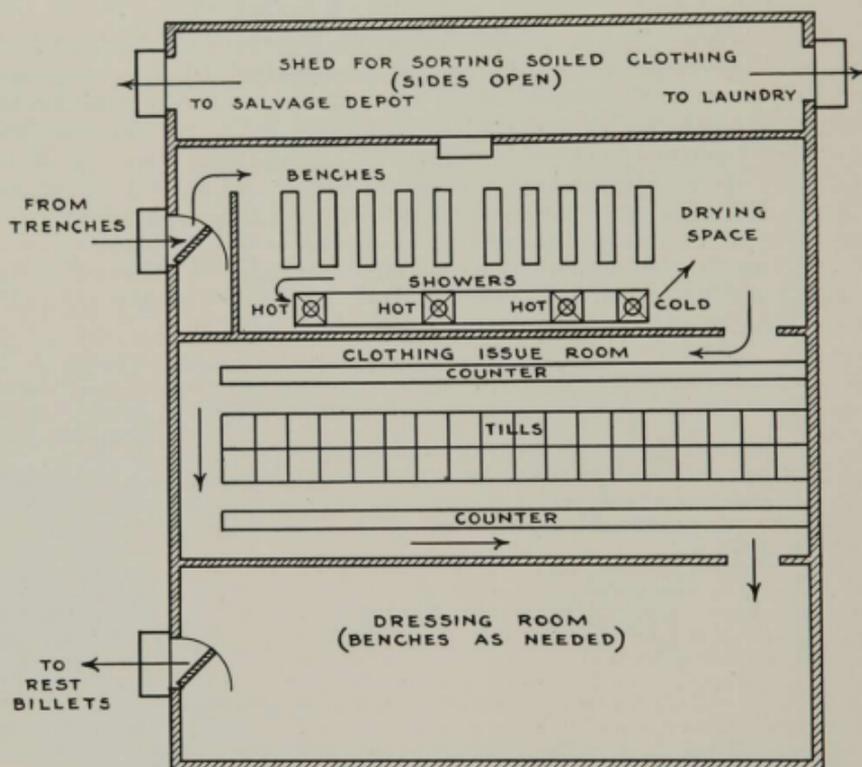


FIG. 117.—Suggested plan for bathing and clothing-issue rooms, A. E. F.

Q. M. Corps, which service will have personnel available throughout the A. E. F. for the superintendence and operation of these activities in conjunction with those already assigned to it, and so avoid unnecessary duplication of effort.

H. L. ROGERS,

Brigadier General, Q. M. C., Chief Quartermaster.

[First indorsement]

C. S., A. E. F., FRANCE, 22 April, 1918.

To C. Q. M., A. E. F., S. O. S.

1. Returned. It is most desirable that responsibility for disinfection, delousing, bathing, laundering, and the supply of clean and renovated clothing be definitely settled.

There is no doubt whatever that upon the thoroughness with which these proceedings are carried out depends the general health of the A. E. F. and its freedom from many of the disabilities which otherwise will cause enormous loss of man power.

2. The Medical Department should undertake all disinfection at its hospitals and the delousing of the patients and their clothing. It can not, however, with its present facilities undertake to clean, renovate and press clothing. It is believed that this should be done by the Salvage Service in connection with the laundering which the Q. M. Corps proposes to operate at hospitals.

3. Subject to the remarks in (2) the suggestions of the Chief Quartermaster are agreed to and heartily indorsed.

WALTER D. McCaw,
Colonel, Medical Corps,
For, and in the absence of, Chief Surgeon.

On April 20, 1918, the Quartermaster Corps, A. E. F., was charged with the provision of personnel (one sergeant and one private, first class) to operate each portable bathing unit,²¹ and on May 20, following, that corps was specifically charged with the operation of such units.²²

The following description, from the report of the surgeon of the 42d Division of the operation of divisional bathing facilities, during trench warfare, is typical of the arrangement made in accordance with the plans outlined above.²³

BATHING AND DISINFESTATION, 42D DIVISION

These plants were so placed that each man in the division was bathed, disinfested, and given clean clothing at least once a week. This proved one of the most effective means of giving comfort to the men and maintaining their morale. Bathing soon became very popular and likewise reduced by a considerable percentage the number of noneffectives, thus contributing greatly to the strength of the command. Skin diseases in the British Army had at one time produced nearly 90 per cent of their total noneffectives from disease. The great importance of bodily cleanliness and consequent freedom from vermin can not be too strongly emphasized. Lousiness and scabies, with resulting inflammations and secondary infections of the skin, unless vigorously combated, produced a tremendous amount of ineffectiveness among troops subjected to conditions of modern warfare in the trenches. This can be illustrated no better than by quoting from the experience of the British as summarized in the lectures of Major McNee and Captain Parkinson:

"Trench fever, scabies, inflammatory processes in the skin such as boils and furuncles (the pyodermias), etc., caused 90 per cent of all diseases in the British armies in France in the summer of 1917." (Major McNee.) "At the head of the diseases which actually cause loss of efficiency is scabies, and its frequent sequelæ, impetigo, and ecthyma. Impetigo means a loss of 10 to 12 days at the base, and scabies means a loss of 50 per cent of a man's efficiency, from loss of sleep by itching and scratching. Nearly all cases of fever of unknown origin (F. U. O.) are accompanied by lice. This F. U. O. is a serious cause of sick wastage among the English." (Captain Parkinson.)

In the 42d Division, it soon became evident that the ordinary method (semimonthly inspection) was entirely inadequate in detecting skin disease, as is shown later. For many months, indeed throughout the winter, during most of which our troops were very uncomfortable, there was no adequate provision for bathing and absolutely no provision, except for makeshift arrangements for delousing. As soon as this division took over a sector of its own,

vigorous steps were taken to insure cleanliness and to delouse every man as soon as possible after his coming from the trenches. Portable French shower baths were procured in sufficient number to provide one to every battalion or approximate unit—in all 28 outfits were installed. This sufficed very well for ordinary bathing. It was necessary, however, to provide delousing stations in addition, as men would become infested with lice during their stay in the trenches and also in their billets, in spite of all care. It was decided therefore, to place a delousing station with each infantry brigade and one farther at the rear to serve such troops as might be in rest. The stations with each infantry brigade also served the artillery brigade, troops from which were sent to whichever station was most convenient. In order to secure the maximum results from our efforts, it was at once evident that troops must pass through the delousing stations by schedule. Through the splendid cooperation of the division and brigade commanders, this was secured, and organizations passed through the station every seven days. Organization commanders soon became enthusiastic about the work, as the beneficial results were in striking evidence, and there was little difficulty in having the schedule adhered to. At each bathhouse a sergeant of the Medical Department was stationed. These men had been instructed by a specialist in skin diseases, and their duty was to pass among the soldiers who were bathing and to pay close attention to the condition of the skin. Any man having any sort of skin disease was immediately singled out by the sergeant, was placed to one side, and then sent direct to a special hospital for skin diseases. He did not return to his company. In order, however, that his company might know what had become of him, a notice on a blank form was sent to the surgeon of his organization. The surgeon then collected his equipment and sent it to the skin hospital for disinfection. A duplicate copy of the notification was kept at the baths, and a triplicate sent to the skin hospital, in order that arrivals could be checked in.

Men were marched to the station, by company, with an officer always in attendance and in accordance with the schedule. The delousing station was made by cutting one wooden French barrack into halves and attaching each half at right angles to the end of a second similar barrack. Forty to eighty men were admitted at a time to the receiving room, where they undressed. Each man was furnished with a numbered bag for personal effects and a numbered mesh bag. Into the mesh bag was placed all his under and outer clothing that would stand steam sterilizing, but he took with him into the bathroom his shoes, helmet, and bag of personal effects. The bag with his clothing was then passed through the window, leading to the platform, into a wheel container which, when filled, was rolled along the platform and into one compartment of a Foden-Thresh sterilizer. The hair was clipped from the armpits and pubes of many of the men. Some objected to this and we did not absolutely compel them to submit to it, though it was a valuable means of destroying eggs that had been deposited. In the bathroom were 80 numbered compartments. Into these, men placed their shoes and other personal belongings that could not be subjected to steam, each according to his own number. Twenty shower heads, later increased to 32, were here provided, with plenty

of hot water, soap, and towels. There the men remained, at first 30, and later, when it was found to be sufficient, 20 minutes, until their clothing had been sterilized. A thorough hot shower bath was thus obtained. They then passed into the dressing room and were followed by 40 to 80 other men who had been undressing while the first lot were bathing. In the dressing room, each man passed to the serving window, presented his numbered bag and received his sterilized clothing, having, of course, brought with him from the bathroom his shoes and personal belongings. In the clothes room was kept a stock of clean underwear, socks, and outer clothing. For his dirty underwear and socks, he received clean underwear and socks, and if his outer clothing made it necessary he was furnished with a new uniform. If a suit didn't fit, he simply handed it back and another size was given him. In case a man came who had no underwear, he was given a suit, but his company commander was notified, so that it could be charged against him, if it had been lost by neglect or carelessness. Every effort was made to make the men feel comfortable, and it was astonishing to see the effect. Dirty, lousy, tired men appeared at the plant, but clean men with clean underwear and socks and free from lice left the place with heads up and happy.

In connection with each large delousing station (one behind each infantry brigade) a portable laundry was operated. This was sufficient to care for much more than was received from the station. Dirty clothes, after sterilization, were passed direct to the laundry, laundered, and returned to the clothes room the following day for reissue. Worn-out clothing was gathered together and sent to the salvage officer for replacement. The plan worked so successfully that soon all issues of clothing were made through the delousing stations. While nominally under the Quartermaster Department, in this division the delousing stations were constructed by the Engineers on plans submitted by the Medical Department and were conducted entirely by the Medical Department. Delousing is so intimately associated with disease prevention that it should be entirely in the hands of the Medical Department. Otherwise indifferent results will be obtained. Laundries should be run in close conjunction with the delousing stations, and to secure perfect coordination between the two should also be under control of the Medical Department. The delousing station that was located in the rear to serve troops in rest had a disinfector of the ordinary Thresh type. This station cared for about 2,000 men. Soiled clothing after disinfestation was taken to a stationary laundry, located in the rear of the sector.

METHOD OF BATHING, 26TH DIVISION

The following description, from the report of the division surgeon, 26th Division, shows the method employed in that division of combining a large, central divisional bathing establishment with smaller, mobile units that were moved from place to place back of the line held by that division to make baths available to men to whom the central bath was not at the time accessible.²⁴

It was difficult to accomplish delousing, even when a division was at rest; when it was distributed along a great battle line, changing according to the military situation, with men moving from the front line to the rest billets, it was a very severe task indeed. While in the Toul sector, the 26th Division placed

the whole system of delousing under one officer, who was appointed an assistant sanitary inspector for the purpose. It should be remembered that the division was doing many things at that time which it would not have done if there had been an organized corps or army back of it, or if the Services of Supply had been ready to perform all of its duties. A fixed delousing plant was established back of a central point, and two itinerant units were maintained to cover the flanks. The great central plant was given to the division by the Red Cross. It had ample water supply and 40 shower baths. After it was thoroughly organized, it was capable of handling from a thousand to fifteen hundred men per day. The men were sent to the station by marching or in trucks. Noncommissioned officers were trained in the detection of skin diseases, and all soldiers so suffering were immediately sent to the hospital. The orthopedist found it a useful place to make inspections with reference to the fit of shoes and the condition of the feet of the men. Every man who came to the plant was given clean underwear and his outer clothing was disinfected by steam. Large supplies of clothing and shoes were maintained and distributed. All soiled clothing was classified and sent either to the corps laundry, which had begun operation at Nancy, or turned over to the Salvage Service, then beginning to operate. The itinerant delousing plants consisted of double boiler, locomotive disinfestors, and a 3-ton truck to carry clean clothing. They started from centers at Aulnois and Menil-la-Tour, back of each half of the line, and established themselves at any place where there were shower baths. Soiled clothing resulting from visits of the itinerant disinfestors was handled, as was that at the central plants. Two field hospitals fortunately situated also maintained small delousing plants. Placing the whole system of bathing and disinfestation, together with the replacement of clothing for the division, under the control of one officer brought about a coordinated service and fine results. Even after other departments were given control or, rather, began to function in the front lines, the Medical Department still felt the weight of responsibility for failure and exercised its energy and interest through the assistant sanitary inspector who remained really, if not technically, in charge.

BATHING IN OPEN WARFARE

Except for troops held in reserve, bathing of the men of a division engaged in open warfare was obviously impossible. The following descriptions, from reports of division surgeons, show typical experiences during open warfare.

BATHING IN THE 3D DIVISION DURING THE MARNE OPERATION ²⁵

French shower baths were secured a few weeks before leaving for the front, and were installed by the Engineers in the 3d Division. Two Foden-Thresh disinfestors were received the day before the division left the area for the Marne. A few cases of scabies occurred and were treated in hospital. An occasional case of louse infestation was found and deloused in the organization by ironing or boiling the clothing, and bathing. The men had been in the lines since July 1 with little opportunity to bathe or wash their underwear. By the middle of July many were complaining of being lousy. The solution of this difficult problem was fairly under way when the great battle came. Fifteen portable baths were secured from the American Red Cross and 12 from the Quartermaster Corps. A bathhouse with 96 shower heads was

erected at Essises. Here, reserve battalions were brought and bathed and clean new underclothing was issued by the Quartermaster Corps. One Foden-Thresh disinfectant was used to delouse the clothing that was turned in. The underclothing was sent to a Paris laundry, and returned in a few days. Efforts were made to secure a mobile laundry, but at that time mobile laundries were issued to hospitals only. A schedule could not be arranged, for day by day an attack by the enemy was expected, thus preventing any systematic effort or any large number being bathed. Other plans were tried; wherever a portable shower bath could be placed one was installed. Three being available, one was placed on a small stream near Courboin for battalions in reserve at that place and for the Engineers camped near by in the woods; two were placed at St. Eugene for the use of the 30th and 38th Infantry Regiments. Several companies were bathed there. At the end of July the officer in charge of bathing and delousing made the following note in the monthly sanitary report for that month:

The physical equipment of this division for bathing and delousing the troops consists of one bathing center containing 6 portable showers, 8 heads each, established in an Adrian hut; 2 Foden-Thresh disinfectors, 1 at the bath, the other at the field hospital for scabies. A few more portable showers have been supplied to isolated groups that did not have access to the division bath. A personnel of 1 officer and 28 men operated the bathing center; even with this meager equipment, we have been able to keep the division fairly clean and we have thus far but little wastage from scabies or lice infestations. We have been able through the cooperation of all concerned to adjust the bathing to the movements of the division and keep the baths operating during the present operation.

All the divisional units as they came out of the line were either marched to the baths or were transported in trucks, given hot baths, a change of clothing, and their soiled clothing was deloused.

The fact that it was possible to provide bathing facilities during the Battle of the Marne is a matter of considerable interest. The equipment at hand was quite portable, consisting of French portable showers and one Foden-Thresh steam disinfectant which moved under its own power. The showers and tentage were carried on trucks supplied from the equipment of other organizations. Rapid moves and lack of transportation for the baths resulted in leaving behind the outfit after leaving the Gondrecourt area for the St. Mihiel operation.

On the Marne the effectiveness of the bathing was much increased by issuing new clothing at the bath. With a small stock on hand with which to begin operations, it was possible to delouse and reissue most of the clothing turned in. In more permanent areas, the issue of clothing at the bathhouse was not necessary. It appeared, therefore, that a bathing and delousing unit with a compact portable equipment moving independently on its own transportation and in touch with the Quartermaster Department, so that the issue of clothing at the bath could be quickly instituted when necessary, could keep a division clean under practically all circumstances which might arise. The French type of portable shower bath was very useful, the Le Page Urbain variety being much superior to the Ch. Blanc, owing to its greater compactness and to the absence of an overhead tank. The Foden-Thresh disinfectant is fairly effective but very heavy and difficult to move.

OPEN WARFARE BATHING, 42D DIVISION²³

Following the relief of the division from the Baccarat sector, the various elements, withdrawing from the line, were concentrated in the Chatel-sur-Moselle area, whence in a few days they departed by train for the environs of St. Germain-la-ville, preparatory to entering the Champagne. The division was moved into the Souin and Esperance sectors in support of the French. Here the limited bathing facilities of the sector were turned over to the division and as many of the men as possible were permitted to bathe, but since they were constantly on the alert for the coming German offensive, no systematic process of bathing and delousing was possible. In this area, as a result of dugout life, there was some reinfestation with vermin, but immediate corrective measures were out of the question; for, with the enemy drive checked, the division was immediately withdrawn and entrained for the Aisne-Marne battlefield.

Thrown into the line in the vicinity of Epieds, the whole division was actively engaged for eight days in pushing back the enemy's line. Here, from the billets and shelters deserted by the retreating enemy, there was a widespread infestation with lice. As the various elements upon relief dropped back into reserve positions, systematic delousing for the time being was impracticable because of the scarcity of water. However, as the division was to be withdrawn in a few days to the La Ferteous-Jouarre area, a detachment of 116th Engineers was sent in advance to construct bathhouses at suitable points along the Marne. Here were also stationed the disinfecting machines. During the short stay in this area, with the joint facilities afforded by the Marne River, the new constructed bathhouses and the Foden disinfectors, systematic delousing was begun. Bathing schedules were prepared by brigade commanders, and were rigidly followed under the supervision of officers, a special effort being made to obtain the greatest possible conservation of time. As a result of this procedure, when the division, at the end of three days, was ordered to entrain for the Bourmont area a large percentage of the infantrymen had been bathed and deloused. The new area, which had previously been used as a training center for American troops, was adequately provided with bathing facilities. These, in conjunction with the Foden machines, which had proceeded overland from the Marne to join the division, made it possible to complete the bathing and delousing of the entire division.

From August 30 to September 14 the division was actively occupied with advance to the Toul sector and its participation in that engagement, which resulted in the reduction of the St. Mihiel salient. During this time obviously all bathing was out of the question, but during the succeeding 16 days, while the new front was being organized, those elements in reserve were provided with bathing facilities. German bathhouses at Essey, Pannes, LaMarche, Nonsard, and Bois de Nonsard were repaired and pressed into service, while a steam disinfector found at Nonsard was worked to the limit of its capacity. While moving from the Essay-Pannes sector toward the Argonne, a detachment of Engineers preceded the division to the Recicourt area for the purpose of constructing bathhouses and repairing such as previously had been in use by the French. As a result of these preparations, in the few days spent by the divi-

sion in this area, many of the men were afforded the luxury of a hot shower bath. Once in the Argonne-Meuse region and from then on up to the time of the signing of the armistice—that is, from October 6 to November 10—bathing was practically impossible, except for a short period when at Exermont a bathhouse was available for the few elements of the command stationed in the immediate vicinity. Constant action, scarcity of water, and the devastation of the surrounding country rendered futile the thought of any organized effort at bathing and delousing.

IMPROVISED FACILITIES FOR BATHING

In the absence of the prescribed equipment for bathing, or in the event that such equipment, though at hand, could not be utilized for one reason or another, improvised means of bathing frequently were resorted to by the combat divisions, A. E. F. Thus advantage was taken of near-by rivers or streams. Shower baths frequently were improvised from cans in the bottoms of which holes were punched to give the effect of shower heads. The surgeon, 1st Division, A. E. F., reported that in addition to the standard French, eight-head shower baths, various organizations of the division also had improvised shower baths, and in some instances bathtubs.²⁶ On the whole, however, the use of bathtubs was exceptional. The surgeon, 5th Division, reported that while the division was on the front, bathhouses were extemporized by using small shacks or dugouts, and heating water for the baths in boilers or galvanized-iron cans.²⁷ In this division improvised means for bathing had to be resorted to throughout the entire war. One method utilized successfully was the employment of water sterilizing bags, filled with hot water and suspended overhead. Tomato cans with perforated bottoms were hung on the nozzles of the bag, a wire clip being attached to the plungers of the nozzles to permit the constant flow of water.²⁷

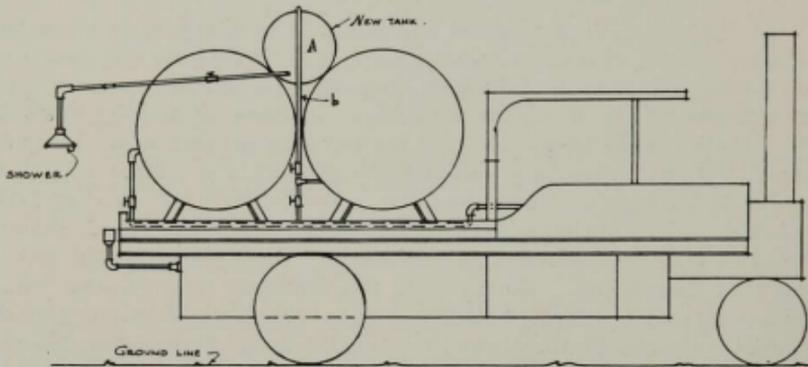
MOBILE BATHING PLANTS

Until the signing of the armistice, subsequent to which the activity of our combat troops was not wholly enforced by military necessity and their location was in consequence relatively stabilized, the work of providing facilities for the cleanliness of the troops and their clothes did not produce satisfactory results.²⁸ Much hospitalization from skin infections, as well as loss of health from minor maladies secondary to infestation with vermin, had resulted; and at the time of the signing of the armistice in some organizations as many as 90 per cent of our men were lousy.²⁸

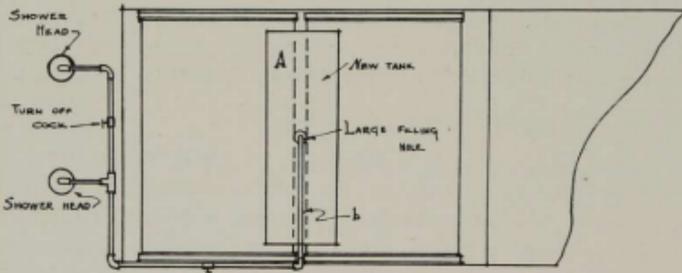
Apart from the loss of physical fitness due to lice infestation and scabies, there was a great danger of the occurrence of typhus fever then imminent, because of the disintegration of the armies of the Central Powers whose delousing systems, until the armistice began, had proved for the allied armies a valuable barrier of protection against infection from the great eastern endemic centers of this disease.²⁸

To provide an effective means for adequately keeping clean all of our combat troops, the chief surgeon, A. E. F., on November 15, 1918, recommended that the degassing service of the Chemical Warfare Service, A. E. F., which then had an efficient organization, and a trained personnel, be con-

THRESH · WATER · HEATING · APPARATUS ·



- E L E V A T I O N -



- P L A N -

NOTE: *New Tank (A)* is placed in position shown on top of disinfecting chambers with new steam pipe "b" entering tank by filling hole and continuing to bottom of tank. Live steam is carried through pipe "b" and discharged into the water contained therein heating same.

FOUR SHOWER HEADS MAY BE SUPPLIED BY PRESENT PLAN.

FIG. 118

verted in its entirety to the purpose of disinfecting the American Expeditionary Forces.²⁸ This conversion was accomplished in accordance with General Orders, No. 216, G. H. Q., A. E. F., November 26, 1918.

In perfecting its equipment for effectively neutralizing poisonous gasses with which our troops came in contact, the Chemical Warfare Service, A. E. F., had devised a mobile bathing apparatus.⁸ This apparatus, designed by Col. Harry L. Gilchrist, M. C., was admirably suitable for ordinary bathing. As described by its designer:⁸

It consists of a 1,200-gallon water tank mounted on a 5-ton Pierce-Arrow truck, with all the necessary appliances for a warm shower bath. The water is heated by a highly efficient, instantaneous system attached to the rear of the truck frame. The gasoline burners, six in number, are cone-shaped, constructed in a circle, with a preheating burner in the center. The 7-gallon feed tank is attached to the left side of the truck frame. A

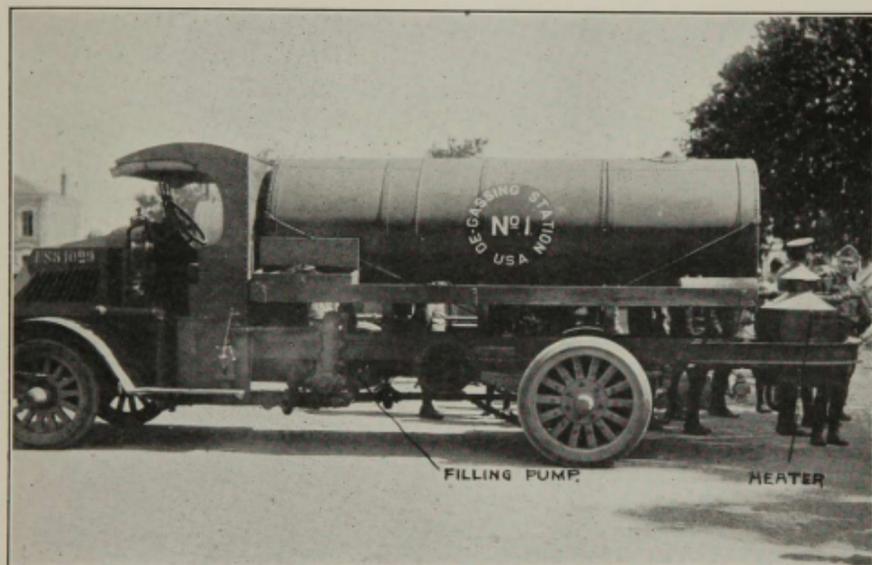


FIG. 119.—Mobile degassing apparatus converted to bathing purposes

centrifugal pump, belt driven from the flywheel of the truck motor, has three functions: (1) Filling the tank from any stream or reservoir; (2) keeping up a continued circulation of water through the heating system; (3) maintaining the pressure for the baths.

The standards, from which the shower heads are suspended, are of the demountable type and during travel are fastened on the side of the truck on racks especially constructed for them. The simplicity of construction facilitates the erection of the shower-bath equipment and putting it in operation in 15 minutes. Allowing each man 3 gallons of water, 400 men can be bathed with each tank of water. The baths, having a capacity of 24 men, can easily accommodate 300 men per hour.

In operating these machines in the billeting areas some supplementary equipment was required in which to house the shower baths. Two 50-foot hospital ward tents, sufficient lumber to construct a temporary platform for the showers, and tarpaulins to cover the ground served to meet this demand. Besides, it was necessary to carry an adequate supply of gasoline both for the motor and for the heating system. Except in extremely inclement weather this tentage and equipment, meager as it was, provided a sufficiently comfortable place for men to dress, disrobe, and bathe. Two large coal stoves kept the tents comfortably heated in cold weather.

The showers, occupying one-third of one of the tents, left sufficient space to accommodate 24 men, while 48 men were allotted to the remaining tent for dressing and disrobing. By this arrangement the showers were kept in constant operation, thus insuring the maximum capacity of the bathing machine.

Work in the billeting areas showed that four men could properly operate this bathing outfit. These were distributed as follows: Two men to operate the burners and control the valves relating to the water supply, one man in charge of the showers, and one man to direct the men preparing for the bath.

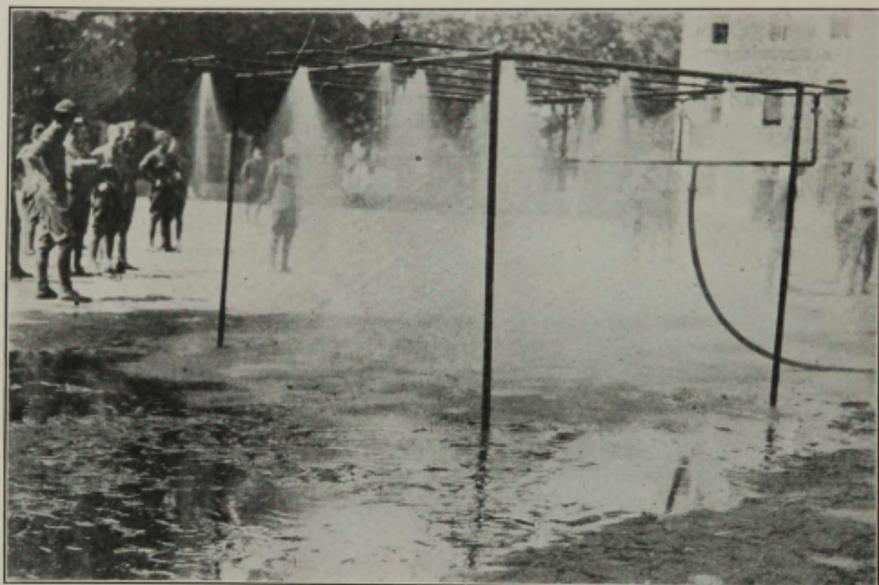


FIG. 120.—Twenty-four showers operated by mobile bathing apparatus shown in Figure 119

BATHING AT BASE HOSPITALS

ON ADMISSION

In the base hospitals, A. E. F., to which patients from the front were evacuated, frequently in trainload lots, it was necessary, as a routine, since these sick and wounded men were all potentially lousy, to bathe them and disinfect their clothing before admitting them to wards for treatment. It was likewise essential that, because of the fact that patients were being handled, there should be as little delay as possible in this cleansing procedure. The practice in this regard in Base Hospital No. 56, A. E. F., may be taken as typical of practices in other base hospitals, A. E. F. In Base Hospital No. 56, A. E. F.,²⁹ the bathhouse consisted essentially of three large rooms. In the first room was located the large boiler in which the water for the baths was heated. Here the ambulant patients went and undressed. Seats had been placed around the room, and a compartment of it had been walled off wherein was shelving for the temporary care of patients' private property. For each such bundle of private property receipts were given to patients concerned, a duplicate being fastened to the bag (usually a Red Cross bag) in which the property was kept.

In this waiting room, kept warm at all times, patients to be bathed were disrobed only as rapidly as others completed their baths, thence being admitted to the next large room where they obtained a hot shower. Usually patients took their shoes with them. In the second room all patients were closely inspected by a medical officer at whose right hand stood an expert barber equipped with a No. 00 clipper capable of removing all excess hair upon a moment's notice. Here, also, was kept a stock of sulphur-ointment, kerosene, and 10 per cent mercurial ointment. From the bathroom proper patients passed to a third room, also well heated, where each was furnished a clean suit of pajamas. After placing their shoes on, each patient was now wrapped in a blanket and was conducted to a ward to which he previously had been



FIG. 121.—Base hospital bathing plant

assigned. Litter patients were taken to the bathroom, in which were placed eight specially constructed, troughlike tables, upon which they were placed, their clothes removed, and given a hot sponge bath. In certain instances, depending upon the physical condition of the patients and as indicated by the receiving officer of the hospital, litter patients were not sent to the baths but were admitted immediately to the wards.²⁹

ROUTINE BATHS IN BASE HOSPITALS

Scheduled baths were obtained in the base hospitals, unless interfered with temporarily by stress of work incident to the reception or evacuation of patients. And since the available number of shower heads as well as fuel and frequently

water was restricted, it was necessary that certain portions of the days of the week be set aside for the various classes of personnel at the hospitals; for example, the schedule maintained at Base Hospital No. 25, A. E. F., was as follows:³⁰ Each patient and each enlisted man was required to have two baths a week. Two nights of the week were reserved for nurses on duty at the hospital, and three nights for officers.

DISINFESTATION OF CLOTHING AND BEDDING DISINFESTATION BY STEAM

In the late summer of 1917, the chief surgeon, A. E. F., after due consideration, and in anticipation of the time when trench occupation by our troops

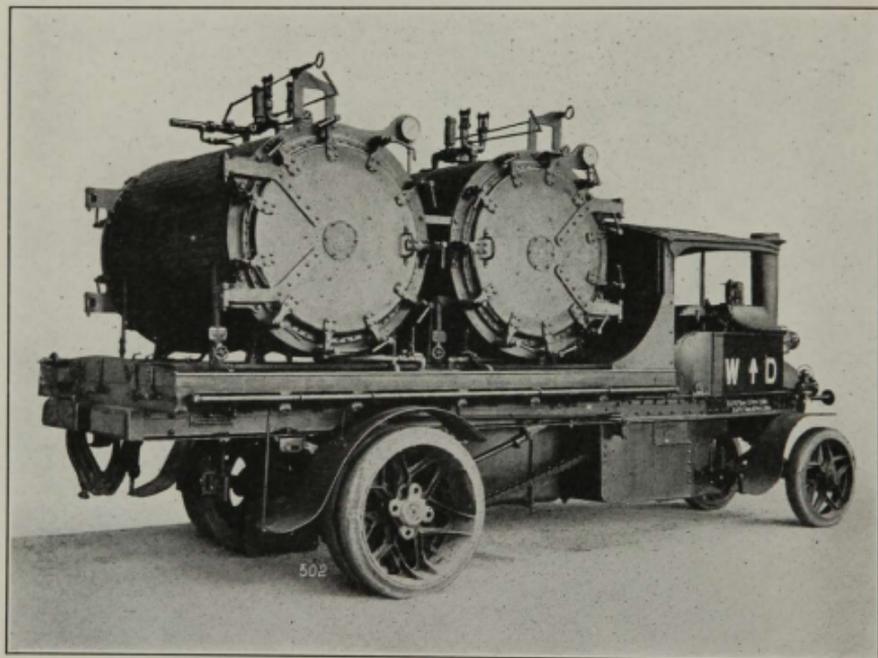


FIG. 122.—Foden-Thresh disinfector

would be an actual condition, decided to adopt the steam method for the disinfestation of the clothing of combat divisions.¹² Such a method, perforce, had to be mobile, and capable of destroying in a wholesale manner the lice and their nits in infested clothing; furthermore, it was highly desirable to adopt apparatus, possessing these qualities, which were obtainable in Europe.

The British War Office was having made, at the time under consideration, a large number of mobile steam disinfectors, which had given satisfactory service in the British Expeditionary Forces.¹² This apparatus, Thresh current-steam disinfector mounted on a Foden steam truck, was the one selected for use in the American Expeditionary Forces. The purchase in England of 20 of these was directed on September 7, 1917,³¹ the intention being to supply two of them to "each of the 10 divisions soon to be in training."¹²

The principle of the disinfecting apparatus designed by Doctor Thresh of England was based upon experiments that he had made, showing that a current of steam passed through a machine removed the imprisoned air therein more quickly and more thoroughly than by any vacuum apparatus. To prevent any undue amount of condensation in the disinfecting chamber, the steam was raised to 212° F. by producing it under a few pounds of pressure. In practice it was necessary only to watch the outlet pipe for an exit of steam and so maintain this status; that is to say, a visible exhaust of steam for the time required for the destruction of lice and their nits. Usually this length of time varied from 15 to 30 minutes, dependent upon the massive character of the material to be disinfested. Following this, the steam current was turned off and a current

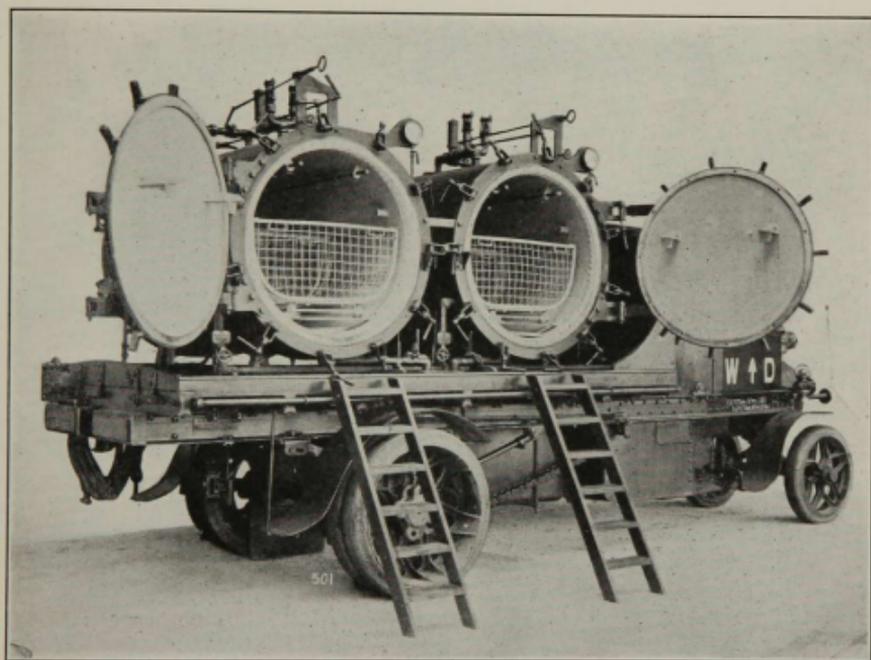


FIG. 123.—Foden-Thresh disinfector. Apparatus open

of hot air was passed through the machines to effect the drying of the contents. The length of time it was necessary to carry on this process likewise varied according to the nature of the material being disinfected. For such things as clothing and blankets, when only lightly packed in the apparatus during disinfestation, five minutes' exposure to the drying process was required. After this they were to be taken quickly from the disinfector, thoroughly exposed and shaken. They then were ready for use.

The Foden-Thresh current-steam disinfector, as supplied to the British War Office, and as adopted for use by the American Expeditionary Forces in September, 1917,³¹ was mounted in duplicate chambers on a steam truck (Figs. 122 and 123). The steam for disinfesting was obtained from the boiler

which furnished the motive power of the truck. The dimensions of the inner or disinfecting chamber were 6 feet length by 3 feet 7 inches diameter. The capacity of each chamber was 60 cubic feet; the capacity of the set, 120 cubic feet. One or both chambers could be used.³¹

In addition to the Foden-Thresh disinfectors for the combat divisions, it was necessary to obtain disinfectors for the hospitals planned for the American Expeditionary Forces. Since these hospital disinfectors were not required to possess the mobile qualities of the Foden-Thresh disinfectors, a simpler type was chosen.³² This was the horse-drawn Thresh disinfecter, which consisted of one disinfecting chamber, whose inner dimensions were 5 feet in length and 3 feet in diameter, mounted on a cart frame. A furnace beneath the disinfecting chamber was used to generate the steam for disinfestation. Twenty-four of these apparatus were ordered from England in September, 1917, and were received in the following month and were distributed in the American Expeditionary Forces in accordance with the wishes of the chief surgeon, A. E. F.³²

The Foden-Thresh disinfectors which had been ordered from England in September, 1917, were delivered in January and February, 1918, and were distributed to troops in the zone of the army by the Motor Transport Service, A. E. F.³²

Meanwhile, the Engineer Corps, A. E. F., whose department of forestry and construction was charged with the construction of our hospitals in the American Expeditionary Forces, had ordered 200 Thresh disinfectors of the stationary, furnace-heater type for installation in the Services of Supply.³² This type of disinfecter had the same capacity as that of the Thresh horse-drawn disinfecter. The order for their purchase stipulated their delivery at the rate of 12 per week, beginning in June, 1918.

In February, 1918, however, the only disinfectors in sight were the portable apparatus mentioned above. Since it was the understanding in the Quartermaster Department, A. E. F., at the time, that all disinfecting operations throughout the American Expeditionary Forces, except in the salvage depots, was to be under the direction of the Medical Department, A. E. F., no disinfectors were being purchased except on the request of the Medical Department.³² With this in mind the question of securing additional disinfectors was taken up with the Medical Department by the chief quartermaster, A. E. F., in February, but, because the Medical Department was awaiting information from the Surgeon General as to the obtainment of disinfectors from the United States, it was impossible for that department to estimate the number of disinfectors it would be necessary to obtain abroad. Furthermore, a board of medical officers had been appointed on February 21, 1918, by the chief surgeon, A. E. F., to study the prevention of skin diseases in the American Expeditionary Forces.³³ Since lice infestation played such a prominent part in the causation of the skin diseases being considered by the board, much attention was being given by its members to the kinds of apparatus most adaptable to purposes of disinfestation. The recommendation of this board indicated that a hot-air disinfesting apparatus would be preferable to the employment of steam. More will be said on the subject of hot-air disinfestation under that heading later; the purpose of mentioning it now is to show that the board's recommendation that a hot-air apparatus be used was in part responsible for the delay in placing orders abroad, for the portable steam sterilizers.³²



FIG. 124.—Horse-drawn Thresh disinfector

In the latter part of May, 1918, after the Quartermaster Corps, A. E. F., had been charged with furnishing the necessary apparatus for disinfection, except in connection with hospitals, in the American Expeditionary Forces,²² steps were taken to obtain additional mobile sterilizers.²³ Twenty Foden-Thresh machines were asked for on May 27; 50 sterilizers (American Sterilizer Co.) were cabled for from the United States, on July 9, 1918; 96 sterilizers (American Sterilizer Co.) were ordered by cable on July 11.²⁴

The "American" Kinyoun-Francis portable steam disinfector consisted of a jacketed disinfector, 30 inches wide by 42 inches high by 80 inches long; a 6-horsepower, submerged tube vertical boiler, a water storage tank; a complete set of firing tools and wrenches; running gear.²⁴

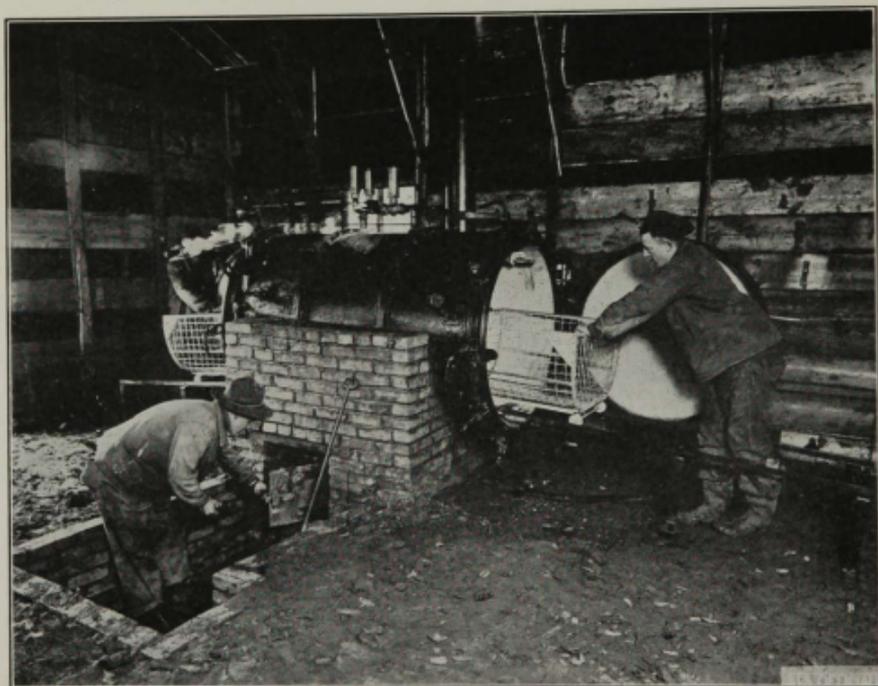


FIG. 125.—Stationary, furnace-heater type, Thresh disinfector for base hospital use, A. E. F.

The disinfector was provided and fitted with the "American" improved type vacuum formaldehyde-ammonia generators, consisting of two containers and one gas generating chamber, properly valved and connected with the disinfecting chamber.²⁴

The car was of wrought-steel construction, basket type, mounted on roller wheels, and was furnished with track and truck supports necessary for operation. The boiler was of the vertical submerged-tube type, 30 inches in diameter by 5 feet 8 inches high. The smoke pipe was 13 inches in diameter, and was hinged for lowering when not in use. The boiler was secured to, and made self-contained with, the disinfector by heavy cast steel or malleable plates bolted to reinforcing saddles to support the boiler at the proper location. The

heavy cast-steel plates supporting the overhanging boiler to the disinfector also formed the riding support; at points of contact, heavy steel spiral springs were placed.³⁵

In July, 1918, 14 portable sterilizers (American Sterilizer Co.) were received in the American Expeditionary Forces.³⁵ These sterilizers, however, had been obtained by the Medical Department, A. E. F., and were for use in connection with mobile hospitals at the front.³⁵ Such delay was experienced in the manufacture of the other sterilizers ordered in the United States for the Quartermaster Department, A. E. F., that none of them became available for use with our combat divisions until during the armistice.³⁵ Delay likewise was

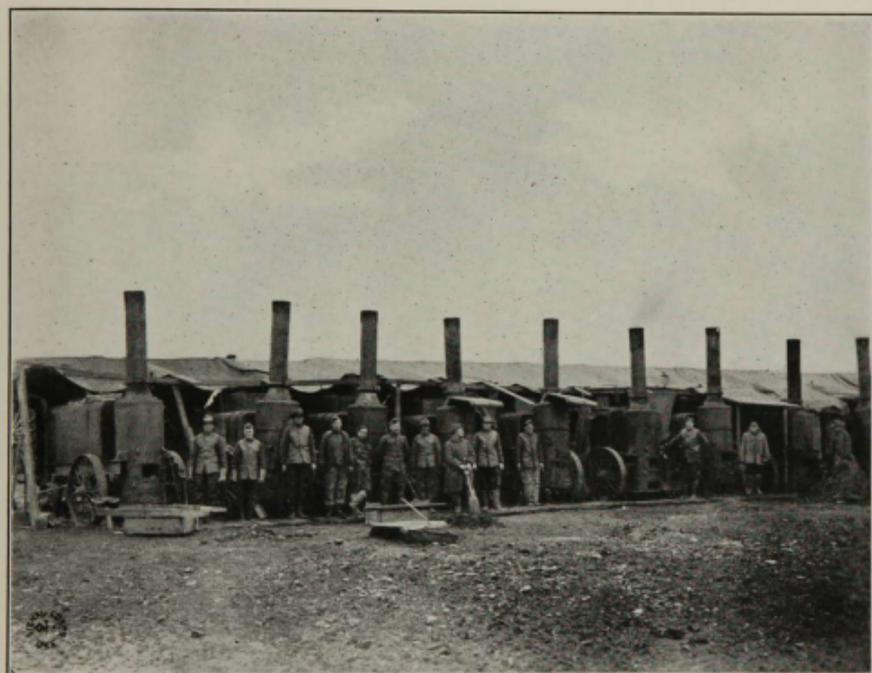


FIG. 126.—A battery of American sterilizers in operation at Camp Hospital No. 11, St. Nazaire

experienced in England in the manufacture of the Foden-Thresh³⁷ disinfectors ordered therefrom in June, 1918, for the Quartermaster Corps, A. E. F.³⁵ In consequence of the inability of the American Expeditionary Forces to secure suitable mobile disinfectors for the combat divisions, many of these divisions were supplied with the animal-drawn Thresh disinfector.

On July 15, 1918, the distribution of disinfectors to combat divisions, A. E. F., was as follows:³⁵

Division	Kind	Number	Division	Kind	Number
1st.....	{Motor-drawn.....	2	28th.....	Motor-drawn.....	1
	{Horse-drawn.....	4	32d.....	do.....	2
2d.....	Motor-drawn.....	2	35th.....	do.....	2
3d.....	do.....	2		{do.....	1
4th.....	do.....	1	42d.....	{Horse-drawn.....	3
5th.....	do.....	2		{do.....	3
	{do.....	2	77th.....	{French machine.....	1
25th.....	{Horse-drawn.....	2			

Subsequent to August 15, 1918, disinfectors were distributed to sectors rather than to divisions,³⁰ and they were not removed from the sectors unless the sector was not to be occupied by American troops following the departure of a division.

Because of the inadequacy of steam-driven disinfectors for our combat troops, use had to be made of the horse-drawn type, even so late as the early part of November, 1918. The following memorandum, prepared by the chief quartermaster, First Army, A. E. F., reveals the number and type of portable disinfecting apparatus in the possession of that army on November 2, 1918, as well as the general scheme followed in preventing lice infestation, in so far as the washing or disinfection of clothing is concerned:

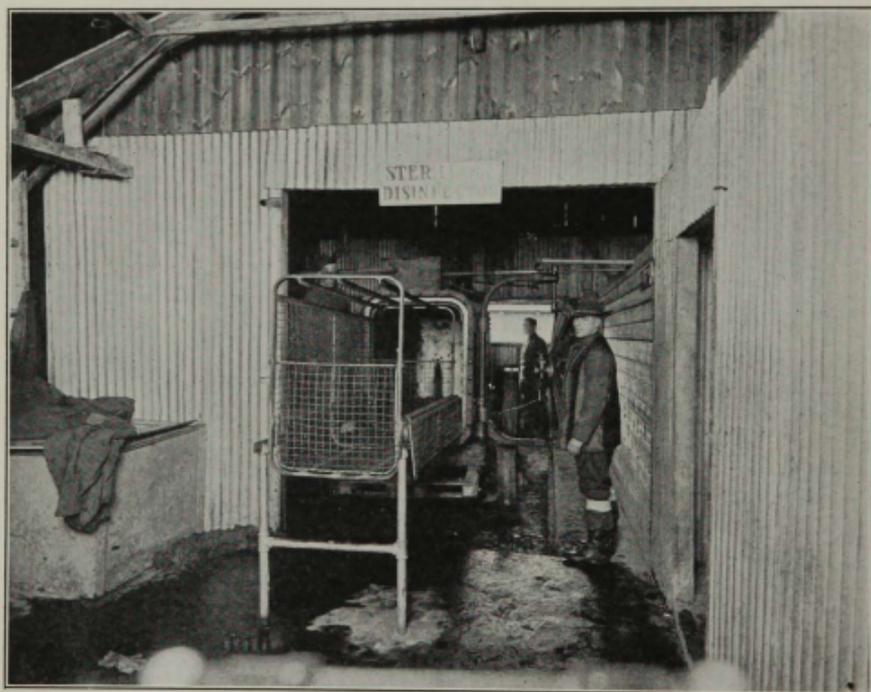


FIG. 127.—American sterilizer, showing chamber

HEADQUARTERS, FIRST ARMY,
OFFICE OF THE CHIEF QUARTERMASTER,

November 2, 1918.

Memorandum: For A. C. of S., G-4, First Army.

Subject: Disinfectors and laundries in First Army area.

1. Re your letter October 20 and memorandum October 24, above subject, please be advised that the matter of disinfectors and laundries has been investigated, carefully studied, and the following scheme of operation is recommended:

(a) Equipment on hand:

7 steam-driven, double-drum, Foden-Thresh delousers.

3 horse-drawn, single-drum, Foden-Thresh delousers.

1 mobile laundry unit, United States.

3½ mobile laundry units, French.

(b) Present location:

Corps	Town	Delouser	Laundry
1st	La Chalade.....	1 steam-driven.....	1 French. Do.
	Rarecourt.....	do.....	
	Froidos.....	2 steam-driven.....	
	Chatel-Chebery.....	1 steam-driven.....	
3d	Chermont.....	do.....	1 United States. 1/2 French. 1 French.
	Soubesme le Grande.....	.....
	do.....	.....
5th	Recicourt.....	1 horse-drawn.....
	Froidos.....	2 horse-drawn.....	
	Varennes-Cheppy.....	1 steam-driven.....	
P. W. E.	Souilly.....

(c) Location recommended:

Corps	Area	Delousers	Laundry
1st	Vicinity of Les Islettes.....	3 steam-driven.....	2 French.
3d	Vicinity of Recicourt.....	do.....	1 United States.
5th	Vicinity of Nixeville.....	1 steam-driven.....	1 1/2 French.
		3 horse-drawn.....	

(d) Additional equipment required: As additional equipment is received it will be distributed as required.

(e) Equipment allowance: In order to insure efficient service, it is estimated that each refitting area should be equipped with—

6 steam-driven, double-drum delousers.

6 portable laundries, double units.

12 storage tents.

75 shower heads and 1 barrack.

(f) Operation: This office has taken steps to provide a quartermaster for each refitting area to have immediate control and operation, under direction of this office, of disinfectors and laundries in each area. Lieutenant Gilmore, on duty in this office, has been designated as the officer in immediate charge of disinfectors and laundries in the First Army Area, and will supervise the operation of this equipment in the refitting and staging areas.

Clothing and blankets to completely reclothe a division will be furnished at the same time on call of division quartermaster, or will be delivered on the spot where the division is to be deloused, if the "Necessary motor trucks are furnished by G-4 in sufficient time."

2. Copy of detailed report from officer in charge of disinfectors and laundries in this office inclosed herewith.

3. It is here to be stated that until additional disinfectors are received in sufficient number, the bulk discarded clothing will necessarily have to be shipped back to the S. O. S. as salvage.

GEORGE LUBEROFF,

Lieut. Col., Q. M. Corps, C. Q. M.

Aside from the fact that the capacity of the horse-drawn disinfecter was less than half that of the Foden-Thresh disinfecter, there were other features about it which made it unsuitable for the use of troops at the front. The surgeon of the 1st Division, A. E. F., reported, after three and one-half months' experience with horse-drawn disinfectors in that division, that these disinfectors were only fairly efficient, even when very carefully manipulated, but altogether inefficient when such was not the case.⁴⁰ Since three hours were required before sufficient steam could be generated for disinfestation purposes, there was a great tendency for attendants to start operating the machine before a disinfecting

temperature had been reached. In the absence of coal, and because of the frequent necessity to use green wood, the maintenance of a disinfecting temperature proved to be difficult. When wood was used, great quantities of it were required. Though the apparatus was portable, it was cumbersome, and not well-adapted to moving from place to place; consequently, when the units of a division were distributed among 30 or more towns, as was the case in the 1st Division, A. E. F., in February, 1918, few horse-drawn disinfectors could be made to serve with difficulty the dispersed units, even when their lice infestation was no greater than 25 per cent.⁴⁰

TABLE 53.—Particulars regarding the working capacity, time requirements, fuel needs, etc., of Thresh disinfectors.^a

	Thresh (horse-drawn)	Thresh (stationary)	Foden-Thresh
Capacity (cubic feet).....	35	50	^b 60
Steam pressure (atmospheric, or pounds).....	(^c)	^d 5	^d 5
Temperature (^o F.) attained (approximate).....	212	218	218
Fuel required to start machine, in pounds coal.....	50	80	110
Fuel required per hour, coal.....	15	28	70
Number of blankets per load.....	30	40	^b 60
Number of kits (excluding overcoats) per load.....	20	30	^b 35
Time required to load, disinfect, dry, and unload, in minutes.....	60	60	60

^a Source of information: Circular (undated) on combating lousiness, issued by the chief, bathing and delousing division, Q. M. C., A. E. F.

^b Each chamber.

^c Atmospheric.

^d Pounds.

TABLE 54.—Charges for American portable disinfectors^a

Item	Number	Weight, pounds	Item	Number	Weight, pounds
Overcoats.....	50	350	Drawers, woolen.....	125	156
Breeches, woolen.....	110	220	Blankets, woolen.....	70	385
Blouses, woolen.....	110	385	Stockings, woolen.....	400	100
Shirts, woolen.....	125	156	Leggings.....	300	100
Undershirts, woolen.....	125	125	Caps, overseas.....	400	100

^a Source of information: Circular (undated) on combating lousiness; issued by the chief, bathing and delousing division, Q. M. C., A. E. F.

It is believed that sufficient has been given under the consideration of laundries and baths above to indicate the part which steam disinfectors played in the plan for lice disinfection of our combat troops. It will be recalled that this plan, as evolved, included bathing facilities, a laundry, and disinfection apparatus, so combined that, when functioning properly, a given organization requiring disinfection was bathed, and while bathing, the underclothing of its members was being laundered, and the outer clothing, disinfected.

The following letter and its inclosure show the measures adopted in the 1st Division, A. E. F., for disinfection:

OFFICE DIVISION QUARTERMASTER,
1ST DIVISION, AMERICAN EXPEDITIONARY FORCES,
France, June 12, 1918.

From: Capt. Seymour Hadaway, Q. M. R. C.

To: Chief of Salvage Service, O. C. Q. M., S. O. S., A. P. O. 717.

Subject: Laundries, disinfectors, and baths of the 1st Division.

1. Under authority of S. O. 88, paragraph 84, June 8, 1918, Capt. Seymour Hadaway, reported to headquarters, 1st Division, June 11, 1918.

2. *Laundries.*—The laundries operating in the area of the 1st Division are two portable French laundries of the Genest-Hereber type. They are both located near field hospitals, one of which is the gas hospital. The laundries are at the present time caring for all laundry work of four field hospitals in the area; in addition are laundering all of the gassed clothing, and in the last two weeks have laundered and reissued to troops 1,000 undergarments.

The gassed clothing is first soaked in a solution of Javelle water, then laundered in the usual way and, afterwards, disinfected.

The capacity of each of the laundry units varies from 1,000 to 1,400 garments per day, including undergarments, gassed outer garments, sheets, etc.

3. *Disinfectors.*—There are two Foden disinfectors in the area of the 1st Division, operating in connection with the above named laundries. Here all goods passing through the laundries, with the exception of hospital material, are sterilized. In addition, the clothing of men after bathing is being sterilized.

In the delousing operation, the sterilizer is worked in conjunction with a bath. The troops take all of their clothing off, including their blankets, wrap it up in a loose bundle with the belt strap, and this is then placed in the disinfecter. While the clothes are being disinfected, the troops are bathing and are ready for the clothes when they come out sterilized, after a period of 45 minutes. By this method 50 men can be handled per hour.

A change has been made in the operation of the disinfecter, which cuts down the time of drying from 20 to 5 minutes. The clothes come out practically dry and, after a few shakings in the air, can be put on without discomfort.

4. *Baths.*—At the present time, with the exception of those operating with the disinfectors, the baths are under the direction of the regimental commanders. The baths in use vary with the materials at hand; some of the regulation baths are supplied by the Engineers, while others are galvanized iron buckets from which sponge baths are taken.

According to information obtained from Lieutenant Buswell, it is felt that the three operations could be more closely combined to advantage. If heavier wheels were placed on the portable laundries, they could be used as trailers of the disinfecter and be carried around from point to point, as is necessary. The limiting factor of the laundry is the washer machine, and the limiting factor of the troop bath and disinfecter is the disinfecter itself. If the bath attachment could be taken along with the disinfecter, it could move from point to point and disinfect the clothing of 500 men in a 10-hour day.

The 10 by 14 foot tent used in connection with the troop bath has proved very satisfactory, and it is felt that in the winter time this type of tent could be heated by a stove, and give perfect satisfaction.

On the whole, the laundry, delousing and disinfecting facilities are very satisfactory in the area of the 1st Division. The laundries, beside the work of the hospitals, have been washing underclothing and reissuing them to troops, thus saving that underclothing being sent to the salvage depot and there reissued.

The following reports are submitted for your information:

SEYMOUR HADAWAY,
Captain Q. M. R. C.

OPERATION OF DELOUSING MACHINE

Instructions to organizations:

1. The delousing machine will be in ——— and ready to receive clothes for disinfection at ——— o'clock ———. A schedule should be prepared in accordance with the following information, so that the machine may be operated continuously, 10 or more hours per day.

2. The delousing consists of:

(a) Steaming the clothing and blankets with live steam.

(b) Rubbing the hairy parts of the body thoroughly with gasoline, and then bathing with warm water and soap.

3. Procedure: The machine is composed of two chambers, each of which will disinfect the clothing of 23 men at one charge. The time required is from 50 minutes to 1 hour. It is therefore suggested that the following procedure be followed:

(a) Forty-six men in double column under the command of a commissioned officer report to the machine at the specified time with their clothing done up in bundles as directed below.

(b) The two files pass their bundles to the men packing the respective chambers.

(c) The men proceed with the gasoline rub and bath.

(d) When the sergeant in charge of the machine reports that the disinfection is complete, the men are lined up in inverse order to that in which they reported and receive their clothing from the machine. This insures each man receiving his own bundle or that of the man next him.

(e) The next group should be ready to proceed.

4. Making up bundles: Lice are not killed in a thick, tightly-rolled bundle. The clothing and blankets must be made into a long, loose bundle with the underclothing outside.

If the overcoats are disinfected they must be put in the chamber separately. If the men have more than one blanket, two bundles must be made. If the overcoats and extra blankets are to be treated the number of men handled at a time must be proportionately decreased.

5. The machine carries its own fuel, the gasoline for disinfecting the bodies of the patients, and a crew of two men for operating engine and valves.

6. Your organization should provide: (a) Eight hundred gallons of water per 10 hours for the machine, unless the machine can be so placed as to draw its own water.

(b) A detail of four men to handle the clothing at the machine and one man from the Medical Department to issue gasoline. These men to report to the sergeant in charge of machine.

(c) Suitable facilities for taking a sponge bath.

NOTE.—The men should be instructed to open their bundles and spread out their clothing within 30 seconds of the time they come out of the chamber. This insures complete drying and airing. If these instructions are followed the clothing will be dry and may be put on at once.

This process does not wash the clothes, but it does freshen them to a marked extent by driving off body odors.

IMPROVISED METHODS OF DISINFESTATION BY STEAM

On occasions when the standard types of steam disinfectors were not available to our troops overseas, improvised methods were adopted for the utilization of steam for the disinfestation of clothing. These adopted methods were the Serbian barrel, or modifications of it.⁸

The Serbian barrel is a large barrel, usually 60 gallons capacity, the bottom of which is perforated with a number of augur holes, while the top is removed and replaced by a weighted flat lid.⁴¹ To each end of the barrel is attached a sandbag collar, to prevent the escape of steam, which enters the barrel from a boiler upon which it rests. One essential to the successful operation of the barrel is that steam must be generated rapidly enough to fill the barrel in 40 seconds.

When steam was available, as at hospitals, the Serbian barrel could be used with much more satisfactory results. Here, the steam could be admitted at the top of the barrel, forcing the air through an outlet at the bottom, thus eliminating air spaces and avoiding condensation. Such an improvement on the Serbian barrel was used at Mobile Hospital No. 39, A. E. F. It is described as follows:

MOBILE HOSPITAL NO. 39,
AMERICAN EXPEDITIONARY FORCES.

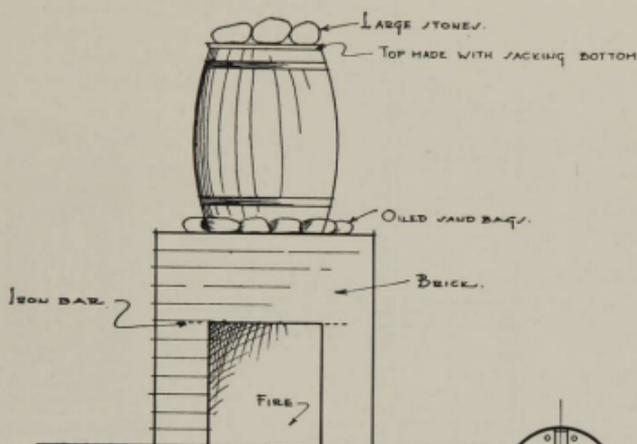
From: Commanding officer.

To: Chief surgeon, G. H. Q., A. E. F. (through chief surgeon, advance section).

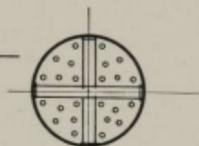
Subject: Delousing apparatus.

1. Transmitted herewith is a sketch of an improvised delousing apparatus under construction at this station. The sterilizing truck has a steam exhaust connected with the ejector on the horizontal autoclave, which can be utilized for the purpose of delousing if the quality of material to be handled is not too heavy. An ordinary wine cask is utilized as

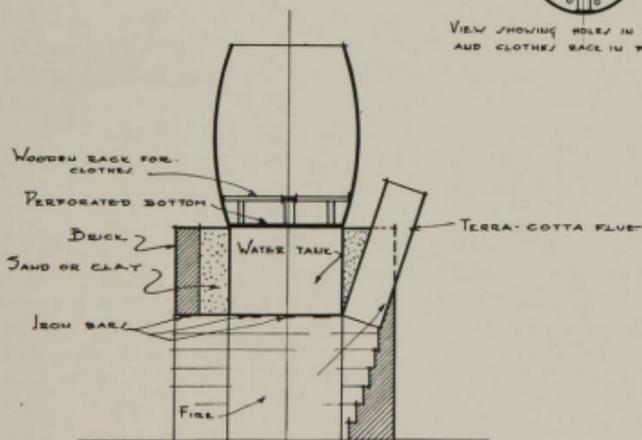
SERBIAN BARREL DISINFECTOR



FRONT VIEW.



VIEW SHOWING HOLES IN BOTTOM AND CLOTHES BAG IN PLACE.



SECTION

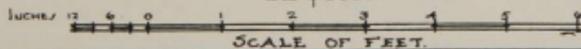
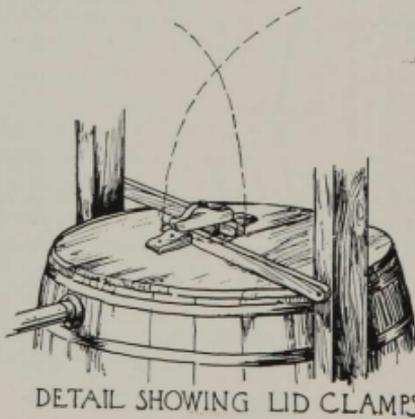
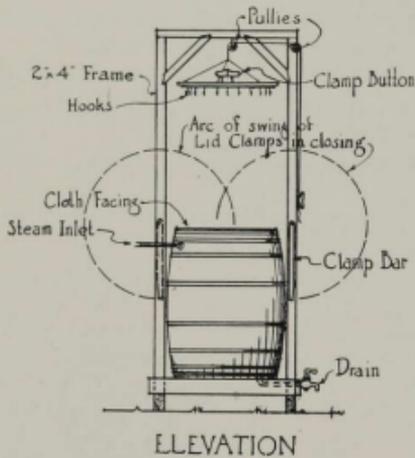


FIG. 128

DELOUSING BARREL STEAM



Steam Inlet to be connected
to Ejector on Horizontal
Autoclave or Sterilizing
Truck or similar apparatus.
Lid to be held down by
clamps or weighted with stone.
Barrel to be cloth faced.

a steam chamber; is provided with an inlet near the top and an outlet at the bottom to empty the chamber of air and also to void the water of condensation. Around the rim of the barrel is a felt or cloth facing to give a steam-tight closure. The lid of the barrel is provided with hooks on which the clothes can be separated and hung and lowered into the steam chamber. After this lid is in place, a slight amount of positive pressure can be obtained by weighting the lid with heavy stones or providing a type of clamp something like a trunk hasp.

2. This type of delouser was employed by the undersigned in 1915 with great success, where a series of these barrels were connected with a high-pressure steam boiler, serving the sterilizing room and used when the latter was not employed for the surgical service. At that time it proved efficient in killing both lice and eggs. It is forwarded with the idea that it might be of service not only for other organizations of this type, but also for any hospital or post provided with a steam generator of sufficient capacity.

(Signed) JOSEPH M. FLINT, *Major, M. R. C.*

The division surgeon, 80th Division, reported satisfactory results from the use, in a number of organizations of that division, of a steam box, the construction of which was based on the Serbian barrel. A description of the steam box is as follows:⁴²

A hole, 3 feet square, is excavated to the approximate depth of 3 feet. At what may be termed the front, an inclined approach to the bottom of the excavation is made to facilitate the control of the fire which is to be laid there. A galvanized-iron can is now so suspended in the center of the excavation, by means of iron bars passing through the handles of the can, that the top of the can is level with the surface of the ground. Over this is placed the disinfesting chamber, which is double-walled and made of wood. The outer wall is 4 feet square, the inner, 3½ feet square. The space thus left between the inner and outer walls has a hole in its center to coincide with the top of the galvanized-iron can. The inner sides of the inner walls and the upper surface of the bottom, except for the center hole, are lined with tar paper, which is covered with sheet iron. At the four corners of the inner box small blocks are placed about 4 inches from the upper surface. These blocks are for the suspension of a rack, comprising a wooden frame, made of 2 by 4-inch lumber, and wires which extend from side to side at intervals of about 1 inch.

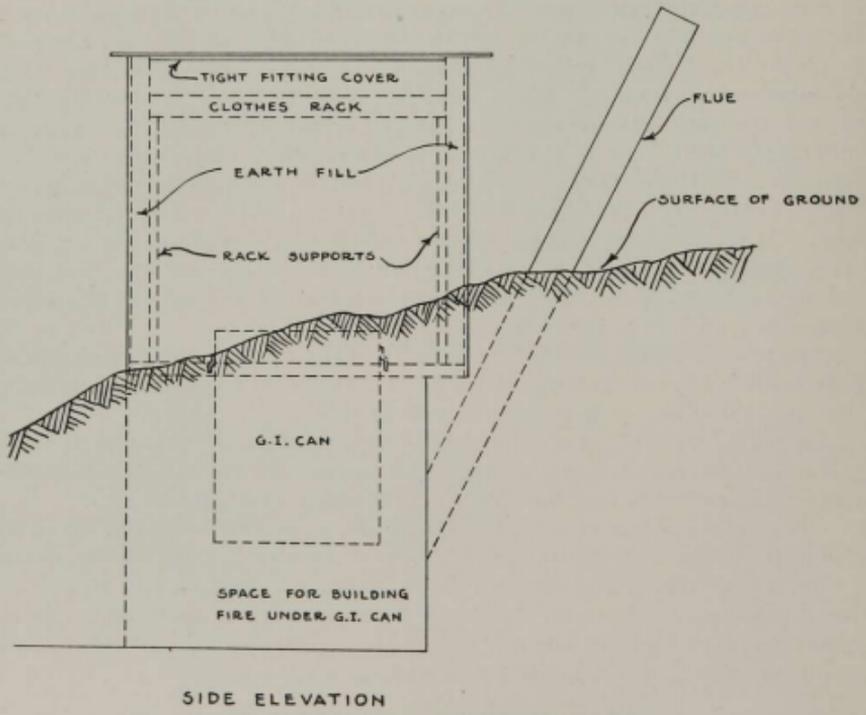
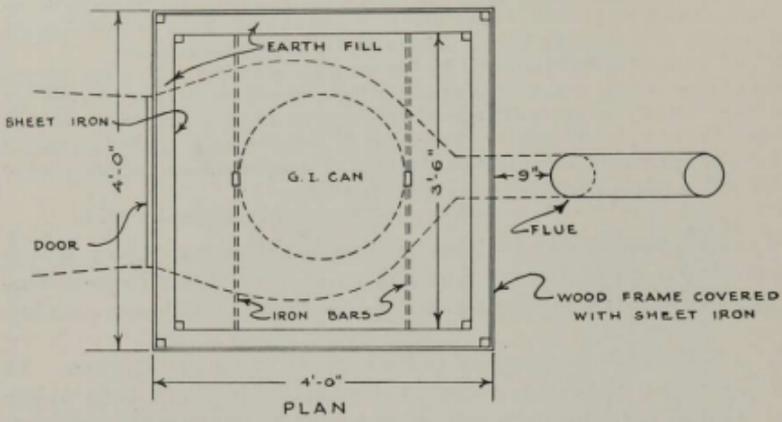
To provide a draft for the fire, a section of stove pipe is placed in an inclined hole, leading from the bottom of the excavation, at its back. A tightly fitting top is provided to inclose the disinfesting chamber.

After steam is being generated from water which has been placed in the galvanized-iron can, articles of clothing to be deloused are suspended from the wires of the rack, which is then placed in the steam-proof box.

The division surgeon, 80th Division, A. E. F., reported that the use of this disinfestor in the 80th Division, A. E. F., over a period of three months showed a complete destruction of lice and their nits after an exposure of 20 minutes. The capacity of the box was about 450 blankets a day or about 200 uniforms. After being take from the box and exposed for a few moments, the clothing was completely dry and was ready for immediate use.⁴²

HOT-AIR DISINFESTATION

The first serious effort to have adopted generally in the American Expeditionary Forces the employment of dry heat for disinfestation purposes was made by a board of medical officers which had been appointed in the American



SIDE ELEVATION

FIG. 130.—Small steam delouser used in 80th Division, A. E. F.

Expeditionary Forces in February, 1918, with the view to studying the prevention of skin diseases in our overseas forces. On the question of disinfestation this board reported as follows:⁴³

While there is a considerable number of different methods by which lice, nits, and the parasites of scabies can be destroyed, the general consensus of opinion is that for large-scale disinfestation, such as that necessary in the Army, heat is to be preferred to fumigation, immersion, or other chemical methods. Heat may be applied as steam or as dry heat, and it seems likely that it will be necessary to make use of both of these forms of heat, adopting the method to the conditions and the locality.

Steam is being applied in the British Army in the form of (a) movable autoclave lorries, such as the Foden-Thresh and the horse-drawn Thresh autoclaves, in which live steam is employed with little or no pressure; (b) the large stationary autoclave of the Manlove-Elliott type, in which steam under pressure is to be used; (c) the wooden cell with a steam-pipe system.

Dry heat is being employed (in the British Army) chiefly by means of the so-called Jacobs hot-air chamber.

In deciding whether for a given purpose steam or hot air should be employed, many factors must be taken into consideration. We know from recent, careful experiments that both lice and nits are destroyed by 60° C. (140° F.) applied for one-half hour, without the presence of moisture, and since this temperature (and indeed considerably higher temperatures) can be used on fabrics of all kinds and leather, this would seem to be the ideal for Army purposes. The Jacobs chamber, then, has the advantage of harmlessness to fabrics and leather, speed, and simplicity. It is economical as regards fuel, and avoids the necessity for subsequent drying of clothes. Its disadvantages as at present in use are lack of mobility, the need of great accuracy in construction, and the necessity for great care of supervision while in operation. We believe, however, that for many locations the advantages of this method are so decided that its disadvantages are relatively negligible. The chamber, of standard size, is said to cost about \$500, if made of materials available at the front. We believe that it would be possible to develop one which could easily be taken down and set up in another place, and perhaps it would even be possible to construct one in the form of a van, which could be moved from place to place. At any rate we would request authorization to experiment in this direction.

* * * * *

PROPOSED ORGANIZATION

We may graphically represent a scheme for an eventual system of disinfestation, as follows: It should be remarked, however, that this plan is intended to be tentative, since we anticipate changes which will be enforced by experience gained during its development and by military necessities pointed out to us by those conversant with such matters. However, the essential principles of this scheme may be maintained in spite of a considerable amount of change in the details of its organization. We would suggest that the problem be attacked, as indicated above, along two lines: (1) Immediate steps for the disinfestation of troops at the front, and (2) the more gradual development of a more effective system.

For immediate measure we suggest that wherever American troops go into the line suitable locations be promptly selected in the lines of support for the installation of the small Charles Blanc, or similar showers, the locations being selected in buildings available in the billeting area in order to avoid any unnecessary transportation of material or new construction.

Similar arrangements of a somewhat more extensive nature we suggest should be made in the reserve area, and that here the construction of a divisional delousing chamber of the Jacobs type be immediately begun in connection with the divisional baths. The baths should be constructed first, and Foden-Thresh lorry used in disinfestation while the hot-air chamber is being constructed.

* * * * *

It is suggested that these proposed measures to be immediately begun serve as a guide to the more permanent establishments to be organized both at the front and in the areas of the rear, the capacity and detailed construction of subsequent stations being left open for the present to be determined by the experience gained by our troops in this preliminary work.

* * * * *

We furthermore request that authorization be granted for experiments on the construction of hot-air disinfestation chambers or steam-driven lorries, several suggestions for which the present board has to make and which, if successful, would represent the solution of an extremely important and difficult phase of the problem.

JACOBS HOT-AIR DISINFESTOR

A description of the Jacobs hot-air disinfestor, as given by its designer is as follows: ⁴⁴

Suggested scheme for working.—Two delousing chambers with bathhouses, as per plan, should be built in each divisional area. These should have a permanent staff to obviate the necessity of new personnel having to learn the working of the scheme and at the same time ensuring continuity of work. A workable size is one capable of delousing the kits of 80 men per hour. The scheme is meant to include blankets, greatcoats, khaki, and underclothes. Only by this means will the treatment be rendered effective.

The time taken to disinfect the kits of 40 men is half an hour, allowing five minutes for loading and five minutes for unloading the chamber. Therefore each batch of clothing is subjected to a temperature not lower than 60° C. for 20 minutes.

With two such bathhouses, a division at full strength may be disinfected once a fortnight. For example:

Strength of division, approximately 20,000.

Rate of bathing, once in 14 days.

Number of men passed through per day, 1,440.

Number of men passed through per hour, 160.

Ticket system for bathhouse.—Man enters bathhouse, undresses, and hands all his clothing (except his boots, which he places in a pigeonhole provided) to the attendant, who hands bather a colored disk representing the articles handed over and to be exchanged. Attendant then hangs all clothing on numbered hooks of sliding racks. The bather then places the disk in his boots, together with any other personal belongings in the pigeonhole which bears a similar number to that on the rack of the chamber. He then bathes, removes his boots from the pigeonhole, and hands his underclothing disk into the clean-clothing store. Clean underclothing is given in exchange. He puts this on and waits in dressing room until his khaki is ready, which he receives from the attendant in exchange for the numbered disk.

Construction of delousing chamber.—The chamber has been designed so that it may be built entirely from material available under active service conditions. The structure is of 4-inch by 2-inch timber, lined with corrugated iron, sheet iron, or Uralite sheeting, and rough boarded on the outside, the space between being filled with sawdust. The floor is cemented to facilitate cleansing. The runners for the racks are angle-iron pickets suspended from the ceiling by 2-inch by 3/8-inch wrought-iron straps. The racks are 2 inches by 2 inches side rails and 2 inches by 1 inch cross battens, with 5-inch wire nails driven through the battens and bent up for hooks. Small 2-inch iron wheels, a local purchase costing 2d., are fitted to make easy running.

Hints on working the chamber.—1. Do not attempt to load the chamber unless the temperature is standing between 71° and 75° C. to allow for drop in temperature when first loading a quantity of cold articles. For example:

Method I. Temperature standing at 71° C., on charging with racks full, drops 11° C. = 60° C. Twenty minutes for treatment, during which time temperature is raised nearly 3° C.

Method II. It is much better to charge the chamber with a full rack each five minutes continuously. Very slight alteration in temperature is then noticeable.

2. Doors must be opened and closed quickly. This is applicable to both methods.
3. Stoking: To obtain best results about 4-inch depth of fire should be kept evenly over the grate area, and new fuel should always be placed in front of the door on the dead plate and pushed forward after it is well alight.
4. Flues should be brushed every seven days.
5. The temperature can easily be regulated by adjusting the two dampers on the flues leading to the main chimney stack.
6. Under wet conditions: When disinfecting wet articles they must first be dried. A thoroughly saturated greatecoat may take two hours to dry; i. e., two and one-half hours in the chamber.
7. A delousing chamber must not be confused with a drying room, as the ventilating system (without mechanical means) is entirely different.
8. Furnace: The furnace should be of cast-iron having a heating surface of 1 square foot to each 100 cubic feet of space to be heated, exclusive of flue pipes.
9. The flue pipes from the furnace should start with one 6-foot length of 6-inch diameter cast-iron piping, the remainder being ordinary 6-inch sheet-iron pipe.
10. The main stack to be 9 inches diameter.

11. The radiant heat from the furnace can be better diffused by placing a perforated sheet of iron over the stove, leaving a 3-inch space all around.

12. Ventilation: Unless efficient means of circulating the air and so causing a uniform temperature throughout the chamber exists, a stratified condition obtains in which the heat is too low to kill at the lower levels and needlessly high at the top (Bacot).

In a chamber erected and experimented with, it was found that the higher temperature favored the lower levels of the chamber owing to the fresh-air inlet coming in at the bottom, warmed, and the outlet ducts also taken from a low level. The fresh-air inlet is delivered into the chamber from both sides of the fire box and passing along underneath the combustion chamber to the center of the room and carried up 15 inches above the floor level.

The ventilating ducts are taken up, one at each corner, in the cavity of the walls and thence across the roof to the main shaft starting 7 inches above floor level.

The main shaft is constructed from 2 inch by 1 inch battens, braced, and the outside covered with tarred felt. The whole is suitably stayed with iron wire to the superstructure.

The minimum size of fresh-air inlet duct (due allowance to be made for shrinkage and ill-fitting doors) and outlet shaft should be of equal area; i. e., 1 square foot for every 500 cubic feet of space in the chamber when empty. The outlet shaft should be at least twice the height of the chamber; e. g., a chamber 6 feet 6 inches high would require a shaft 13 feet high.

13. Labor required for working the chamber is 4 men. Bathhouse personnel would be extra.

On March 14, 1918, the chief surgeon, A. E. F., recommended to the commander in chief, A. E. F., the erection of a stationary disinfector, under the direction of the chief engineer, A. E. F., on the area then occupied by our 1st Division; experimentation by the chief engineers, with the view to developing a portable hot-air disinfector for operation in connection with our bathing establishments for combat troops. His stated reason for preferring hot-air disinfestation was the possibility of destroying lice and nits, by using this means, at a relatively low temperature (140° F.) and within a reasonable length of time (one-half hour), without harming in any way fabrics, leather, and metals. In addition, articles could be delivered from the disinfector dry and ready for use.⁴⁵

Because of the lack of materials and pressure of other work which the department of construction and forestry of the Engineer Department, A. E. F., had in hand, it was impracticable for that department to undertake the construction of disinfectors.⁴⁶ Then, too, the purchase of 200 stationary Thresh disinfectors had been ordered, the intention being to install them in the base

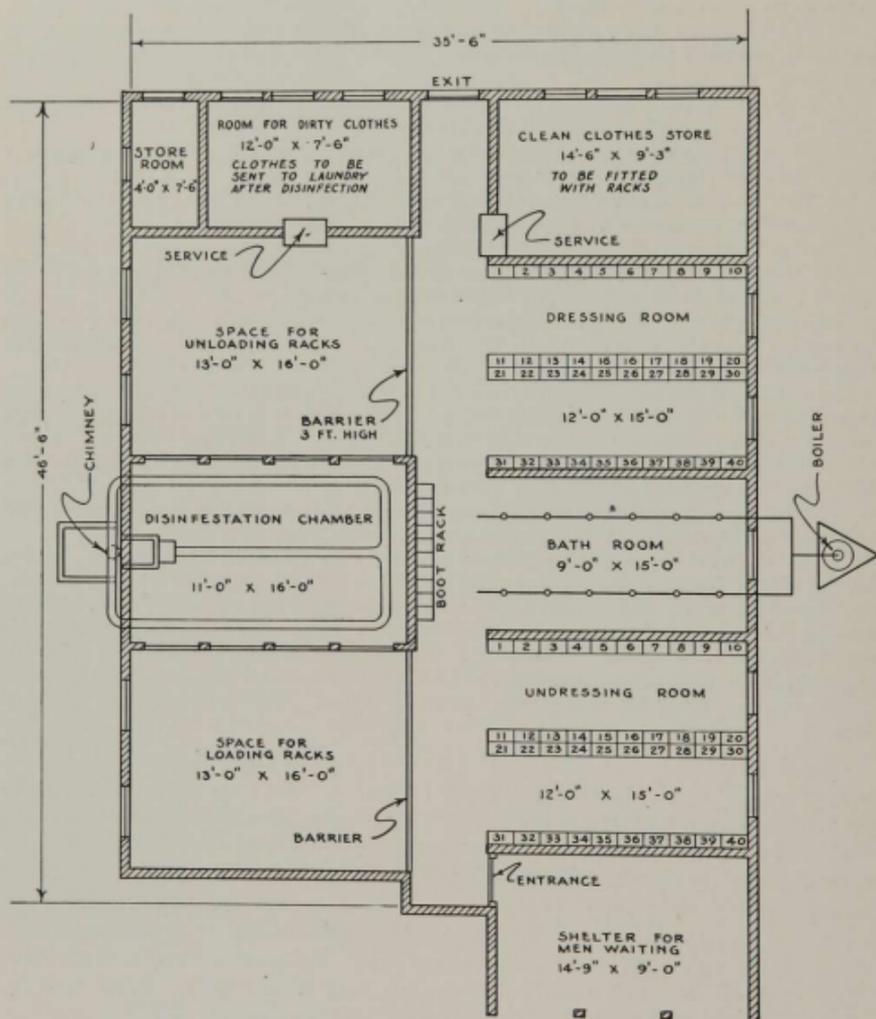


FIG. 131.—Jacobs' suggested plan for bathing and dry-air disinfection

hospitals of the American Expeditionary Forces, thus releasing many mobile disinfestors for use with combat divisions.⁴⁶ For these reasons, the recommendation of the chief surgeon, A. E. F., was disapproved;⁴⁷ and though hot-air disinfestors subsequently were utilized, the use of steam for disinfestation was not given up in the general plan of preventing lice infestation in the American Expeditionary Forces.

CANADIAN HOT-AIR DISINFESTOR

It was not until after the armistice had begun, when a greater amount of time and attention could be given the question of disinfestation, that hot-air disinfestors were used to any extent. A type extensively used was the so-called Canadian hot-air disinfestor, designed by Maj. H. Orr, Canadian Army Medical Corps.⁸ The details of this means of disinfestation by hot air may readily be seen by reference to the plan for its construction (Fig. 133) which was furnished to organizations by the officer in charge of bathing and delousing, A. E. F.⁸ The features which permitted its successful operation were the supply of air for combustion in the heaters and for the circulation of air within the disinfesting chamber to insure an evenness of temperature throughout.

GILCHRIST PORTABLE DRY-AIR DISINFESTOR

A portable dry-air disinfestor was designed by Col. H. L. Gilchrist, M. C., for use in connection with the mobile bathing apparatus (also designed by Colonel Gilchrist for employment in the Chemical Warfare Service, A. E. F., and described above under "Bathing") that was used largely in the billeting areas of the American Expeditionary Forces.⁸

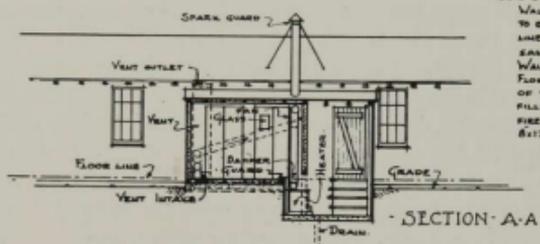
Gilchrist's portable dry-air disinfestor consisted of a sheet-iron, asbestos-lined chamber, measuring 6 feet by 14 feet by 6 feet. Within the chamber were 34 crossbeams, each fitted with 14 hooks, upon which the men's clothing and equipment were to be hung. Heat was supplied by means of two gasoline blowtorches, located on a standard at the side of the chamber, and was conveyed to the bottom of the chamber through an L-shaped, sheet-iron pipe, thus making it possible to maintain a temperature of from 210° to 220° F.⁸

The disinfesting chamber was mounted on a 3-ton Packard chassis. Its capacity was adequate to disinfest the clothing and equipment of 17 men every 45 minutes.⁸

HOT-AIR DISINFESTORS AT EMBARKATION CAMPS

When plans were drawn for the disinfestation plants of the embarkation camps of the American Expeditionary Forces, it was intended that hot air would be the means employed for the disinfestation of clothing and bedding. Such means were established at the American Embarkation Center, Le Mans, France, and at the base ports of Base Sections Nos. 1, 2, and 5.⁸ The hot-air disinfestors were integral parts of bathing and delousing plants, especially erected. The plans for these plants called for a building 175 feet long by 85 feet wide, comprising a main building and two wings.⁸ The main portion of the building, measuring 85 feet in length and 50 feet in width, contained the bathing, medical examination, and clean-clothing departments. The wings,

HOT AIR DISINFESTOR

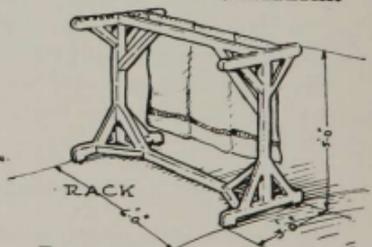
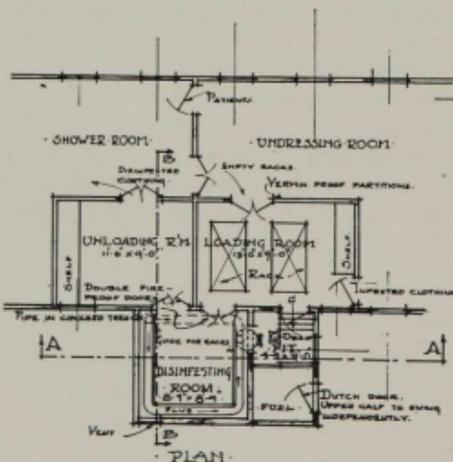
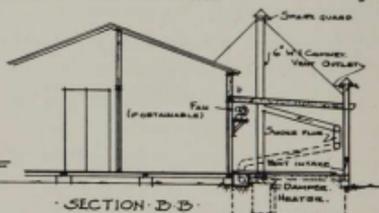


NOTE

WALLS AND ROOF OF DISINFESTING CHAMBER TO BE OF 2" (2 1/2") BOARDING EACH SIDE, LINED WITH ASBESTOS. A SPACE FILLED WITH SAND DIRT AND OR SAWDUST. WALLS TO BE OF BRICK WHERE AVAILABLE. FLOORS TO BE OF CONCRETE WHERE AVAILABLE OR OF WOOD OR SLEEPERS; SPACE BETWEEN TO BE FILLED WITH SAND OR DIRT. EXPOSED PORTIONS FIRE-PROOFED WITH ASBESTOS OR TIL. SIZE DOUBLE WINDOW FOR THERMOMETER.

OPERATING

1. LICE AND OTHER BODY VERMIN ARE KILLED IN TWENTY MINUTES BY DRY HEAT AT A TEMPERATURE OF 140° F.
2. DIRT AND FILLS IN STOVE WITH DIRECT HEAT, WHEN BURNING BRIGHTLY TURN DAMPER SO THAT DRAFT PASSES THROUGH THE CIRCULATING STOVE PIPE IN DISINFESTING CHAMBER.
3. HANG CLOTHING BLANKETS OR ARTICLES OF KIT WHETHER LEATHER OR METAL ON WOODEN RODS OF RACK.
4. BRING TEMPERATURE OF CHAMBER TO 160° F.
5. ROLL LOADED RACKS INTO DISINFESTING CHAMBER; MAINTAIN HEAT FOR TWENTY MINUTES.
6. REMOVE RACKS TO UNLOADING ROOMS.
7. REPEAT PROCESS.
8. A TEMPERATURE OF 180° F OR MORE IS UNNECESSARY AND INJURIOUS TO FABRICS.



RACK CAPACITY

- 15 BLANKETS PER RACK, 20 MINUTE PERIOD.
 3 BLANKETS PER MAN, PLUS THE EQUIVALENT IN CLOTHING OR
 4 BLANKETS PER MAN DIVIDED INTO 15 BLANKETS PER RACK.
 2 RACKS x 3 PERIODS PER HOUR = 15 MEN'S EQUIPMENT PER HOUR.

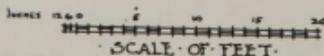


FIG. 132

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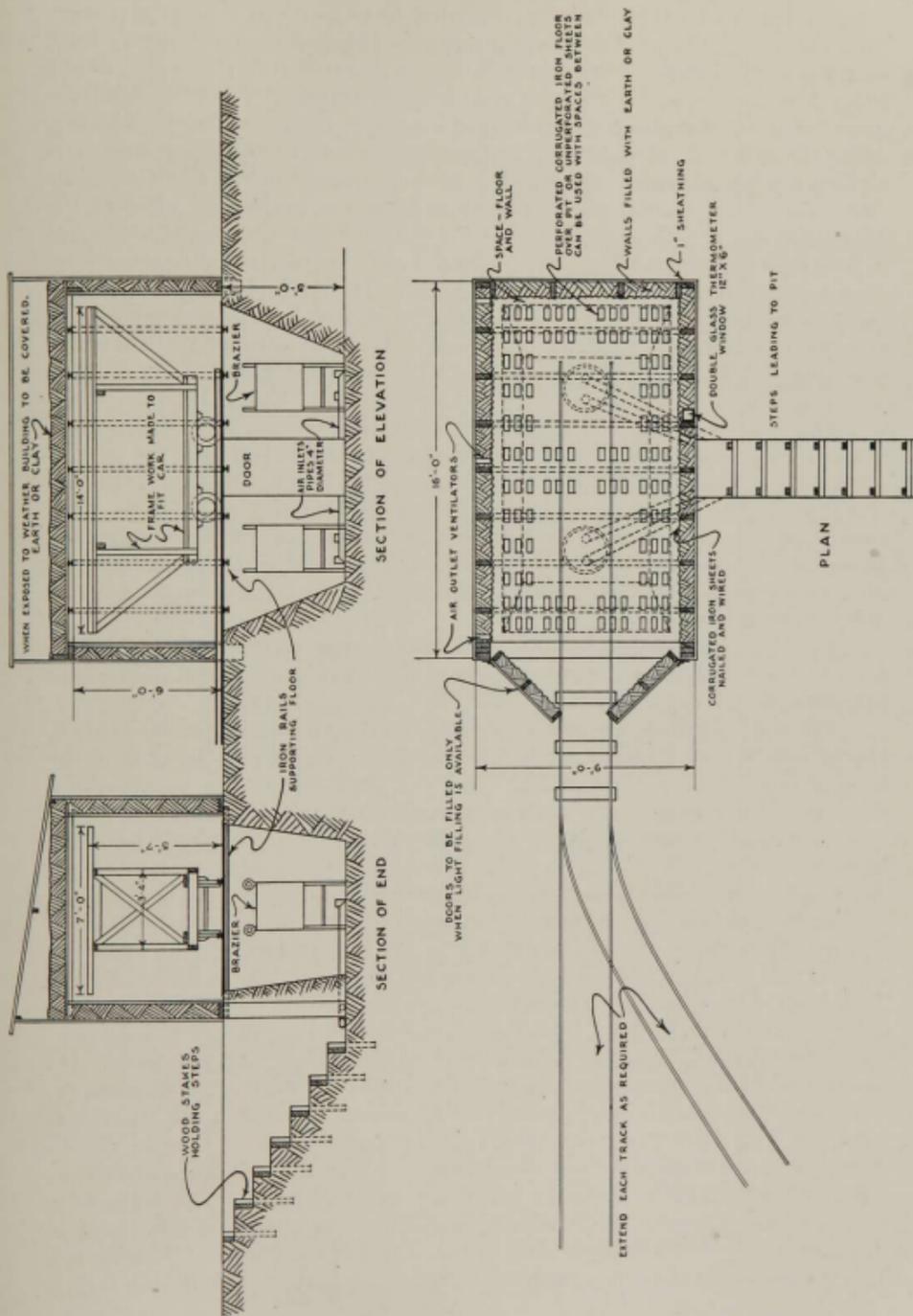


FIG. 133.—Canadian hot-air disinfector

125 feet long and $32\frac{1}{2}$ feet wide, extended to one side in a parallel manner from the main building, thus leaving a space of 20 feet between them. Each wing was divided into 10 compartments, each compartment having a designating letter, from A to J, and containing seats laterally arranged for the accommodation of 16 men. One wing was to be used for undressing; the other for dressing. Along the outer side of each wing, and connecting with each compartment, was a passageway 5 feet wide. On the floor of each compartment was a Decauville (narrow-gauge, portable) track, extending from the undressing wing to the dressing wing, and through the hot-air disinfector which occupied the space between the two wings. This track guided the clothes rack from the undressing compartment to the disinfesting chamber, thence to the dressing compartment. Each rack was 7 feet long and 3 feet wide, and was divided into sections so numbered as to coincide with the numbered seats of the compartments to which it pertained. The sections were provided with hooks on which to hang clothing and equipment.

The exterior dimensions of the disinfector were 120 feet in length, 15 feet in width, and 7 feet in height. It was divided into three chambers, the interior dimensions of that at either end being 37 by 13 by 7 feet, whereas the middle chamber measured 45 feet in length. Thus the middle chamber was sufficiently large to house four racks, leaving three for each of the other chambers. Double doors, each $3\frac{1}{2}$ feet in width, afforded entrance to the disinfector for each rack from the undressing compartments and, likewise, exit to the dressing compartments.

To secure insulation, the walls of the disinfector were constructed of two layers of corrugated iron, between which sand was placed; the ceiling was covered with cinder packing.⁸

The original scheme was to heat the disinfector by means of gasoline heaters, four of which, each consisting of five burners, were placed in a pit sunk in the floor of each disinfesting chamber.⁸ Air was conducted to the burners from without. Being heated it rose into the chambers, thus tending to create approximately the same degree of temperature at both their upper and lower levels.

Heating the disinfesting chambers by means of gasoline proved impractical, and its use was soon discontinued.⁸ In January, 1919, observations were made on the effectiveness of the disinfesting plant, constructed at the American Embarkation Center, Le Mans, in accordance with the plans outlined above.⁴⁸ Two racks were loaded, one with the complete equipment of 8 men, and one with complete equipment of 16 men. On either rack were placed metal equipment (except steel helmets), blankets, shelter tent halves, and bed sacks. On closing the chamber, its temperature rose from 35° C. to 60° C. within 2 minutes, as indicated on the two thermometers used, one being placed at the uppermost level and one at the floor level. The temperature steadily rose to 70° C. during the next 10 minutes, and was maintained between that point and 78° C. for 25 minutes from the time at which 60° was registered. The racks were then withdrawn from the disinfesting chamber, and a reading was made of thermometers which had been hung in the center of the clothing of each rack. This reading showed 45° C., the assumption being that there had been a drop

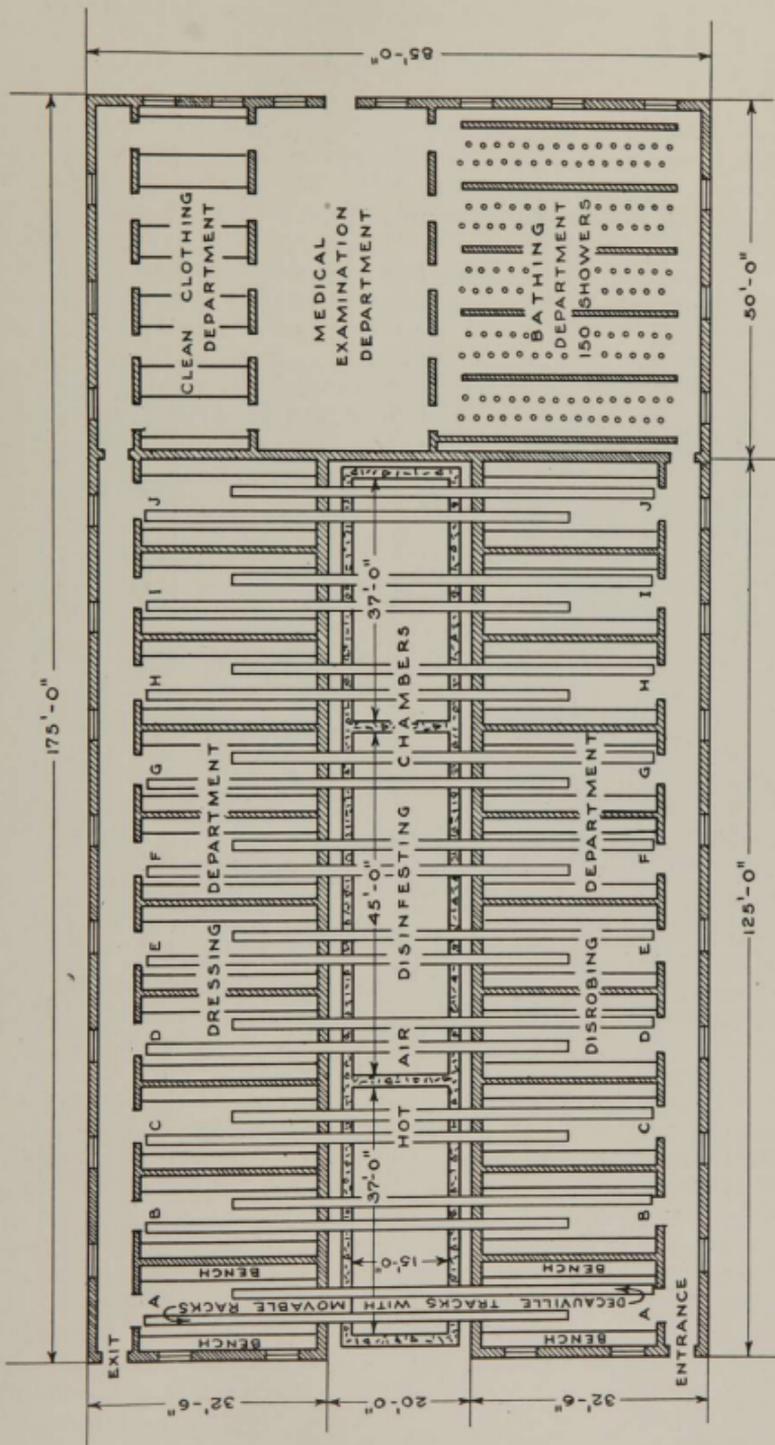


FIG. 134.—Plan of delousing plant, embarkation camps, A. E. F.

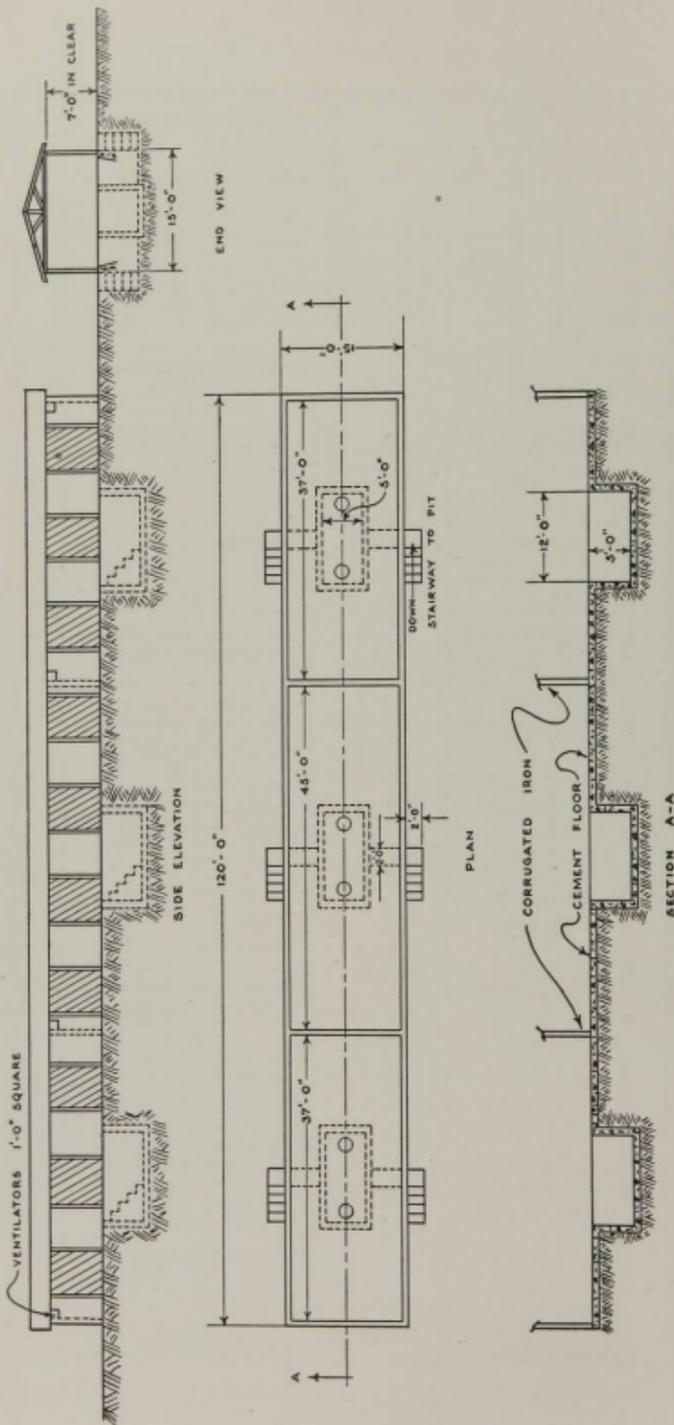


Fig. 135.—Section of disinfection chambers

of 5° or 10° before the reading had been made. An examination of the clothing on the rack containing eight men's equipment showed living lice. These lice were found on a shirt which had been suspended at the outer edge of the rack where conditions presumably were most favorable to an exposure to a lethal temperature. These lice had in all probability protected themselves by crowding beneath a layer of cloth of the shirt, since several dead lice showing definitely the effect of high temperature, as indicated by their shriveled appearance, were found on the outer portion of the same shirt.

This experience, similar in its character to conditions met at the base ports, A. E. F.,⁴⁹ indicated that the failure of this type of disinfestation plant was not



FIG. 136.—Clothing rack, after removal from disinfestation chamber

due to the lack of heat in the disinfesting chamber, for a temperature higher than that necessary to kill lice and nits was readily attained.⁵⁰ The failure was due, however, to the fact that a lethal temperature was not attained, in the specified time (one-half hour), within the folds of woollen garments.⁵⁰ To have made hot air a successful means of disinfestation in these plants would have necessitated either a longer exposure of the garments within the chambers, or so opening up and spreading out the garments as to make all surfaces outside surfaces. Since time was a measure of such importance, to have adopted either of the means suggested would have materially slowed the rate of flow of troops through the disinfestation process, and consequently their embarkation for the United States.⁵⁰

At the American Embarkation Center, Le Mans, and at Brest, steam disinfection replaced hot-air disinfection. However, hot-air disinfection continued to be practiced at the ports of Base Sections Nos. 1 and 2.⁸

The following account shows how the disinfection plant at Bordeaux was converted from a gasoline-heated plant to one whose heat was supplied by means of steam-heated pipes, and how the disinfection process was thereafter successfully operated.⁵¹

THE THERMAL EQUIPMENT OF THE DISINFESTATION PLANT, EMBARKATION CAMP, BASE SECTION NO. 2, A. E. F.

The thermal equipment of the disinfection plant consists of: (a) A boiler with pumps, tanks, and apparatus complete; (b) Steam transmission pipes from boiler plant to the ovens, and (c) the delousing ovens and steam heaters.

The boiler is a 125-horsepower Houston Stanwood & Gamble stationary locomotive-type boiler equipped with a 2-inch Worthington, double-action feed-water pump. The boiler is cased in wire netting and asbestos paste and is apparently operating at one-half capacity. One hundred and twenty pounds steam pressure has been found to give the most satisfactory results, as this pressure effects a just balance between the temperature desired in the ovens, the area of the heaters and their distance from the plant.

The equipment of the delouser has been divided into three ovens: Oven No. 1, into which racks A, B, and C run; oven No. 2, into which racks D, E, F, and G run; and oven No. 3, which takes racks H, I, and J. Ovens Nos. 1 and 3 are of the same size, but oven No. 2 is considerably larger. Oven No. 1 is 13 by 37 by 7 feet in dimensions, containing 3,367 cubic feet of air, weighing 200 pounds at this point, which is practically sea level. In order to raise this volume of air from the mean, average, local temperature to a temperature of 106° C., an expenditure of 4,185 B. T. U.'s is necessary. Now as these ovens are not perfectly air-tight, and as in the operation of the plant it is necessary to open the doors several times per hour, it has been found advisable to provide in this oven three heaters, each consisting of 64 lengths of 1-inch pipe, 13 feet long, arranged with 180° return bends, 8 pipes in a tier and 8 tiers high, the total having a radiating surface of 277 square feet, or the three heaters in the oven having a total surface of 831 square feet. It has been found from tests that this style of heater will radiate approximately 200 B. T. U.'s per square foot of surface at a steam pressure of 120 pounds per hour, and at this rate this surface is sufficient to maintain a temperature of 106° C. in the oven, with the oven changing volume 40 times per hour, which, experience has proven, about compensates for the opening of the doors and the superficial radiation of the oven walls and surfaces.

Oven No. 2 is of 13 by 45 by 7 feet in dimensions, containing 4,459 cubic feet of air, weighing 323 pounds, and necessitates an expenditure of 6,827 B. T. U.'s to raise the temperature of the air volume to 106° C. For this oven four heaters have been provided, having a total radiating surface of 1,108 square feet, which provides equally satisfactory results.

Thus for the successful operation of the plant an expenditure of approximately 600,000 B. T. U.'s per hour is necessary, and figuring ordinary coal at from 10,000 to 12,000 B. T. U.'s per pound, and the boiler efficiency at normal, an expenditure of about 200 pounds of coal per hour.

The radiating surface provided in each chamber varies from 1 square foot to 3.3 cubic feet of chamber volume in the case of the chamber nearest the boiler, to 4 square feet of radiation in the large chamber, to 4.4 cubic feet in the chamber most distant from the boiler. The heaters are at fault inasmuch as no plans were made for its installation in the original construction, and it was placed in position and in quantity, where experience demanded it, and where room was available.

One of the most important features of a heating installation such as this is to provide adequate drainage for the condensed steam in the heaters. For this purpose it is recommended that in future constructions the entire building be located on a slope of at least 1 per cent, as this will then allow of laying the heater pipes parallel with the floor, and at the same time assure adequate drainage from the heaters to the steam trap. This is a matter of prime importance if even temperatures are to be maintained in the oven.

In the present installation the heating surface of the boiler is approximately one and seven-tenths times the radiation surface of the ovens exclusive of the pipes connecting boiler and radiators. However, the boiler is at present not working at capacity, and in future installations of this sort it is suggested that the boiler heating surface be one-half that of the radiation surface. For this purpose, a recommendation of 1 square foot of surface of the heatings to 3.6 cubic feet of oven contents is made.

The installation of the present heating chamber is not good, inasmuch as the chamber consists of corrugated-iron sides filled with sand, which is not a good insulator and allows of considerable loss of heat. In the event that hollow tile, brick, or concrete construction is not available, I would suggest that the delousing chamber itself be made entirely of wood, two thicknesses of tongued-and-grooved, ship-lap being fastened to each side of the joists, these double coatings to have roofing or building paper inserted between them. As a means of fire protection, the introduction of live steam into the chamber would not be considered sufficient for an entirely wood construction, and for this purpose fire protection should be supplemented by automatic extinguishers. This could readily be connected to the tank used for water running to the bathroom, and with a proper installation of these automatic sprinklers the danger from conflagration would be negligible.

After the final construction of the plant, and after several months of progressive operation, during which time the system of gasoline was dropped and that of steam adopted, and all other minor changes that experience proved necessary were made, this office was confronted with its last problem: Hot-air rises. Hence after continued tests it was found that while the ovens registered 106° to 110° C. 3 feet from the ceiling, the temperature on the floor registered 60° to 70° C. So it was deemed advisable to provide some system within the ovens themselves to raise the temperature of the floor layer of air. This was accomplished by the use of four and one-fifteenth-horsepower electric fans, of the type found in any home in the United States, in each oven.

The temperature of the ovens being well above the melting point of all insulations used in the construction of motors, it was impossible to place the fans intact within the oven chambers, as the motors would immediately "burn out." Hence the fans were detached from the motors and a shaft extension made of sufficient length to reach through the walls of the oven and allow the fans to operate within the ovens, while the motors operated without.

As the fans were 12 inches in diameter, a 12-inch sheet metal pipe was built for the fans to turn in. The metal pipe was L-shaped, with the fans turning in the short leg of the L, which lay on the floor, and with the upper end of the L terminating 6 inches from the ceiling of the oven. Thus, as the fans turned, the hot air was drawn down from the ceiling and laid on the floor. Tests with a thermometer thereafter proved the temperature on the floor to be 90° C. which was satisfactory.

The fans operated in a 12-inch pipe, moving the air at a rate of approximately 200 feet per minute; or 160 cubic feet per minute. The four fans therefore had a total capacity of 640 cubic feet of air per minute; and as the contents of the oven was 2,457 cubic feet, these fans completely rotated the air every four minutes, or caused a complete cycle of circulation 15 times per hour.

DISINFESTING A DIVISION IN THE INTERMEDIATE SECTION

The following account of the means that were adopted in the 85th Division, American Expeditionary Forces, when it had moved back from the vicinity of Toul to the Le Mans area preparatory to returning to the United States, is enlightening as indicating sources of lice infestation, as well as showing what can be accomplished in the way of disinfestation by the use of improvised measures:⁵²

The problem of bathing and delousing a division in the intermediate section is not a difficult one. In the billeting area a crude shower bath can be very easily constructed out of bacon cans suspended by ropes or wires. A Serbian barrel may be made from an iron kettle and a galvanized-iron can or an old wine barrel. But with casual troops the problem is much more difficult. Many of these men had lost their sense of military discipline, and the statement made by many of them that they had not been inspected for weeks nor been in a position to either bathe or change their clothing would seem to be borne out by their condition.

When the 85th Division left the Toul area, an inspection showed that the men of the division were free from lice. When they were inspected in the Le Mans area about 40 infested men were found. In determining the reason for the appearance of these cases, the following questions were considered: (1) Were inspections sufficiently rigid? (2) Was our delousing efficient? (3) Were the men infested from cars used en route? (4) Was there some spread of the infestation by the crowding of men in box cars for this journey? While it is possible that the previous inspections and delousing had been inadequate, it seems probable that they became infested during the journey.

With the receipt of about 12,000 casualties by the division late in January, 1919, it was found that over 50 per cent of them were infested with body lice. In some detachments received, 90 per cent were found infested. A careful inquiry was made as to the possible source of their infestation and the following was ascertained: A great many of the men were hospital evacuations, and they stated that at the hospitals they were bathed and their clothing was deloused. They were sure they left the hospital without body lice. Subsequently, they passed through forwarding camps, at which places they were issued salvaged clothing. They state that they were rarely inspected and that the delousing, when it was done, consisted of a bath and a change of underclothing without a sterilization of outer clothing or of blankets.

We were confronted with a large problem, that of rapidly and properly delousing these men and their clothing. This area, which had originally been laid out as a regimental area, now had to be expanded to a divisional area covering over 30 towns. The five bath units which we found installed for regimental purposes were totally inadequate for a divisional problem. We then secured all available bath units, which were 10 in number, making a total of 15 in the area, and we were required to exercise our ingenuity in supplying baths for the remainder of these towns. This was accomplished by the use of bacon cans, in the bottom of which a few holes were punched, and these tins were suspended by wires to serve as shower heads. With a French kettle to heat the water, this arrangement makes an excellent shower bath.

There was considerable delay in securing new underwear for these men, for transportation was extremely difficult to obtain. It is absolutely essential in the handling of casualties to have new underclothing for distribution, as most of the clothing in their possession is in deplorable condition and not fit for reissue. There were some cases in which the men were absolutely without underclothing.

In each town in the area one or more Serbian barrels were constructed; besides these, gasoline was used, and the seams of clothing was ironed with hot flatirons. In Conlie, seven Serbian barrels were built. Here, between the dates of January 24 and February 4, 1919, a total of 2,203 men were bathed and deloused. After reducing the number of infested cases to about 1 per cent, the plan was adopted of delousing all billet mates of each man who was found to be infested. This low percentage was reached on February 15, 1919, with the use of only the above crude methods. At about this time three portable steam sterilizers were received. These were distributed in the area, sanitary men being put on duty with them. When one of these machines reached a town a schedule was made out and every man in the town was given a bath, and all his clothing, including overcoat, bed sack, and blankets were put through the sterilizer. In spite of rigid inspections and the immediate delousing of all men found infested, we found that we were slow in freeing all the men. The reasons for these few remaining cases of infestation we believe to be the following: (1) At first the failure to sterilize identification tags and tape, wrist-watch bands, money, money belts, etc., or articles of clothing like a privately owned serge suit or an extra sweater. (2) Infested billets. While it is claimed by most textbooks that billets are not liable to infestation, we are convinced that when men are sleeping in haymows and in billets which are not capable of being policed it is very probable that lice do wander far enough from the human body to lay their eggs on the hay or straw of the billet. This is further borne out by the communicability of the infestation; i. e., if a body louse does not wander farther from its host than to his outer clothing, there would not be nearly so great a dissemination of lice in armies. One of the great problems in the prevention of the transmission of lice from man to man is to prevent the huddling of men together for the purpose of increasing bodily warmth. Even with a stove, the poor condition of many of these billets precludes the possibility of adequate

heating in freezing weather, and owing to the rapid expansion of this area the supply of stoves to every billet promptly was impossible. (3) Salvaged clothing is a very probable source of infestation. This clothing may have been passed through a sterilizer, but oftentimes the heat is insufficient or is not maintained long enough to destroy all eggs. This applies equally well to Red Cross sweaters, pajamas, etc. (4) Association with civilians. The American soldier is very prone to fondle the French children, and it is usually the dirty and lousy child of the street who climbs about the good-natured soldier. (5) Insufficient sterilization in our own delousers. It is easily possible that in a rudely constructed Serbian barrel, especially when many cases were to be handled, that all eggs were not killed. (6) Inaccurate and careless inspections. There is always a tendency if inspections are held daily that some carelessness will develop in getting all men present for inspections and in making the inspections sufficiently thorough. An infested man not found and deloused is a good focus for the spread of lice to other men.

To eliminate, if possible, this small number of remaining cases, the following precautions were taken: (1) The sterilization of everything belonging to a man except his shoes and his slicker; burning the straw from his bed sack and sterilizing the bed sack. (2) Thorough police of billets and the delousing of all billet mates of a man found infested. (3) The sterilization of all clothing before issuing it to the soldier. (4) Discouraging the fondling of French children. (5) Using the greatest care that clothing be exposed to live steam for at least 20 minutes in a Serbian barrel. (6) Repeated delousing; i. e., having men return at intervals of two days for three or four delousings. (7) More minute inspections with shirts turned wrong side out over the arms extended upwards. Insisting that men on duty getting supplies, driving trucks and ambulances, etc., report for inspections. (8) It was insisted that the noncommissioned officers in charge of each billet enforce existing regulations that men not only slept head to feet but that each man slept alone under his own blankets. As a result of the above measures the percentage of infested men fell to the point that at the final inspection by the Embarkation Center authorities extremely few infested men were found in the entire division.

BATHING AND DELOUSING DIVISION DURING THE ARMISTICE *

Inasmuch as the work pertaining to bathing and delousing the American Expeditionary Forces during the armistice was assigned to the Quartermaster Corps, A. E. F., all activities pertaining to this work were carried on through that department; however, a large percentage of the personnel performing the work belonged to the Medical Department.

The subject of bathing and delousing was closely associated with that of the "demustardization" of men subjected to the fumes of mustard gas. The Chemical Warfare Service, through its medical director, had perfected a thorough organization for administering hot baths to men at the front who had been subjected to the fumes of mustard gas; and in view of the fact that this organization would no longer function after the signing of the armistice, it was recommended by the chief surgeon, A. E. F., by the chief quartermaster, and by the chief of the Chemical Warfare Service, that this organization be transferred to the Quartermaster Corps, A. E. F., for the purpose of bathing and delousing the infested men. This project was approved by the commander in chief, A. E. F., and as a result the entire organization was assigned to the Quartermaster Corps. The transfer took place November 25, 1918, and the medical director of the Chemical Warfare Service, A. E. F., was placed in charge of all activities pertaining to the work.

* Taken from *Delousing the American Army in France*, by Col. H. L. Gilchrist, M. C., *The Military Surgeon*, Washington, D. C., 1920, xlvii, No. 2, 129.

ESTABLISHMENT OF THE BATHING AND DELOUSING DIVISION

The bathing and delousing division, A. E. F., was established in compliance with the following memorandum:

NOVEMBER 21, 1918.

From: Commanding General, S. O. S.

To: C. in C.

Subject: Delousing and bathing.

1. The health of the troops largely depends upon the completeness with which delousing and bathing is done, especially during the coming period of diminished activity and relatively permanent station.

2. Up to the present, the work of providing facilities for the cleanliness of the men's clothes and bodies has not produced satisfactory results. Much hospitalization from skin infections with vermin has resulted. In some organizations as many as 90 per cent of the command are louse.

3. Apart from the loss of physical fitness due to lice infestation and scabies, there is the danger of typhus fever which is now imminent. This results from the disintegration of the armies of the Central Powers, whose delousing systems have up to the present time been a valuable barrier of protection for the allied armies against infection from the great eastern endemic centers of this disease. Winter is the season of typhus fever and of trench fever, both transmitted by the louse. Scabies is always more prevalent in winter.

4. The Chemical Warfare Service has developed, under the direction of its Medical Director, Col. H. L. Gilchrist, a degassing service, with an efficient organization and trained personnel. This service could be most efficiently applied to the work of delousing.

5. It is recommended, therefore, that the attached draft of a general order be published, detailing Col. H. L. Gilchrist to this duty, under the direction of the chief quartermaster. The chief quartermaster, the chief surgeon, and the chief of the Chemical Warfare Service are in accord with this action.

6. It is requested that such instructions be issued to the armies as will enable Colonel Gilchrist to carry on this work, and that copies of such instructions be furnished him.

J. G. HARBORD,

Major General, U. S. Army, Commanding.

In compliance with the above recommendation the following general order was issued:

General Orders, No. 216.

G. H. Q., AMERICAN EXPEDITIONARY FORCES,

France, November 2, 1918.

* * * * *

II

1. The health of the troops depends largely upon the completeness with which delousing and bathing is done, especially during the coming period of diminished activity and relatively permanent stations.

2. To provide for the carrying on of this important work, Col. H. L. Gilchrist, Medical Corps, is hereby detailed for duty, under the chief quartermaster, and placed in charge of all activities with reference to the delousing of armies.

3. The equipment and personnel of the degassing service is attached to the Quartermaster Corps. This equipment and personnel, together with that now in operation under the Salvage Service, will be placed at the disposal of Colonel Gilchrist for this work.

4. Such part of section 7, G. O., No. 144, these headquarters, and all orders and instructions heretofore issued which conflict with the above are rescinded.

By command of General Pershing.

JAMES W. McANDREWS,

Chief of Staff.

Official:

ROBERT C. DAVIS, *Adjutant General.*

Pursuant to the above general order, the degassing service, consisting of the following personnel, was transferred from the Medical Department, A. E. F., to the Quartermaster Corps, A. E. F., in connection with this work: Commissioned, colonels, Medical Corps, 1; majors, Medical Corps, 7; captains, Medical Corps, 27; first lieutenants, Medical Corps, 4; first lieutenants, Sanitary Corps, 5; second lieutenants, Sanitary Corps, 15; total commissioned, 59. Enlisted, sergeants, first class, Medical Department, 5; sergeants, Medical Department, 12; corporals, Medical Department, 3; cooks, Medical Department, 3; privates, first class, Medical Department, 13; privates, Medical Department, 178; total enlisted, 214. Grand total personnel, 273.

ORGANIZATION, BATHING AND DELOUSING DIVISION

The central office of the bathing and delousing division maintained direct communication with each subdivision. This was considered most essential in that it furnished a means by which the chief of the bathing and delousing division could keep in personal touch with all activities connected with the work. By means of this arrangement the transfer of bathing and delousing personnel and equipment from one division to another was readily accomplished.

Trained officers, in the majority of cases medical officers, designated as supervisors of bathing and delousing were assigned with every division. Almost invariably these officers were former division medical gas officers who took with them their trained office personnel. Under plans emanating from the central office, each of these officers immediately organized his section, placing sub-supervisors of bathing and delousing with all regiments, battalions, and smaller organizations.

When the division of bathing and delousing was organized, every endeavor was made to avoid burdening the supervisors with an undue amount of administrative work; it was the plan to leave them free from such, thus permitting them to devote more time to the essential features connected with the work. However, certain information was needed in the central office; consequently, printed forms requiring only such information as was actually wanted were supplied for the purpose.

The supervisors were held strictly accountable for carrying on the work in the divisions to which they were assigned, and as a rule they were not interfered with.

In each division a thorough system of bathing and delousing was organized, by which arrangements were made for the complete and thorough disinfection of units at definite intervals. This plan proved to be of the utmost importance. Time-tables were drawn up, and the period and places at which various units were to be bathed and disinfested were specified in orders.

As a rule, the units were deloused systematically, either by companies or battalions, so that the men who were freed from lice could be segregated from men of other organizations awaiting disinfection. In delousing the men great care was exercised in the disinfection of their belongings at the same time. This was a most important measure in combating lice infestation. It was essential that all clothing, including service dress and underclothing, should be thoroughly and systematically disinfested. This required a certain amount of

equipment which, in many cases, could not be provided; as a result, the troops were thrown on their own resources and improvised many ingenious and successful contrivances for carrying out the bathing and disinfection projects.

For the prevention of reinfestation of troops freed from lice, the following preventive measures were adopted in all divisions: (1) The detection of men who were infested with lice. (2) The disinfection of all clothing and bedding belonging to lice-infested men. (3) The cleaning of the men by bathing. (4) Cleansing of their billets or sleeping quarters.

The relative importance of these measures was realized. The early detection of lice-infested men was essential, without which the rapid spread of lice would follow; so periodical inspections of men to detect lice infestation were made, and when possible these inspections were conducted in the presence of commissioned officers.

In conducting this work, every attempt was made to gain the men's confidence and thus their assistance. All men, if suspecting infestation, were instructed to report immediately to the designated officer in charge of the work in their units.

As a result of this organization, the bathing and delousing of troops of the American Expeditionary Forces was carried out very successfully; in less than six weeks after the bathing and delousing division was created the lice-infestation rate dropped from 90 per cent to less than 3 per cent.

DUTIES OF SUPERVISORS OF BATHING AND DELOUSING

The supervisors of bathing and delousing were appointed upon the recommendation of the chief of the bathing and delousing division, A. E. F. They were placed in general charge of all bathing and delousing in the division or base to which assigned, and attached to the staff of the division or base quartermaster. Owing to the close relationship existing between the Medical Department and the Quartermaster Corps in connection with the work, they coordinated in every possible way with these departments.

They prepared for publication and distribution to all organizations in their respective divisions extracts from reports and literature which had a direct bearing on the subject, forwarded to them by the chief of the bathing and delousing division. They gave numerous lectures to the different organizations on the subject of lice infestation; they arranged for the regular inspections and supervised the same; they furnished the chief of bathing and delousing with all data having any bearing on the subject, together with all required reports.

MEASURES FOR ELIMINATION OF LICE

At the beginning of this work many adverse conditions were met, all of which had to be overcome. There was a scarcity of bathing and delousing equipment, and that on hand was not being utilized to the best advantage. Laundry facilities were poor; consequently, there was a shortage of underclothing. The troops were unsettled; they were constantly changing from one area to another, and many were billeted in private homes and places which could not properly be disinfested. These were serious conditions which had to be eliminated before any improvement in the verminous conditions could be looked for.

Regularity in the changing of underclothing, proper bathing and disinfecting facilities, and the supervision of the work by a commissioned officer were found to be the predominating necessities for the successful elimination of lice.

In the carrying out of this work, two general methods of disinfestation were followed: (1) The mechanical method. (2) The chemical method.

Under the mechanical method the following equipment was used: Steam sterilizers (mobile and stationary); steam boxes; Serbian barrels; hot-air disinfestors; Canadian hot-air disinfestors; hot boxes; heated caves; flatirons; heated cans, etc.

Under the chemical method the following were used: Acetic acid, 10 per cent, or vinegar for head lice; alcohol, absolute, or strong spirit, for head lice or pubic lice; benzine for head lice and body lice; benzol; camphorated alcohol (camphor 1 part in 90 per cent alcohol); camphorated oil; carbolic acid, 2½ per cent, followed by olive oil; cresol solution—5 per cent cresol soap solution killed nits and lice in 30 minutes, 3 per cent killed nits and lice in one hour; mercury for head, body, and pubic lice; mercury ammoniated white precipitate ointment; mercury and vinegar; mercury—solution of 1 part to 2,000; N. C. I. (naphthaline 96 parts, cresole 2 parts, and iodoform 1 part).

DIFFERENT TYPES OF DISINFESTORS USED

Several different types of steam disinfestors were employed in this work, and when handled with care proved successful. Much unjust criticism was made relative to the inefficiency of certain types of steam disinfestors, but careful investigations proved in nearly all cases the fault was not due to the apparatus but to other causes, such as inexperienced personnel, overcrowding of the chambers, and lack of proper exposure.

DISINFESTATION OF TROOPS AT BASE PORTS

Following the signing of the armistice, troop movements to the United States commenced almost immediately. A large percentage of the men transported home were verminous, with the result that many complaints, and just ones, were received from the home ports. The condition became so serious that the commanding general, S. O. S., directed that no further troop movements be made until proper arrangements were provided for delousing troops prior to embarkation; consequently every effort was made to provide, on short notice, delousing plants at each of the embarkation ports sufficient in size to care for 10,000 troops in 24 hours.

It was decided that the most feasible method for conducting the work and handling the large numbers which would have to be considered would be to divide all preembarkation camps into two sections: A reception section and an evacuation section. All troops arriving at such a camp were assigned to the reception section, where they remained until such time as they could be thoroughly deloused, whereupon they were transferred to the clean or evacuation section, a complete line of demarcation separating the two sections. To carry out this plan necessitated large buildings and delousing plants, of sufficient

size to handle the maximum number scheduled to pass through the camps. The plan was submitted to the commanding general, S. O. S., and was approved.

The next important matter for consideration was the type of delousing plant to be adopted. No plans of bathing and delousing plants of any description were available in the American Expeditionary Forces; consequently drawings were prepared by the chief of the bathing and delousing division, A. E. F., submitted to the chief quartermaster, and approved by the commanding general, S. O. S. Orders were issued for their immediate construction.

In planning the delousing plants the following activities were concluded to be necessary: (1) A general inspection of all clothing and equipment for the purpose of listing such articles as were missing and for which others would be required. (2) The checking and compiling of all individual records. (3) The delousing of all clothing and equipment retained after passing the general inspection. (4) The venereal inspection. (5) Bathing. (6) Complete medical examination. (7) The reissuing of such articles of clothing as were required. (8) Shaving of the hairy parts of the body when necessary. (9) Final dressing.

OPERATION OF BATHING AND DELOUSING PLANTS

When the bathing and delousing plant was in operation 200 men reported every half hour. They were divided into platoons of 20 men each, each platoon being in charge of a noncommissioned officer who was designated as compartment chief.

The men were instructed by the compartment chief to proceed to certain stalls designated by capital letters and to numbered seats. At the same time each man's clothing slip was marked with the letter of the stall and the number of the seat to which he was assigned. The men were then instructed as to the method of disposing of their clothing, as to bathing, drawing of clean clothing, disposition of dirty, cast-off underclothing, and the designated places to await the complete delousing of their belongings.

Bathroom.—Men found free from venereal diseases in the first instance passed immediately into the bathroom. Here they were required to soap their heads and hairy parts of the body thoroughly and to scrub themselves vigorously. Clean towels were provided each man; liquid soap was used exclusively.

Medical examination room.—After the men dried themselves they passed in single file in front of a line of medical officers, each a specialist, where a careful and complete examination of the throat, lungs, heart, skin, etc., was made. Men found suffering from any serious disease were sent to the hospital for further examination, classification, and treatment. In the medical examination careful inspection for vermin was made, and men infested were shaved, treated, and required again to bathe thoroughly and report back for reexamination. Men having skin diseases or any specially interesting pathological conditions were classified and photographed.

Quartermaster issue room.—From the medical-examination room the men passed to the clothing department, where they presented their clothing slips and received clean underwear, socks, fresh identification tapes, and such other equipment as had been checked off for them to draw.

Dressing room.—With the new equipment in their arms the men then entered the dressing room and final inspection department, where they were directed to compartments and seat numbers corresponding with those in the undressing sections. Their clothing and equipment remained in the disinfector for a period of 30 minutes. While waiting for the clothing to be disinfested they put on the clean clothing drawn. When the rack bearing their clothing was shoved out in their sections they hurriedly removed all their belongings, thus permitting the rack to be shoved back in the undressing sections for the receipt of clothing of others. Each checker in charge of the different sections or compartments called off the articles which each man was supposed to have. Shortages were reported and filled.

If a delay of over three days existed after the troops were deloused, prior to embarkation, they were sent again through the delousing plant for re-examination.

PERSONNEL ATTACHED TO EACH LARGE BATHING PLANT

At each large bathing plant a permanent operating staff of 7 commissioned officers, 25 noncommissioned officers, and 175 privates was constantly required to carry on the work. This staff was divided into squads, thus permitting the plant to run continuously when required.

MEDICAL PERSONNEL ATTACHED TO THE LARGE BATHING AND DELOUSING PLANTS

To insure a thorough physical examination of all men prior to embarking for the United States, a large medical staff with personnel was required at the plants at Bordeaux, St. Nazaire, and Brest. Twenty-two medical officers were detailed at each plant for this work. They were divided into three shifts, each shift working eight hours. A permanent medical detachment consisting of 30 enlisted men acted as clerks and in other capacities required in this one department. In carrying on this work a laboratory was provided in which dark-field examinations were made of specimens from all penile sores, and urethral smears were stained for gonococci.

SANITATION

The handling of so much clothing and equipment on the floor, especially in the disrobing room, resulted in much dust, dirt, and litter. This was removed by sweeping by special details, in the interval between the exit of one assignment of men to a stall and the entrance of the next. To keep down dust, which was considered especially dangerous under these conditions, the floors were sprinkled with sawdust, wet with cresol solution, and every two hours the floors are sprinkled with a 7 per cent cresol solution. A knapsack sprayer was found especially useful for that purpose.

EDUCATIONAL WORK

This work was of such importance that a special department was created in the central office with branches throughout all divisions, each in charge of specially qualified men.

A comprehensive program of education concerning lice, their habits, and their relation to health was started at the beginning of the work. In conducting this program many methods were used in distributing pertinent information.

The matter was taken up also with organizations, where memoranda on the subject were read at all formations to the men. Also, thousands of large circulars and charts were posted throughout division areas and in places where men congregated.

The cinematograph proved of the greatest importance in distributing information. To gain the interests of the men, cartoons were thrown on the screen showing the lice and their habits, as well as pertinent facts and figures. This method of distributing information proved of the greatest value. In the entire scheme every effort was made to solicit the cooperation of the men.

CLEANLINESS OF BILLETS

One cause for the constant presence of lice on men was the fact that the billets were infested. To overcome this, it was recommended that whenever possible extemporized bedsteads or canvas cots be provided for the men, and bed sacks used instead of loose straw. The floors of the billets and other places in which lice were found were washed or sprayed with a 10 per cent watery solution of cresol.

ACTIVITIES OF THE BATHING AND DELOUSING DIVISION, AMERICAN EMBARKATION CENTER, LE MANS

The bathing and delousing division, American Embarkation Center, at Le Mans, was organized and operated as follows: (a) One officer, known as supervisor, bathing and delousing, American embarkation center, was responsible for the installation, operation, and administration of adequate bathing and delousing facilities for the entire area; (b) one officer responsible for the repairs and proper maintenance of all bathing and delousing apparatus in the embarkation area; (c) one officer responsible for the inspection of all equipment, and the reporting of needed repairs to the maintenance officer; (d) one personnel and statistical officer, in charge of reports and matters relating to the personnel.

Under the direction of the supervisor, there were supervisors for the concentration camps—i. e., forwarding camp, Belgian camp, and classification camp—and for the following districts: Montfort, Le Ferte Bernard, Le Theil, Ecommoy, Le Suze, Ballon, and Conlie.

Large bathing and delousing plants were installed at the forwarding camp, Belgian camp, and classification camp, with combined facilities for bathing and delousing approximately 1,200 men per hour. In addition to these plants, bathhouses were erected, with sufficient capacity to bathe all men not infested with lice. For the convenience of troops billeted in the city of Le Mans, an excellent French bathhouse, with a capacity of 600 baths per day, was leased and operated.

Throughout the billeting area, in the towns occupied by troops, or within easy marching distance, portable eight-head shower baths were installed in tents, French buildings, or in bathhouses especially constructed by the Engineers. Each bath had a bathing capacity for about 300 to 400 men per day. Where practicable, French bathhouses were taken over for the use of the troops.

The area delousing was accomplished by means of portable Erie, Thresh, and Grampian sterilizers, by improvised Serbian barrels, by pressing clothes with hot flatirons, by boiling the underclothing, by the use of disinfecting fluids such as cresol, and by various other available means. The sterilizers were capable of disinfecting 50 complete kits per hour, and were moved about in much the same manner as the mobile bath units described below.

There were seven mobile bath units, each with 24 shower heads, and each capable of bathing 300 men per hour. These were moved through the area according to the fluctuation of its population, thus relieving any congestion that might occur.

In order to carry on this work, permanent personnel of 17 officers, including those before mentioned, and 175 enlisted men, were maintained, and when necessary, additional men were detailed to assist in this work, from the troops occupying the divisional area.

STEAM DISINFESTING PLANTS AT LE MANS

Description of the plant.—The disinfecting and bathing buildings at Le Mans were similar to those at the base ports, but were much smaller. The hot-air method of heating the disinfecting chambers first tried was abandoned in favor of steam at low pressure. At each of those plants six small steam chambers were constructed, each 15 feet long, 6 feet wide, and 6 feet high, of tongued-and-grooved lumber on the outside and lined with asbestos boards. At each end of the chambers were double doors, each door of double thickness and lined with asbestos boards. Loosely fitted racks were provided in the upper part of the chambers for the reception of the articles. Steam was introduced in the chambers from two $\frac{3}{4}$ -inch pipes connected to an 85-horsepower boiler. The pipes entered each chamber from a supply pipe where it extended along the outer edge of the floor. These pipes were perforated with small holes at intervals of 6 inches for the escape of steam.

Hot air for drying purposes was driven into the chambers through 6-inch pipes extending under the floor, by means of a fan propelled by a 15-horsepower motor. The air was heated in a brick fireplace constructed just to the rear of the chambers. Trapdoors 4 feet in diameter were provided at the top of the chambers for the escape of steam, when the hot air was introduced. A steam exhaust 2 inches in diameter was placed in the corner of each chamber. This pipe extended through the roof and down to within 6 inches of the floor.

At a trial test, one of the chambers was filled to its capacity with the entire equipment of 15 men, each equipment comprising the following articles: Cap, overseas; overcoat; coat, service; belt, waist; gloves; breeches, service; puttees; tags, identification; helmet; haversack and pack carrier; belt, cartridge or pistol; canteen cover; first-aid pouch; gas mask haversack; comb; sterilizable souvenirs; blankets, three.

During this test the following experiments were conducted: A bottle filled with tap water of a temperature of 6° C. was placed in the pocket of a blouse in the center of the chamber; a potato which was covered with several thicknesses of overcoat was placed in the pocket of another blouse; two puttees were rolled tightly and hung in the chamber. At this test the chamber was not

preheated, but steam was immediately turned in and allowed to exhaust for 15 minutes. During this time several outside temperatures were taken at the upper part of the exhaust on the outside leading to the chamber: In 1½ minutes after the steam was turned on the exhaust registered 60° C.; in 2 minutes 70° C.; in 4 minutes 85° C.; in 5 minutes 90° C.; in 6 minutes 94° C.; in 7 minutes 99° C.; in 9 minutes 99° C. The thermometer remained at 99° C. throughout the remainder of the test.

Also a close study was made as to the effect of this steam on the pressure in the boiler. The steam was taken from a large 85-horsepower boiler, which was also furnishing power for several steam disinfestors, for running laundry machines, etc. When the steam was turned on the pressure gauge registered 57 pounds. This gradually dropped to 40, but again ascended to 46, showing a drop of 11 pounds during the test of 15 minutes. After turning off the steam the trapdoors at the center of the chamber were opened and the hot air was forced in, this continuing for 10 minutes, at the termination of which the doors were opened.

It might be stated also that a leather shoe was hung in the chamber to see what effect the steam would have on this material. In addition, a test was made concerning the shrinkage qualities by using a web belt for this purpose and noticing if the clip cases would be affected. The shoe was badly shriveled and in like condition following any steam disinfestation. No apparent shrinkage was noticed in the web belt and other equipment. All articles were apparently dry. The temperature of the water in the bottle, which before being placed in the chamber was 6° C., was found to be 85° C.; the potato was cooked for three-eighths of an inch, and three minutes after it had been taken from the chamber its center registered 60° C. The puttees, after being unrolled, were found steaming in the center.

DISINFESTATION, BASE SECTION NO. 2

Of the several ports of embarkation in the American Expeditionary Forces where delousing work was being done, the system adopted at Bordeaux was probably the most satisfactory one.⁵³ However, it must be taken into consideration that a very much smaller number of men embarked from Bordeaux than from Brest, also that the ships sailing from Bordeaux were considerably smaller in size and capacity than those sailing from Brest.⁵³ These circumstances permitted of a system at Bordeaux which would hardly have been practicable at Brest with the increased number of men to be taken care of.

At Bordeaux practically all of the towns and villages within a radius of 25 km. and more were used as billeting places for our troops.⁵³ When troops arrived at this port with the intention of embarking as soon as shipping facilities and the priority list permitted, they were detained as near their billeting areas as possible. They were then either marched or transported in trucks to the towns selected for their billets.

All of our troops who embarked at Bordeaux passed through the Bordeaux embarkation camp, causing a constant shifting of organizations at this camp; and as rapidly as organizations embarked and left vacancies in the camp,

others were brought in from the surrounding billeting areas to be prepared for embarkation, thus keeping it filled to capacity at nearly all times.⁵³

The embarkation camp consisted of two separate camps, the entrance camp and the permanent camp, or Camp Genicart, as the latter usually was termed. These were about 1 km. apart, but both were under the same administrative control. Troops arriving from billeting areas were received at the entrance camp and there detained until embarkation movements left available quarters for their accommodation at Camp Genicart. When such quarters were available, the troops to leave for the United States were ordered to this camp for delousing and final preparation for embarkation. All troop movements between the two camps were arranged on schedule, the men being dispatched by companies from the entrance camp at intervals of from 20 to 30 minutes. This arrangement permitted their steady arrival at Camp Genicart in such numbers as could be taken care of at the delousing plant. Here it was necessary to regulate their arrival so as to permit of its running to capacity during the hours of operation, and yet not have the men arrive faster than they could be taken care of.

Upon their arrival at the delousing plant the troops first entered a large steel and corrugated-iron structure, 300 feet long by 66 feet wide, originally intended for a hangar. About two-thirds of this building was used as a waiting room and afforded shelter for several thousand men. This was found to be necessary, especially during the winter months. A wooden railing separated the shelter portion of this building from the remaining third of the space, which was used for the inspection of clothing and equipment. After entering the shelter room the men filed through openings in the railing to the inspection department. As they passed through these openings each man was given a new Red Cross bag in which to carry his personal effects, and a clothing issue blank on which to check off any articles necessary to complete his clothing and equipment. At the same time, the strings of identification tags were cut as the men filed past, by others stationed there for that purpose. The old strings were placed in cans, to be burnt, and the tags placed in each owner's Red Cross bag.⁵³

After entering the inspection department each man was directed to a low, wooden table, on which he spread out all the clothing and equipment carried in his pack or barrack bag. This was examined by an inspector. All surplus clothing was taken from the men and sent to the salvage plant for renovation; unserviceable clothing was condemned. The clothing issue slip held by each man was checked off by the inspector to permit the drawing of new clothing in exchange for that condemned. Also at this place the men were instructed in regard to putting their money, watches, and other valuables and small personal effects, not of cloth, in their Red Cross bag to prevent loss. Here all blankets were also taken up, to be replaced by sterilized ones later on.⁵³

After the inspection was completed the men left this room and passed through a small, open yard to the administration room about 20 feet distant. This room was 100 feet long by 19 feet wide, with an L-shaped wing at the end. Long tables extended down either side throughout its entire length and continued into the wing. As the men entered this room they formed in two

single files and passed along in front of the tables, one file to each table. Here they were questioned by a row of clerks, seated behind the tables, who filled out all service cards and other papers necessary for embarkation. These were completed by the time the end of the room was reached.⁵³

As the men reached the exit of this room they were counted into the disrobing room of the delousing section. This section consisted of a disrobing room, disinfesting chamber, bathroom, and dressing room,⁵³ the details of which have been described on page 1051.

On entering the disrobing room the men were checked through the doorway in sufficient numbers to correspond with the capacity of the sections that were empty at the time. This gave three sections to each end oven and four for the central one. From 12 to 16 men were allowed to each rack, the number depending entirely on the amount of clothing and equipment carried by the men, extra personal clothing, or shortage usually causing the variation between the minimum and maximum numbers. As each man entered this room he was in possession of all his belongings, and it was surprising to note the difference that was found to exist between different organizations as far as personal effects were concerned.⁵³

A man was stationed in each section to instruct the men as to hanging their clothing on the racks, and to supervise the loading of the same. This instructor, usually a noncommissioned officer, had an assistant to pull the empty rack from the oven and to push it back again when it was loaded. While the men were undressing they received their instructions with reference to loading their effects on the rack.⁵³

As the empty rack was pulled from the oven they began loading at once. Pack carriers, gas masks, helmets, and all metal, leather, and web equipment, excepting the shoes worn at the time, were placed on the screen floor of the rack. All cloth articles were hung on the upper hooks, and this hanging of the garments was an important operation, requiring constant vigilance on the part of the section instructor and his assistant to see that the articles were placed in the proper manner. All clothing was hung as widely separated as the space permitted and but one garment to a hook. All long articles necessitated their lower ends being looped up to prevent covering the articles on the bottom of the rack; shelter halves, especially, required close watching in this respect. All this was carried on with as much speed as could be attained and yet have the racks loaded properly. From three to five minutes was the time usually required to load the racks.⁵³

Some of the instructions given to the men were as follows: "Keep quiet and work fast." "Remove all valuables from your pockets and place them in your Red Cross bag." "Remove all matches from your pockets before hanging your clothes on the rack." "All cloth articles must be hung on the rack. Do not attempt to carry any cloth articles in your Red Cross bag except new silks and your tobacco bags." "All those wearing money belts will remove the money and place it in their Red Cross bags and hang the belts on the rack." "All scapulars must be removed from around the neck and placed on the rack." "Do not carry handkerchiefs or cloth housewives in your Red Cross bag." "You will be furnished with a clean towel in the bath-

room, so do not carry one in your bag." "Place all articles of clothing that you are going to salvage in a separate pile. Do not hang them on the rack, as they are to be thrown through the salvage window as you leave the section." You will be furnished with clean underwear and socks, so do not hang those that you are removing on the rack. Place them with your condemned garments to be salvaged." "Have all your web, leather, and ordnance equipment separate from the rest of your clothing to load on the bottom of the rack as soon as it comes out. Load this on first." "Hang all clothing on the hooks at the top of the rack." "Hang but one garment on a hook and as widely separated as possible. Do not crowd the clothes on the rack." "If you get your stuff hung up, first help the man beside you." "Remember the letter of your section and your seat number." "As soon as the rack is loaded pass out of the section into the aisle. Throw all salvage through the salvage windows and pass down the aisle." "Watch the man ahead of you and do as he does."⁵³

It was necessary to repeat these instructions and in detail several times before they were understood by some of the men. Usually the men were instructed as soon as they had entered the section and were undressing, and again after they had removed all their clothing and were waiting for the racks to come out of the disinfestors. Signs telling the men what to do were painted on various parts of the walls to facilitate the work as much as possible. In addition, the section instructor marked the letter of the section and seat number on the back of each man's clothing slip to prevent confusion.⁵³

As soon as the racks were loaded the men filed out of the sections into the side aisle, those from each section falling in behind the ones ahead of them. The line thus formed passed by two inspectors, stationed in the aisle, who examined the contents of each Red Cross bag. This was a very necessary procedure to prevent the carrying of cloth articles—a possible source of reinfestation—which the men persisted in doing in spite of all instructions received. All such articles found in the bags were returned to the owner, to be taken back and turned over to the instructor to be hung on the rack, or to be salvaged. This was left entirely to the owner, who usually disposed of the articles as their value prompted. The men then filed by medical inspectors, stationed in an alcove at the end of the aisle, who examined them for venereal diseases. Upon completion of this examination each man was given a clean towel at the door of the bathroom, and passed in for a bath.⁵³

The bathroom was 27 by 32 feet in size, with a cement floor, and was equipped with about 80 showerheads. Shelves extending between each row of showerheads provided space in which the Red Cross bags and shoes could be placed. Wooden duck boards, about 4 inches high, were arranged under the showers to stand on. A semiliquid soap was provided for bathing. This was placed in containers at various parts of the room so that each man could take in his hand as much as was necessary to thoroughly soap himself. The hot water for the baths was supplied from a 5,000-gallon tank set at an elevation of about 12 feet, out in the yard near the boiler house. This was heated by coils of hot steam pipes and the injection of live steam from the boiler. Mixing valves in the bathroom, operated by an experienced man, regulated the tempera-

ture of the water for the showers. All men were given as much time for bathing as conditions allowed, all of them getting at least time enough for a good bath and thorough scrubbing.⁵³

After finishing his bath each man moved from under the showers to the ends of the duck boards, where after drying himself he again fell in line and passed into the medical examination room.⁵³

In this room the medical inspectors were stationed in a row, each inspector having a certain part to examine. Officers inspecting for skin diseases also looked for vermin. One inspector was seated on a high stool, and as the men filed by they raised their arms to allow for an examination for lice or nits on the body hairs of the axillæ, back, chest, or other parts of the upper portion of the body. The next inspector examined the pubic regions, buttocks, scrotum, and legs. The man to be examined stepped before the inspector who was seated on a low stool and holding an electric light with a reflector in his hand. If no indications of lice or nits were present, he was then passed on to the next inspector, for a throat or chest examination, as the case might be.⁵³

The active stages of *Pediculus corporis* were seldom found at these examinations, as those remaining on the body after the clothing was removed were usually washed off while in the bathroom, except in occasional cases where they were found in the axillæ or beneath the scrotum, due to carelessness of the man in taking his bath. When *Phthirus pubis*, or nits of either species, were found the man was turned over to an orderly, with a card stating what had been found on him, and was conducted to a consultant at the opposite side of the room. After the presence of lice was confirmed by the consultant, and the name of the man and his organization were taken by the clerk, he then was directed to the shaving room to be shaved on the infested areas. Safety razors were used in this work, so that each man could shave himself as far as possible. On parts of the body where the men could not reach themselves they ordinarily shaved each other. This they seldom objected to doing. Whether the shaving was done dry or with lather was left to the men themselves; the dry shaving ordinarily proved to be the most satisfactory.⁵³

A number of men who were on duty in the shaving room to inspect the work, and to assist in shaving when necessary, watched closely that all hairs were removed from the infested parts and that none was left to cause reinfestation a few days later. When the hair was removed the men anointed themselves with a lotion consisting of equal parts of kerosene and cottonseed oil. The cottonseed oil prevented skin irritation. This mixture was left on for 10 minutes, whereupon the man again was examined by the consultant. If found free from lice and nits he was sent to the bathroom, where he received a second bath to free himself of the oil. After this, each man as treated was checked off on the record book at the clerk's desk, and then passed by a table at the exit of the examining room, where he gave his name. An officer from each of the companies passing through the delousing plant at the time was seated at the table to check the men as they passed, from the rosters of the companies. This checking was always done under the supervision of a representative of the Medical Department. Upon emerging from the medical examination room each man was given a clean suit of underwear and socks. In addition to this

he was given a blanket in which to wrap himself while passing through the clothing issue room, where no time was afforded to dress other than to put on underwear and socks.⁵³

The clothing issue room was 75 feet long by 52 feet wide, with a partition extending along its center to within about 7 feet of the far end, thus making two long, parallel rooms. An opening connected these rooms at the end. Counters extended down each side of the room, and behind the counters were deep shelves arranged along the walls to provide places for the stock of clothing to be issued. As the men entered the clothing issue room they formed two lines each moving along in front of a counter. Here they showed their slips to the men behind the counters, at each place where an article checked on their slip for exchange was issued; for example, a man needed breeches, a blouse, a cap, and shoes. His clean underwear, socks, and one blanket had been secured at the door. He then passed along one or other of the counters until the breeches section was reached, whereupon he received new breeches, their issue being marked on his slip. Continuing in line he reached the blouse section, where the same thing occurred, and so on until he had drawn his complement of clothing. As the men left the issue room each received two more blankets and new tape for his identification tags.⁵³

The men now came to the dressing room. Here guides stationed in the aisles looked at the slip of each man as he entered and directed him to the place corresponding to the section letter and seat number marked on the back. This prevented the men from becoming confused, and resulted in each man reaching his proper place and getting his own clothing from the rack. If the racks were still in the disinfestor when the men reached the dressing room—as was usually the case—they put on such clothing as they had drawn in the clothing issue room, arranged the new tape for their identification tags and replaced these about their necks, folded their blankets more conveniently for their barrack bags, and sat down to wait until their disinfested clothing was ready. One noncommissioned officer, as instructor, and one assistant to handle the rack, were stationed in each section in the dressing room as in the disrobing room. As soon as it came from the disinfestor, the noncommissioned officer instructed the men to remove all clothing from rack and place it on the proper seats. It was his responsibility to see that the racks were speedily unloaded and to maintain order and quietness in the section. The racks were unloaded in from one-half to one minute and were then pushed back in the oven to be pulled out in the disrobing room and loaded again. After getting their clothes from the racks the men hastily dressed, packed their barrack bags, and were ready to leave the dressing room.⁵³

Before leaving the section the men were questioned as to whether or not they had their full equipment. Men who reported shortages were sent back to the issue room to get what was needed to make up the shortage. Men having their full equipments left the section and passed up the aisle to the exit, where they were met by an inspector who examined all new shoes to see that they fitted properly. When they did not the wearer was sent back to make an exchange for a pair that did.⁵³

On leaving the dressing room the men next passed into the barber shop, where an inspector examined the hair of each man as he passed, those in need of a hair cut being sent to one of the barbers, of whom there were about 16 in the shop. Men whose hair did not require any attention marched across the end of the barber shop to the door, where, after giving up their clothing slips which they had so far retained, they passed outside. These slips were all collected and used in totaling the consolidated amount of issues drawn by each company or regiment.⁵³

After leaving the barber shop the men passed along a board walk for a few yards and entered a large, open building where they were given a chance to readjust their leggings, to make up their packs if no barrack bags were carried, or to finish dressing. After this was completed they were formed in companies and marched to barracks in the permanent camp. The barracks in this camp were for clean troops only and were never occupied by any men unless they had first passed through the delousing process. In this way the barracks at the permanent camp were kept clean and free from infestation with vermin.⁵³

After being disinfested all men were confined to camp until time to embark. This was an important point and essential in keeping the men clean and free from danger of reinfestation.⁵³

DATA CONCERNING MAXIMUM PERSONNEL, EQUIPMENT, AND GENERAL OPERATIONS OF THE BATHING AND DELOUSING DIVISION, A. E. F., TOGETHER WITH NUMBERS OF MEN BATHED

The following tables show the number of officers and enlisted men engaged in administering the bathing and delousing division, the bathing facilities, the number of men bathed in five months, during which records were kept, and the total number of articles disinfested.⁸ It will be observed that over 6,000,000 baths were administered, and over 10,000,000 articles of clothing disinfested during the five months in the different divisions. At Bordeaux, over 1,000,000 men were bathed; at St. Nazaire, 800,000 men were bathed, and 4,000,000 articles of clothing disinfested; at Le Mans 2,200,000 men were bathed, and 4,000,000 articles of clothing disinfested; at Brest, 1,300,000 men were bathed, and 3,000,000 articles of clothing disinfested. Throughout the divisions at Le Mans, and at the base ports 11,300,000 men were bathed and 25,000,000 articles of clothing disinfested.

DIVISIONS		DIVISIONS—continued	
Personnel:		Disinfesting facilities:	
Officers.....	242	Stationary steam sterilizers	52
Enlisted men.....	1, 336	Horse-drawn steam sterilizers.....	233
Bathing facilities:		Improvised steam sterilizers	437
Stationary baths.....	739	Improvised hot-air sterilizers.....	121
Portable baths.....	304	Articles disinfested (10 days).....	1, 304, 000
Mobile baths.....	14	Articles disinfested (5 months).....	10, 000, 000
Total number shower heads	15, 853		
Men bathed (approximately 5 months).....	6, 000, 000		

BORDEAUX		LE MANS—continued	
Personnel:		Disinfesting facilities:	
Officers.....	24	Stationary steam sterilizers.....	5
Enlisted men.....	561	Horse-drawn steam sterilizers.....	13
Bathing facilities:		Large plant sterilizers.....	3
Stationary baths.....	30	Articles disinfested (10 days).....	335, 000
Mobile baths.....	2	Articles disinfested (5 months).....	4, 000, 000
Shower heads.....	1, 048		
Men bathed (10 days).....	92, 060		
Men bathed (5 months).....	1, 000, 000		
Disinfesting facilities:			
Stationary steam sterilizers.....	3		
Horse-drawn steam sterilizers.....	5		
Improvised steam sterilizers.....	20		
Large plant sterilizers.....	1		
Articles disinfested (10 days).....	385, 773		
Articles disinfested (5 months).....	4, 000, 000		
ST. NAZAIRE		BREST	
Personnel:		Personnel:	
Officers.....	17	Officers.....	20
Enlisted men.....	197	Enlisted men.....	553
Bathing facilities:		Bathing facilities:	
Stationary baths.....	1	Stationary baths.....	15
Shower heads.....	149	Shower heads.....	664
Men bathed (10 days).....	36, 246	Men bathed (5 months).....	1, 300, 304
Men bathed (5 months).....	800, 000		
Disinfesting facilities:		Disinfesting facilities:	
Stationary steam sterilizers.....	6	Stationary steam sterilizers.....	2
Horse-drawn steam sterilizers.....	12	Horse-drawn steam sterilizers.....	20
Hot-air sterilizers.....	4	Large plant sterilizers.....	1
Large plant sterilizers.....	1	Articles disinfested (10 days).....	200, 000
Articles disinfested (10 days).....	325, 000	Articles disinfested (5 months).....	3, 000, 000
Articles disinfested (5 months).....	4, 000, 000		
LE MANS		RECAPITULATION	
Personnel:		Personnel:	
Officers.....	12	Officers.....	315
Enlisted men.....	362	Enlisted men.....	3, 009
Bathing facilities:		Bathing facilities:	
Stationary baths.....	11	Stationary baths.....	796
Mobile baths.....	7	Portable baths.....	304
Shower heads.....	1, 482	Mobile baths.....	23
Men bathed (approximately 5 months).....	2, 200, 000	Shower heads.....	19, 196
		Men bathed.....	11, 300, 000
		Disinfesting facilities:	
		Stationary steam sterilizers.....	* 68
		Horse-drawn steam sterilizers.....	283
		Improvised steam sterilizers.....	582
		Large plant sterilizers.....	* 6
		Articles disinfested.....	25, 000, 000

* Does not include disinfestors employed in salvage work.

* Included are registered activities only. Does not include activities not scheduled.

PREVENTION OF LOUSE INFESTATION AMONG TROOPS ON TRANSPORTS

What has been said concerning the activities of the bathing and delousing division, A. E. F., in the preceding pages, had to do with the disinfection of the American Expeditionary Forces prior to their embarkation, in France, for the United States. Since there was a great possibility of these forces again becoming louse infested subsequent to embarkation and while en route to the home ports, in the absence of sustained, preventive measures, the following memorandum was prepared by the chief surgeon, A. E. F., for the guidance of commanding officers of troops on transports, with the view to preventing louse infestation among the troops:

AMERICAN EXPEDITIONARY FORCES,
France, December 30, 1918.

Memorandum for C. O. of troops on transports:

1. A vermin inspection will be made by medical officers of all personnel on board as soon as possible after departure from a European port. The inspection will include a thorough examination of the hair of the head, axillary, and pubic region for nits, followed by an examination of the seams of all the clothing worn. The vermin inspections will be made by medical officers under the supervision of the senior medical officer in charge.

2. All troops will be directed to examine their clothing daily for lice. A period of 15 minutes will be set aside daily for such an examination. This examination will be under the supervision of a medical officer. All vermin infestation will be reported to him.

3. After a period of six days following embarkation, another vermin inspection of all personnel on board will be made by medical officers.

4. Should a transport carry male civilian passengers, the same procedure will be carried out with them as for troops. Female passengers will be instructed to examine their clothing daily, and promptly report any vermin infestation to a medical officer.

5. All cases of head lice in males will be treated by cropping the hair of the head with a hair clipper, followed by a bath. Pubic lice will be treated by shaving, followed by a bath. Clothes lice will be treated by cropping the hair of the head, axillary, and pubic regions, with a clipper, followed by a bath. In all instances the bath will consist of washing with warm water and a soap jelly to be furnished for the purpose. The hair of women will not be cut until the individuals have been given a sufficient opportunity to rid themselves of lice by other means, such as washing the hair and soaking it in carbolic solution, 2 per cent.

6. The medical officer will examine the sleeping quarters each day for vermin, paying particular attention to the cots and blankets.

7. On arrival in the United States, the senior medical officer of the command will report in writing to the medical debarkation officer:

- a. The dates that vermin inspections were made of personnel aboard ship.
- b. Whether daily vermin inspections were made by troops.
- c. The strength of command by organizations, and number of cases of head lice, body lice, and pubic lice found in each organization, and description of the treatment employed.
- d. Whether lice were found on examination of cots or blankets.

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CHAPTER XIII

PREVENTION OF SCABIES

Of the two parasites which infested the exterior of the soldiers' bodies and their clothing in the American Expeditionary Forces, namely, the louse and *Sarcoptes scabiei*, the louse attracted the greater amount of attention. That this was so was due partly to the greater visibility of the louse, thus rendering it more readily recognized, and partly to its potentiality in causing typhus fever. However, measured in the light of agencies reducing the man power of the American Expeditionary Forces, the itch mite ranked superior to the louse, for, because of the intense itching it caused, principally at night, scabies in itself had the reputation of destroying 50 per cent of a soldier's efficiency;¹ uncomplicated scabies necessitated hospital treatment for at least three or four days, whereas, in scabies complicated by pyodermic conditions the length of hospital treatment was necessarily prolonged. In the American Expeditionary Forces, whose maximum strength, in November, 1918, was 1,916,992,² the primary admissions to hospital because of scabies numbered 22,035.³ This figure is short of the actual number of occurrences of scabies, because it is not now possible to determine the number of instances when scabies complicated some other condition for which admission to hospital was made.

A number of factors obtained during the greater part of the first year of the existence of the American Expeditionary Forces which permitted the incidence and spread of scabies. There was a scarcity of skin specialists; proper facilities for bathing our troops, for the sterilization of clothes, and for the treatment of skin diseases did not exist.⁴ Furthermore, a soldier during the early stages of scabies was prone to attribute the itching to louse infestation and not to report for treatment. Then, too, in the absence of facilities for maintaining personal cleanliness, and because of unavoidable conditions encountered in the military service, the classical signs of scabies with which the civilian practitioners had been familiar were obscured by the complications. In point of fact, however, the American Expeditionary Forces had no experience with such chronic skin infections as the "pyodermias," as did the allied armies in the earlier years of the war. Knowles, in reporting upon scabies in military and in civil life, gave the following differentiating points:⁵

SCABIES IN CIVIL LIFE

Eruption usually on lateral aspect and on webs of fingers, consisting of pustules and burrows, excepting in those unusually cleanly, in washerwomen, and mechanics who work in oils, greases, graphite, etc.

Penis frequently shows only one or two pustules and burrows; occasionally more.

Complications are absent in most instances.

SCABIES IN MILITARY LIFE

Hands are involved in but few instances.

Penis usually shows a marked involvement, numerous pustules and burrows.

Complications, such as an unusually large number of pustules, boils, impetigo, and secondary pustular infections, frequently present.

In controlling the spread of scabies, because of its parasitic nature the same preventive measures were needed as for the prevention of louse infestation; that is to say, baths for personal cleanliness and disinfestors for clothing and blankets. But in so far as the handling of men having scabies was concerned, additional steps were necessary, for though passing a man through the delousing process would with facility rid his clothing and blankets of the acarus, his body offered much more difficulty in the way of disinfestation where the acarus was concerned than was the case with the louse. It was necessary, first of all, that, when troops were inspected for such conditions as venereal diseases or louse infestation, special efforts be made to determine the presence of skin infections. Since urology and skin diseases were linked together in the same professional service of the American Expeditionary Forces,⁶ it devolved upon the divisional urologist to carry out the necessary inspectional work for this purpose in combat divisions. Usually this was done at the time the troops were going through the baths.

With the selection of men suffering from scabies, it was necessary to segregate them for treatment for not only the scabies but also for any complicating dermatitis. For this purpose a field hospital of each combat division was assigned the function of caring for patients suffering from skin diseases, as well as patients with venereal diseases.⁷ The following account of the operation of the skin hospital of the 42d Division, A. E. F., when that division was in the Baccarat sector in the spring of 1918, may be taken as an example of the best means adopted in the American Expeditionary Forces for the prevention and control of scabies in the combat divisions.⁸

SKIN HOSPITAL, 42D DIVISION, A. E. F., BACCARAT SECTOR

Patients afflicted with skin diseases, when sent to the hospital, either directly from their organizations or from the bathing plants at the divisional delousing stations, went directly to the reception tent. They were not permitted to enter any other portion of the hospital until after they had been through the hospital baths and had been given clean clothing. At the reception tent the patients were registered, then were required to form in line, whereupon they separated from their clothing and equipment all unsterilizable articles such as rubber goods, gas masks, ordnance belts, and side arms. These articles which had been separated then were placed in piles in front of the line the patients had formed, where they remained under guard for the time being. The patients now took their sterilizable articles of clothing and equipment (overcoat, blankets, outer clothing) and entered the undressing room of the bathhouse. Here, each patient received three checks for the following purposes: One, the property card; a second, a strip of bandage marked with indelible pencil; a third, a paper check tag. All checks bore the serial number of the patient concerned. After securing his checks, each patient undressed and secured his clothing, except shoes, in a bundle, using a blanket for a wrapper, and attached to it the bandage tag showing his number. His shoes were tied together, his valuables and property card being placed in one. The clothing bundles were then taken to the sterilizer, located just outside the bathhouse; the shoes, containing valuables, were passed through

the check window, to be reissued at the other end of the stockroom on completion of the treatment to which the patients were now subjected. The checks for reclaiming the shoes and valuables were kept by the bath attendant during the time the patients were undergoing the bath and treatment.

As a preliminary to the bath and treatment, which will be described later, the hospital barber clipped the hair of each patient from the head as well as other portions of the body. At the close of the bath and treatment the patients received, besides their shoes and valuables, clean socks, underclothes, and pajamas. The first check, the patient's property card, which was placed in the shoes with the valuables, was taken up and retained with the record of clothing issued to him during his stay. When patients had clean underwear in their kits it was sterilized and issued to them instead of taking it out of stock. Patients then in clean underwear, socks, and pajamas and their own footwear returned for their unsterilizable equipment left under guard, and were assigned to a bed in a ward tent.

While the patients were bathing, their equipment and underclothing were being sterilized as rapidly as the capacity of the Thresh disinfectator permitted, and their sterilized equipment was returned to them by having the ward master summon patients to the sterilizer as the bundles tagged with their numbers were ready. Patients used the blankets in their sterilized kits to make their beds; however, in the absence of an adequate number, blankets were issued to them by the ward master, who was responsible for them.

The hospital stock of blankets, underwear, pajamas, and socks was maintained by having patients return at the time of their discharge all such articles issued them, since meanwhile they had ample opportunity to wash their own underwear and to have it sterilized. When their own clothing was so worn as to warrant discarding it, clothing from the hospital stock was issued to them and the discarded articles were reclaimed through salvage and new ones drawn to replenish the stock.

During their stay in the skin hospital, patients were obliged to change their underclothes frequently and whenever soiled, which was determined by frequent inspections. A change was always possible, as they had at least the suit in which they arrived and the one issued after the first bath. Soap and brushes were given to them with which they washed the soiled articles, after which they were sterilized again. Patients arriving late in the afternoon or evening, after the bathing plant had shut down for the day, were held in a detention tent until the next morning.

Bathing plant.—The bathing room contained 18 shower heads arranged in 3 rows of 6 each, so that 36 men could be bathed at the same time. The floor of the bath sloped from each end toward the middle and also toward the outer wall, so that the waste water was quickly carried through a wooden drain to the near-by river. The floor and side walls were covered with tarred roofing paper, which seemed to make a satisfactory covering. The hot water was furnished by a hot-water apparatus outside the building. As the hospital was at the edge of the river, the water was dipped therefrom in buckets and was pumped by hand into the heating apparatus. Thus a satisfactory supply of water could be constantly furnished the 18 shower heads.

Details of bathing and treatment.—The routine treatment for scabies consisted of the repetition of a three-day unit of treatment as the individual cases required. This included a 30-minute bath and scrub, followed by a 20-minute rub with 20 per cent sulphur ointment on two successive days, with a third day of rest on which a cleansing shower was the only treatment. New patients entered the baths through the undressing room; old patients undressed in their tents, except for shoes and underclothing, and entered the baths through the clean dressing room, where they left their shoes and underclothing. The 30-minute bath was arranged as follows: On entering, the water was turned on for five minutes, and the men lathered themselves thoroughly with "black soap." The water was then turned off and the men formed a ring, each man scrubbing for five minutes the back and buttocks of the man in front of him, using a bath mitten made of turkish toweling. For the next 10 minutes each man scrubbed the remainder of his own body. Then the water was again turned on for the remainder of the half-hour, during which the lather was removed. For the 20-minute rub, the group of bathers went into the dressing room and after drying themselves with turkish towels, they again formed a ring, rubbed each other's backs for 5 minutes with the sulphur ointment, and used the other 15 minutes to rub the rest of their bodies. It would have been more desirable to have had a separate rubbing and dressing room, as groups could have been handled more expeditiously; however, this was not possible because of the limitations of the building.

Disinfection and laundry.—An animal-drawn steam (Thresh) disinfector with a capacity of 15 complete equipments, including overcoats and blankets, was used. While this was smaller than was desirable in times of pressure, it proved adequate if kept in constant use.

Bath mits.—For scrubbing purposes bath mits were supplied, in sufficient numbers for several groups of bathers, and were washed and sterilized before being used again.

Bath towels.—After use bath towels were hung out to dry, and were then sterilized. Afterwards they were sorted; those not soiled were used again. Before being sent to the laundry they were again sterilized. A portable laundry was run in connection with this hospital, and though not an essential, it helped materially when the admission rate was running very high.

Work and recreation.—After a patient had his daily bath and treatment, he was assigned to some sort of duty, as a camp guard, or in building roads and paths in the camp. On occasions when no work presented, patients were sent off with an officer on a hike or for setting-up drills. Baseball games and athletic sports were also held. The American Red Cross provided the hospital with a Bessonneau tent, 60 by 20 feet in size, to be used as a recreation tent. In this were placed tables for writing and reading, with an opportunity for arranging concerts and entertainments. This tent was especially useful in providing a place for patients to congregate on rainy days and to prevent collecting in their tents, disarranging their beds and disturbing the orderly appearance of the hospital. The Red Cross also provided base balls and bats, games, and reading materials.

Results.—The following list shows the skin diseases admitted during the period from April 23 to June 26, 1918. The graphic chart is extended to June 19 only, as on that date the division moved from the sector. A few cases were discovered during the move and these are included in this list: Impetigo, 5; psoriasis, 5; urticaria, 5; eczema, 2; dermatitis, 1; pediculosis, 87; ringworm, 3; pyoderma, 6; ichthyosis, 1; scabies, 736; simple ulcers, 1; total, 852.

The following data were recorded concerning the scabies treated: Total cases treated, 736; days lost in hospital, 9,230; average days lost, 1,254. Patients admitted in April, 1918, 46; days lost, 790; average days lost, 17.12. Patients admitted in May, 607; days lost, 8,063; average days lost, 13.28. Patients admitted in June, 83; days lost, 377; average days lost, 4.52. Greatest length of time spent by patient in hospital, 46 days. Only one patient was readmitted for scabies, and that after a period of 20 days. It will thus be seen that while in April, scabies averaged 17 days' treatment, in May 13 days were required, and in June only 4.5 days. The April cases comprised many that were chronic, the accumulation of the winter months; whereas the June period represented the early cases detected at the baths.

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CHAPTER XIV

RODENT ERADICATION

To appreciate adequately the gravity of the problem concerning the destruction of rats which infested the regions occupied by the American Expeditionary Forces, more especially in the zone of the armies, it is necessary to review briefly the situation prior to the time when our forces went to France. Early in the war, rats in unusual numbers, infesting the advanced sections of the zones of operations, began to attract attention and soon were recognized as a serious pest, especially in the trench areas along the stabilized lines of the opposing armies on all fronts. These animals became numerous about dugouts where they not only ate contaminated or destroyed food, but also extended their ravages to clothing, leather, and many other things. Aside from their damage to material of various kinds, the rats also constituted a serious menace to the health and comfort of the men.¹

Where dugouts were not of rat-proof construction, rats boldly entered in search of food even during the day, and by their annoying presence deprived soldiers of necessary sleep and rest. They were most troublesome at night, however, when they would run over and occasionally bite sleeping or wounded men. Many American, French, and British soldiers described their harrowing sensations on awaking at night to feel the muddy feet or tail of a rat passing over their faces. This happened so frequently that some of the men habitually slept with some covering over their faces as a protection.¹

EFFORTS BY FRENCH TO CONTROL RATS IN TRENCHES

Investigations relative to rats in the trenches and some work of extermination in certain sectors was begun by the French in 1915.¹ Various methods were tried. Trapping and the use of several poisons yielded unsatisfactory results. The so-called rat virus of Danysz, probably *Bacillus typhi marium* (Loeffler), prepared by the Pasteur Institute, was employed to some extent but apparently without much success, and its use was soon prohibited, owing to a possible pathogenicity for man.

A measure of success, however, with an extract of squills, or sea onion (*Urginea maritima*), was reported.² The extract was prepared by the Pasteur Institute and delivered in bottles sterilized in an autoclave at 120°. The object of the sterilization was to prevent bacterial decomposition, as this rapidly impaired the effectiveness of the poison. Although work was prosecuted within a very limited area, the destruction of 37,850 rats by this poison within four months was reported. As a supplementary measure, dogs were employed, and 8,825 rats were killed by them during the same period.

This work, while apparently successful as a local measure, was not widely extended, and later in the war the preparation of the extract was discontinued by the Pasteur Institute. However, a squill powder poison was prepared and supplied by the *Pharmacie Centrale de l'Armée* for use in various French sectors

and camps. The powder was mixed with grease in the proportion of 1 of the former to 2 or 3 of the latter, and delivered in tins of various sizes ready for use. In preparing bait 1 kilo of this compound was heated and mixed with 5 kilos of bread cut into dice, the entire mass being stirred until the poison was absorbed or evenly distributed.¹

The use of phosphorus paste as a poison and of gases generated in holes by carbon bisulphide and calcium carbide were also advised by the *Service de Santé* of the French Army.¹

ORGANIZATION OF A RODENTOLOGICAL UNIT FOR THE AMERICAN EXPEDITIONARY FORCES

When the United States entered the war, the hordes of rats infesting the entire war area and some of their depredations had already been described by many observers.¹ A number of cases of infectious jaundice, a rat-transmitted disease, had been reported. In addition, the danger of the introduction of bubonic plague was recognized early. Owing to the abnormal numbers of rats and their close association with the men in the trench areas, the transmission of this epizoötic disease in the ordinary manner through rat fleas would be especially easy, and the ground seemed well prepared for one of the greatest epidemics in history. The importance, therefore, of keeping in touch with conditions and of controlling the rats as far as possible became evident as sanitary and economic measures.² Therefore, a member of the Biological Survey of the Department of Agriculture, because of his qualifications as a specialist in rat extermination, was commissioned in the Sanitary Corps, and was sent to the American Expeditionary Forces early in 1918, to make a study of the rat problem in its relation to the American Expeditionary Forces, and to determine what protective measures might be taken.³

Conditions, at that time, along the front naturally first claimed the attention of this officer, and an examination was made of trenches and dugouts in the lines of the 26th Division⁴ holding the sector north of Toul in April, 1918. As a result of this investigation a clearer conception of the problem in its various bearing was gained. Since the American occupation of particular trenches was believed to be only temporary, evidence accumulating that the war would be likely to become one of movement, the chief surgeon, A. E. F., directed that the work on the rat problem should for a time be concentrated mainly on the protection of the vast stores then pouring into France for the supply of the American Expeditionary Forces.¹ A preliminary examination was then made of the principal ports in use, Brest, St. Nazaire, Bordeaux, La Pallice, and large interior depots at Gievres, Is-sur-Tille, Montoir, St. Sulpice, Nevers, and Thouars, as well as various camps, including Camp Hospital No. 29, about 40 miles southwest of Bordeaux.¹ The construction of enormous depots was well under way, but supplies were arriving faster than they could be cared for adequately, and conditions favored rapid and dangerous infestation by rats.¹

As it became obvious that trained assistants would be required, the transfer from other branches of the military service of men experienced in rodent destruction work was recommended.⁵ This recommendation was approved, and the men were requested by cablegram.⁶ These men were from the staff of

the Biological Survey, but as they had enlisted or had been drafted into various branches of the military service, considerable time elapsed before they could be transferred to the Medical Department and sent to France.¹

In November, 1918, three officers arrived in France as Rodentological Unit No. 1, and two enlisted men, already overseas, were added to the organization, which in total personnel then consisted of four officers and two non-commissioned officers.¹ These men were attached to the staff of the central Medical Department laboratory, whence the junior officers and enlisted men were assigned to temporary duty for the direction of labor details furnished by the Quartermaster Corps at the more important depots and ports where rats and mice were becoming troublesome and heavy losses due to their inroads were threatened.¹

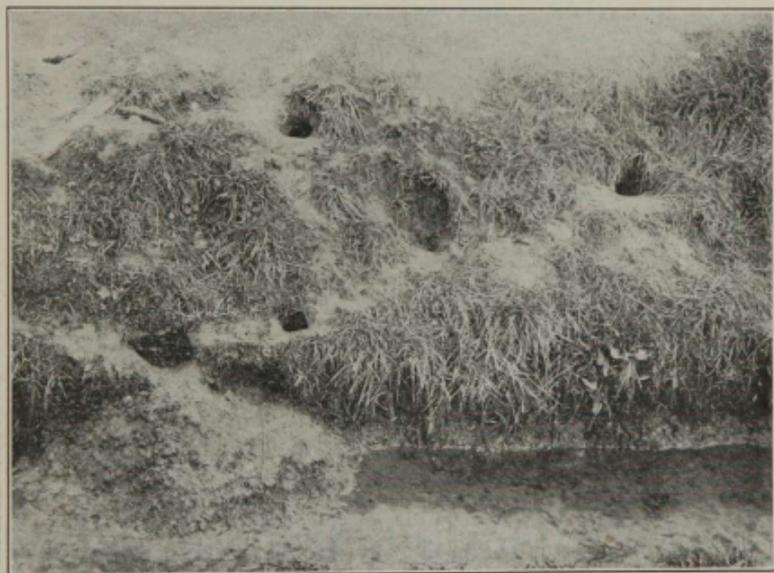


FIG. 137.—Typical rat infestation (holes and runways shown) in the side of a trench west of Verdun

INVESTIGATIONAL WORK AT THE FRONT

As has been mentioned above, investigational work at the front began with a study of conditions in the trenches and dugouts in the lines held by the 26th Division⁴ in the sector north of Toul in April, 1918. Numerous trenches, dugouts, and ruins at and near the front were examined in order to determine the degree of infestation by rats and the effect of the presence of these rodents in large numbers on the health and comfort of the soldiers. The dugouts used as sleeping quarters were, as a rule, of rough wooden-frame construction with numerous possible entrances for rats. The animals were found to be destructive and troublesome, their abundance being evidenced by the number of their holes and well-beaten paths about dugouts, ruins, and even along the sides of bare trenches, where they frequently were forced to burrow well above the bottom, owing to standing water (Fig. 137). While most of the dugouts exam-

ined in this sector were entered easily by rats, better structures later were seen elsewhere in French lines taken over by the American Expeditionary Forces. Many German dugouts, examined after the armistice, were found to be of heavy timbers and planking with tight-fitting doors, which rendered them rat proof. But numerous rat holes and well-worn runways in the loose material banked at the sides against dugouts, pictures of the animals on walls of quarters, and traps found here and there were ample evidence that the Germans also were annoyed by rats (Figs. 138 and 139). Traps found were mainly of the snap type, but small cage traps also were evidently used by them.¹

The men reported that rats took their food, sometimes gnawing holes in receptacles to reach it; and they complained especially of the annoyance caused

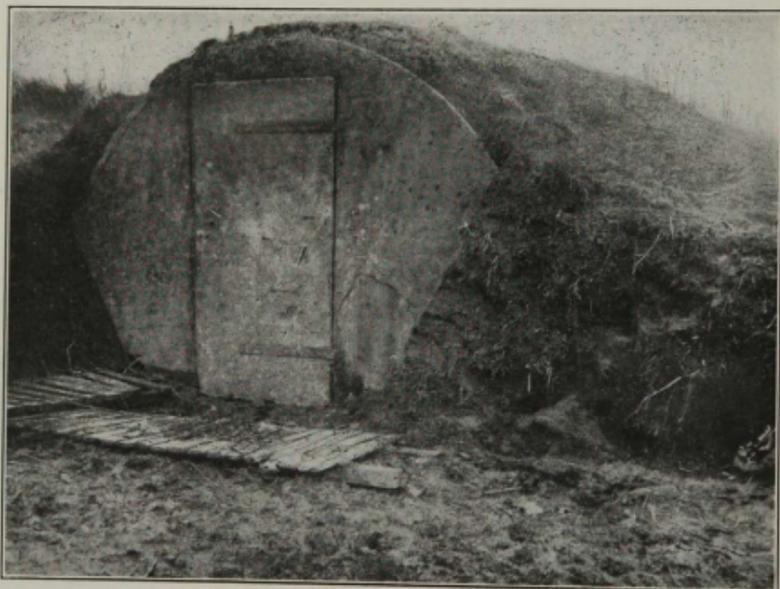


FIG. 138.—German dugout near Damvillers, Meuse. Note rat holes to the right of the lower edge of door. This type of dugout, with top and sides of heavy corrugated iron, could be made fairly rat proof, but frequently the animals made their entrance through the wooden ends

by rats running across their faces when they were trying to sleep. An officer reported that one trench in which no rats had previously been seen by him appeared to be extensively invaded suddenly, as the animals began running about in numbers one night where none had been noticed before. This incident, according with the known migratory habits of rats, indicates what may happen near any heavily infested area. This local movement may have been due to attractive refuse and scraps of food scattered about by the men.¹

Rats commonly passed from bed to bed, and evidence was not lacking that in the trench areas they came in closer contact with man than was usual elsewhere. Aside from scattering fleas which might have become plague-infested, or other external parasites capable of communicating disease to the soldiers, there was obviously great danger under such conditions of the transmission of disease through contamination of food.¹

A further study of conditions with reference to rats was made along the former American front in January and February, 1919.⁷ Detailed examinations were made at many points within the general area extending from near Nancy on the east to beyond Grand Pre on the west.

While the entire region proved to be still generally infested with rats, there had been a marked movement since the former examination of lines north of Toul, described above, this movement evidently having taken place since the men had advanced and the trenches were abandoned.¹ A few rats still were living about dugouts and many sheltered places left unoccupied by the men, but the majority were congregating about places still in use, or where dead animals or much garbage was left on the field. Many horses and mules remaining unburied, or very thinly covered, together with general unsanitary conditions prevailing about temporary camps of men clearing the field, furnished an abundant supply of food in places. With one or two exceptions no evidence of breeding was found among the females examined; whereas, about quartermaster depots numbers of young were being brought forth at the same season. This fact suggested that conditions somewhat harder than those prevailing at the same time about depots were being met with by rats on the old front. Cats were numerous about the old trenches. Evidence that many weasels and foxes regularly patrolled the old trenches and searched the dugouts were also noted. Numerous tracks of wild boars were seen about trenches, the ground in various places being deeply rooted up:¹

Specimens of the rats, all of which proved to be of the brown species (*Rattus norvegicus*), were taken for examination, and a few were prepared as museum material. Examinations, mainly microscopical, were immediately made and slides prepared for more detailed microscopical studies. Most of the rats were fairly fat and appeared to be free from excessive numbers of internal parasites, with the exception of tapeworms in a few instances, suggesting that the animals infesting the trenches may average better in health than those frequenting the sewers and permanently filthy places in and about a great city. The following report and appended list of parasites, tabulated by localities, summarize the result of findings in the field and in the laboratory:¹

Seventy-five specimens of rats from eight stations along the American war front, collected in February, 1919, were examined, and also 16, the majority of which were young, from Is-sur-Tille. Examinations were made as follows: (1) For external parasites; (2) macroscopic examination for intestinal parasites; (3) microscopic examination for blood and tissue parasites in stained smears from bladder wall and bisected kidney; (4) microscopic examination of centrifuged feces.

The microscopic examinations of smears from the bladder and kidney, stained by Giemsa's method, were made primarily to find *Spirochæta icterohemorrhagiæ*, the organism of infectious jaundice. Six of the 70 specimens from the front of which smears were made contained spirochetes, which are presumably *S. icterohemorrhagiæ*, representing a percentage of 8.6 of

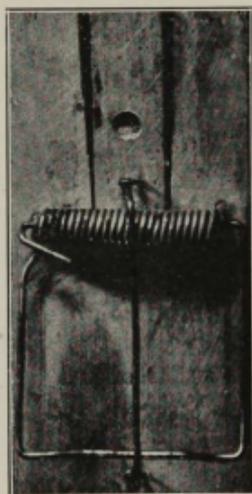


FIG. 139.—German wooden-base snap trap employed by Germans in their trenches

these specimens. As it was not feasible to make either cultures or animal inoculations, the identity of the spirochetes is merely presumptive, but this percentage compares favorably with the findings of other investigators.

The high percentage of infestation with *Hymenolepis nana*, which is now quite generally believed to be identical with the dwarf tapeworm of man, is worthy of note. In Italy, southern United States, and other places, this parasite has been recorded as one of the most common, if not the most common, tapeworm of man. On account of its small size, even though often present in large numbers, this worm is commonly overlooked. As the rat parasite is transmitted to man, as is now quite generally believed, by contamination of food or drink with ova-containing feces, it is not at all improbable that, under the conditions along the Western Front, many soldiers became infested by this worm. No data on this point, however, have come to hand. The larger species of *Hymenolepis*, *H. diminuta*, is also an occasional human parasite.

Interesting from a purely scientific standpoint is the occurrence of a pair of specimens of *Capillaria* sp. in the bladder of a rat, together with a specimen of the irregularly shaped, tough, whitish vesicular concretions which are frequently found in rats. The concretion



FIG. 140.—Old shell hole, partially filled with water and camp refuse, whose shattered edges afforded convenient rat burrows. Illustrating battle-field conditions during the armistice between Varennes and Montfaucon, Meuse.

was removed when the rat was dissected in the field, placed in formalin, and preserved. Upon examination several weeks later the above-mentioned male and female *Capillaria* were found in the bottle with the concretion. This naturally suggests a possible relationship between the worms and the concretions. No other explanation for the formation of the concretions has yet been given. Unfortunately these specimens of *Capillaria* were destroyed in transit to the United States, and the species, therefore, could not be determined. Hitherto, male and female specimens have not been found associated in the bladders of rats, consequently the specific identity of the two sexes, separately described and named, is uncertain.

A point worthy of note is the local abundance or rarity of particular species of parasites, affording an excellent demonstration of the fact that among rats, as among men, under the conditions of trench life, the fauna of one are likely to become the fauna of all. The following examples are illustrative of this. At all points investigated along the Western Front, *Trypanosoma levisi* were present in approximately 30 per cent of individuals, whereas not one of 16 specimens from Is-sur-Tille was infected. All of the three specimens taken at Glorieux had their intestines crowded with tapeworms, of three different species, at least two species in each. This condition was not found to anything like the same extent in any other set of specimens. The cysts in the liver of *Cysticercus fasciolaris*, the larval form of *Tænia tænia-*

formis of the cat, occurred in 33 per cent of the specimens from Bras, whereas not more than one case in 15 to 18 specimens was met with elsewhere. The common rat louse, *Polyplax spinulosus*, occurred practically universally on specimens from Loupmont and Bras, and only to the extent of 30 to 50 per cent in other places. Even more striking was the occurrence of the itch mite, *Notodres muris*, in the majority of specimens from Loupmont and Etain, and its rarity or complete absence from specimens from the other localities.

On account of the season of the year, midwinter, few external parasites were found except lice and itch mites. Some specimens were carrying an incredible number of louse eggs, others only a few or none. The lice themselves were not numerous. Only one flea, a specimen of *Ceratophyllus fasciatus*, was found.



FIG. 141.—Brown rat, taken at entrance to burrow in trench wall near Varennes, Meuse

TABLE NO. 55.—Parasites detected in rodents discovered in Zone of Advance, A. E. F.

Locality	Beaumont	Mont Sec	Loupmont	Etain	Bras	Glorieux	Varennes	Mont-faucou	Is-sur-Tille	Total percentage	Remarks
Specimens examined:											
Blood.....	1	7	12	15	18	3	14	0	16	-----	
Intestinal.....	1	7	12	13	17	3	13	1	14	-----	
External.....	1	7	15	15	18	3	12	0	16	-----	
<i>Spirochæta icterohemorrhagica</i>	1	1	2	0	0	2	0	0	0	7	Presumably <i>S. icterohemorrhagica</i> .
<i>Trypanosoma lewisi</i>	0	2	5	5	3	1	6	-----	0	24.6	
<i>Hymenolepis diminuta</i>	0	0	3	2	0	2	0	0	0	8	Occasional human parasite.
<i>Hymenolepis nana</i>	0	3	1	4	7	2	2	0	4	26.4	Probably identical with the common human species. If so, readily transmissible.
<i>Tænia ratti</i>	0	0	0	1	1	2	0	0	0	4.6	
<i>Cysticercus fasciolaris</i> (larva of <i>Tæniaformis</i>).....	0	0	1	1	6	0	0	0	1	10.3	Encysted in liver.
<i>Trichuris (muris?)</i>	1	0	0	1	2	0	0	0	0	4.6	Only eggs found (in feces).
<i>Strongyloides</i> (sp. ?).....	1	2	2	3	1	0	*2	*1	0	17.6	*Larvæ found in feces.
<i>Capillaria</i> sp.....	0	0	1	0	0	0	0	0	0	1.1	♂ and ♀ in bladder with tough irregular concretion. (Specimens destroyed in transportation, therefore species not determined.)
<i>Polyplax spinulosus</i>	1	5	13	4	17	3	6	-----	8	61.3	
<i>Ceratophyllus fasciatus</i>	0	0	0	0	1	0	0	-----	0	1	Small per cent due to season (February).
<i>Notodres muris</i>	1	1	8	11	0	0	0	-----	0	22.5	

INVESTIGATIONAL WORK IN CAMPS AND DEPOTS

During the progress of rat-and-mouse destruction work prosecuted in camps and depots, specimens were preserved in order to identify specifically the various animals involved, and numerous experiments with poisons, traps, and baits were carried on with a view to improving methods of attack in accordance with varying local conditions. Records also were kept, in so far as it was practicable to do so, of the relative numbers of males and females destroyed, together with other data bearing especially on breeding habits and infestation by parasites.¹

As in the trenches, the rats inhabiting camps and depots proved to be nearly all of the brown species (*Rattus norvegicus*). However, a few black rats (*Rattus rattus*) were found in certain warehouses, especially at Gievres,

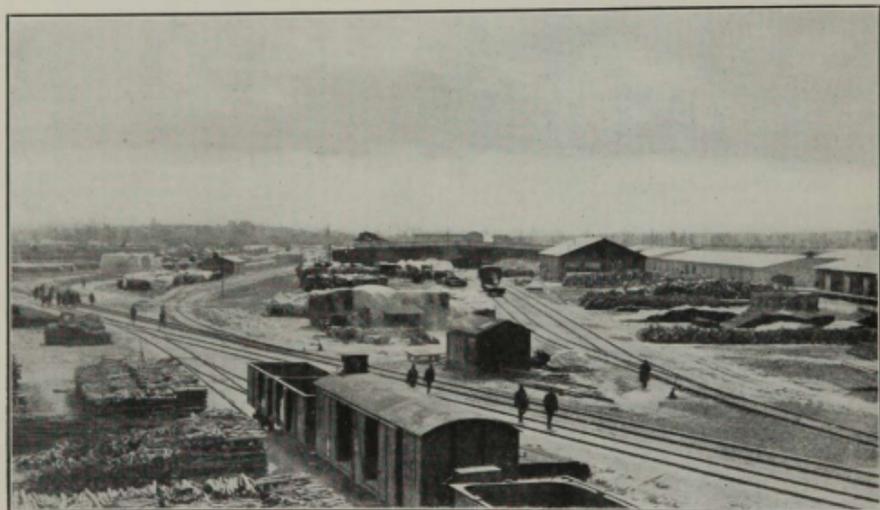


FIG. 142.—Advance Depot No. 1, near Is-sur-Tille, Côte d'Or. Storage of miscellaneous supplies, among which rats were likely to find shelter as well as food

where brown rats were present in small numbers and competition between the two was slight. The house mouse (*Mus musculus*) became troublesome in places, and several indigenous species of mice also were caught in the depots.¹

Experiments with poisons were carried on in connection with rat-destruction work which began at Camp Le Courneau, 4 miles from the coast and about 40 miles southwest of Bordeaux. At this point about 400 barracks and other structures were taken over from the French by the Americans early in the spring of 1918. The buildings were grouped on a level sandy plain surrounded by pine forests. The nearest towns are Cazaux, on the lake of the same name 3 miles to the south, and La Teste on the coast $4\frac{1}{2}$ miles to the north. A canal passing the camp connects Lake Cazaux with the coast near La Teste. Except for this canal, which affords a favorable migration route for rats, the camp was fairly well isolated. During the winter the place had been occupied by some 15,000 French and Colonial troops. Conditions prevailing at that

time had permitted the development of a colony of brown rats estimated at 5,000. The barracks and adjacent canal banks were heavily infested, the animals living mainly in holes in the ground. The rats began to come out early in the evening, and in the latter part of May and early June numbers might be seen moving about before dark. At this time the camp was used by the American Expeditionary Forces largely as a labor replacement depot, the men at first mainly Spanish civilian contract laborers were soon followed by about 1,500 Italians employed as labor troops. Although conditions were not entirely favorable, some difficulty being encountered in controlling the scattering of food and waste by these imperfectly disciplined men, the rats were rapidly destroyed by poisoning until comparatively few were left.¹

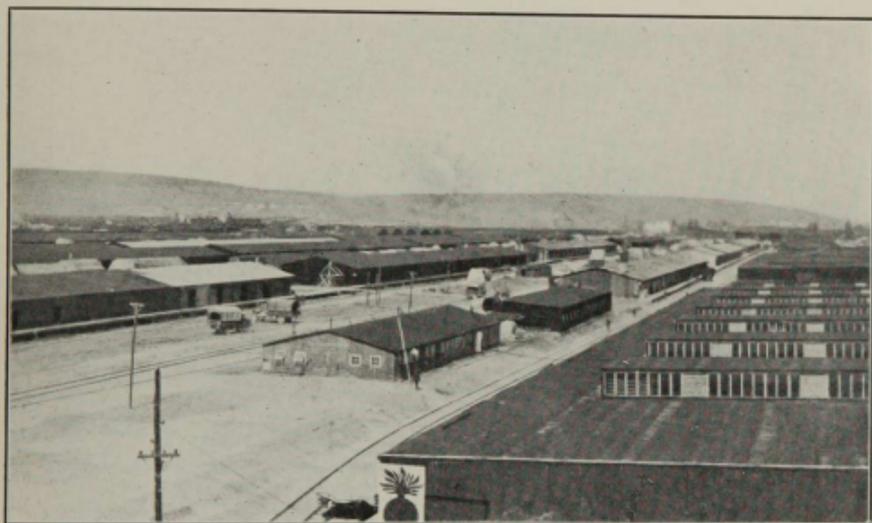


FIG. 143.—Advance Depot No. 1, near Is-sur-Tille, Côte d'Or. On left typical view of warehouse 50 feet wide and varying from 300 to 500 feet in length. By systematic and persistent trapping rats were prevented from becoming unduly numerous here

Strychnia (alkaloid), white arsenic or arsenious acid, and powdered squills or sea onion (*Urginea maritima*) were poisons tested and used fairly effectively in turn. A quantity of barium carbonate, one of the most efficient rat poisons known, also was ordered, but through some error the material supplied proved to be an inert form of this mineral and useless for our purpose. Squill poison, especially, was employed in many experiments. That rats may be killed by eating squills has been known for many years. The plant has been less extensively utilized, however, for this purpose in America than in Europe, perhaps because it is essential that the material used should be as fresh as possible, and that exported is apt to undergo deterioration. The use of the poisonous extract, which is probably best, by the French during the war has already been described (see p. 1071).¹

At Camp Le Courneau a measure of success was obtained with the squill powder, which, when in good condition, is evidently an effective, although

rather slow, rat poison. The extract, or scillitin, formerly prepared by the Pasteur Institute and later manufactured commercially in England, was not tested, but is said to be much more rapid and deadly to rats. Squill powder is exceedingly bitter, and, owing to this warning taste, is not likely to be taken by human beings in doses large enough to be dangerous, an obvious advantage over most rat poisons. Unfortunately, however, it is also repugnant to rats, and they may be induced to feed freely upon it only when very hungry or when the powder is mixed with some very attractive food. In experiments at Camp Le Courneau the most satisfactory results reached were by stirring dry squills with grated cheese, rolled oats, cornmeal, or flour, in the proportion of about 1 part of the squills to 4 of the other ingredients. To this was added enough of a mixture of sirup and water to make a stiff dough, which was rolled



FIG. 144.—Advance Depot No. 1, near Is-sur-Tille, Côte d'Or, showing forage (hay and grain) piled on dunnage laid on the ground and covered with canvas

on a board and cut into cubes about one inch in diameter. One-half of one of these cubes was usually fatal to the rat in about 48 hours, as shown by feeding experiments carried on at the camp hospital laboratory. The rats began to show evidence of discomfort within an hour after feeding upon the poison, crouching in a corner of the cage in a somewhat stupefied condition, the toes of the front feet sometimes clenched. A few hours later they were found lying on one side or rolling over and over in evident pain, the underparts, and in some cases the entire fur, soaked with urine. Meanwhile, in some instances, the limbs were spread widely apart and apparently no longer capable of supporting the weight of the body. Some hours before death the animals passed into a semicomatose condition, usually lying on one side. Several rats which ate smaller quantities of squill powder became ill, but apparently recovered after

a day or two. These usually refused to take squills again, but could be induced to eat some other poison. The campaign at this locality demonstrated the importance of changing poisons and baits frequently. Of the rats killed, a comparatively small number were found on the surface, the majority being able to reach their holes. The fact that baits were taken and a few dead animals were seen scattered here and there, some in the entrance of burrows, together with the absence of tracks in places which had been much frequented, was evidence of progress in the work.¹

Comparative tests of strychnia (alkaloid) and strychnia sulphate indicated that the latter was almost invariably rejected by rats, probably owing to its greater solubility and the increased difficulty in concealing the exceedingly bitter taste. In the less soluble alkaloid form, strychnia also proved strongly repugnant to the rats, but when baits were suitably prepared, a certain number received fatal doses. This poison was most successfully used in a starch paste as a coating for rice and whole oats. Whole oats are preferred by rats, but as each grain is very skillfully hulled by them it was found that most of the poison was avoided, unless the grain was still moist. In order to obviate this difficulty, the oats were boiled for about 10 minutes in order to loosen the kernel and permit the poison to enter. The grain was then drained and coated. Arsenic was used successfully in various compounds, especially cooked rice and rolled oats.¹

A small number of rats remaining after a great majority had been destroyed appeared to reject all poisons offered, and this number was then further reduced by systematic trapping. In this work some French cage traps were given a trial, but soon were rejected as being much less effective than the all-metal snap traps which were secured. (Fig. 145.) Trapping affords a better opportunity than poisoning operations for examining specimens. Very few pregnant females were found until about the month of September, 1918, when the number began to increase. All the rats examined at Camp Le Courneau were of the brown species (*Rattus norvegicus*). A noteworthy color phase, apparently melanistic and not observed elsewhere in France, included a large proportion of individuals: These were blackish and not very unlike true black rats in general appearance. Similar specimens are sometimes taken in America and in the British Isles. During the dry weather of summer the rats were heavily infested with fleas (*Ceratophyllus fasciatus*), but these became much less numerous with the advent of the autumn rains.¹

In November, 1918, systematic trapping operations were organized in the larger quartermaster depots, some of which were then threatened with serious infestation by rats and mice. In this work the trained men assigned by the

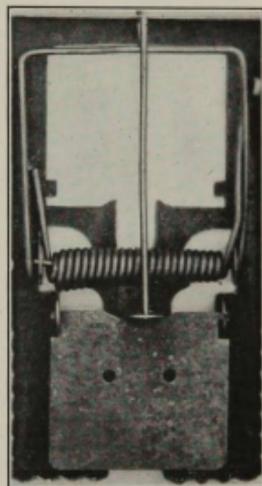


FIG. 145.—French all-metal snap trap, of which thousands were used in rodent-control work for the American Expeditionary Forces

Medical Department were placed in charge of squads of laborers, usually from two to four men, furnished locally by the Quartermaster Corps. Snap traps of a French type (Fig. 145), varying in number from several hundred to 2,000 or more, according to local conditions, were set by the men in the warehouses and other places frequented by rats. These were visited and rearranged daily. In some places it seemed advisable to cover all traps carefully; in others it appeared to be more advantageous to leave them exposed.¹

The larger and more important depots were located at points at some distance from places where large colonies of rats already were established. This

was a most fortunate circumstance, as the warehouses 50 feet wide and 300 feet or more in length (see Fig. 143), were mainly temporary structures hastily erected under stress of war conditions, nearly all without proper floors, and affording ample food and shelter to all rats able to reach the locality. Although no rats were present when the buildings were constructed, it was clear that some would be carried in along with the vast stores transported. The importance of preventing rats and mice from becoming established in large numbers was recognized early and through the trapping campaign they were effectively checked. Conditions were found to vary widely in different depots, how-

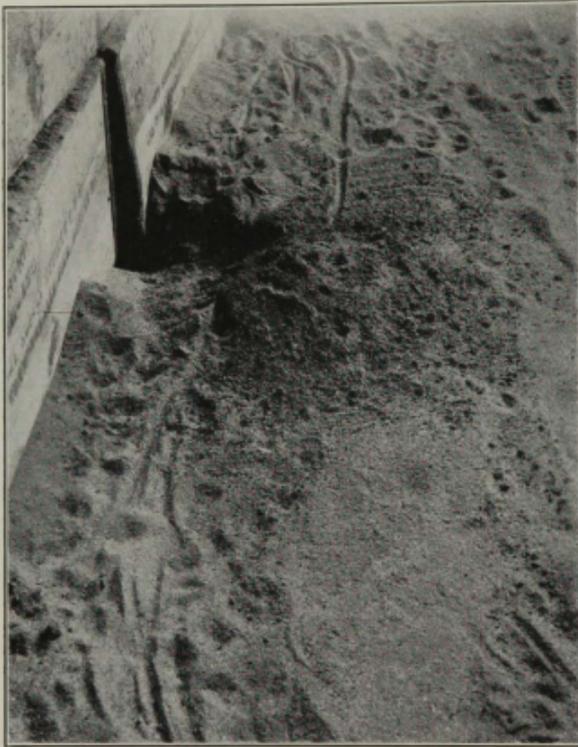


FIG. 146.—Rat hole under boxes of subsistence supplies in warehouse at Montoir, Base Section No. 1, A. E. F. Note tracks and tail marks of rat on sandy floor

ever, and the value of eliminating as far as possible any shelter for rats and mice was demonstrated. Where warehouses were constructed with floors elevated several feet very few rats appeared. In many places it was necessary to pile vast stores on dunnage consisting commonly of wooden slabs or scrap lumber laid on the ground. Rats and mice found convenient shelter and burrowing places for rearing their young under the slabs; but when stores were moved frequently, and the slabs invariably turned up and the ground cleared at every opportunity the animals were dislodged and their rapid increase in numbers effectively checked.¹

The most difficult conditions were met with at Advance Depot No. 1, near Is-sur-Tille and Cote d'Or. The position of this great depot, so vital to the American forces, may be likened to the neck of an hourglass. Converging streams of supplies from the various base ports and intermediate depots poured in for distribution thence in diverging lines along the front. Rats and mice were observed in arriving cargoes and numbers were undoubtedly transported in salvage material returned from the rat-ridden zone of operations. Vast stores of forage impossible to rat-proof accumulated near the Tille River, together with huge piles of firewood and salvage, and furnished abundant shelter for rats. The problem still further was complicated by the presence of thousands of men in temporary barracks in Camp Williams closely adjoining



FIG. 147.—Rats and mice of various kinds trapped in one night. A typical catch in Advance Depot No. 1, near Is-sur-Tille. Note type of trap used

the depot. The rats tended to gravitate to the subsistence warehouses and to the great stacks of forage, where trapping operations were centered. Although, as the records show, both rats and mice were breeding freely throughout the winter at our principal depots in France, the trapping operations served effectually in checking inroads by rats. Thousands of mice were destroyed by the men in early spring when stacks of forage which had remained a long time in place were removed.¹

RATS AND MICE DESTROYED

Owing to the fact that numbers of the rats poisoned at Camp Le Courneau died in their holes, no accurate records of the total number destroyed there could be obtained. It is believed, however, that it would not have been less than 5,000. Following is the list of animals trapped to check their increase in

storage depots, but does not include a considerable number devoured by their own kind after being caught, those removed from traps and thrown away by unauthorized persons, others dragged away by dogs, and still others the sexes of which for various reasons were not determined. The total number of all rodents recorded as destroyed in camps and depots, excluding Camp Le Courneau, is 12,203. Analysis of the figures for which data are complete indicates a rapid breeding rate with no marked disparity in sex. Thus the number of immature individuals and of embryos in the brown rat (*Rattus norvegicus*) each exceeds the number of adults of both sexes. The number of black rats (*Rattus rattus*) is too small to afford a basis for reliable deductions. The large number of embryos of the house mouse (*Mus musculus*) indicates a high frequency of births, since as compared with the brown rat the average size of litters is much smaller.¹

Brown rat (<i>Rattus norvegicus</i>):	
Adult males.....	670
Adult females.....	640
Young males (not of breeding age).....	636
Young females (not of breeding age).....	807
Embryos.....	1,767
Total.....	4,520
Black rat (<i>Rattus rattus</i>):	
Adult males.....	14
Adult females.....	5
Young females (not of breeding age).....	4
Embryos.....	20
Total.....	43
House mouse (<i>Mus musculus</i>):	
Males.....	1,938
Females.....	1,704
Embryos.....	2,717
Total.....	6,359

Of 100 pregnant brown females examined, the average number of embryos was 7.92; the highest number, 17, was observed in a single individual at Is-sur-Tille; the smallest number, 3, was noted twice in examples from St. Nazaire. Every number from 3 to 17 is represented in the series. Two females of the black species from Gievres contained 10 embryos each. Of 100 pregnant female house mice examined, the average number of embryos was 5.73; the highest number, 10, was recorded in three individuals; and the lowest number, 1, in a single example. All intermediate numbers were represented.¹

GENERAL HABITS OF RATS IN FRANCE

General observations in many parts of France indicate that while the country as a whole is infested with brown rats, their numbers are not so excessive in most places as they would be were it not for the nearly exclusive use of masonry in construction. Since the brown rat is essentially a burrowing

animal, considerable difficulty is encountered in finding suitable quarters in buildings of stone and concrete. Rats are forced to burrow largely in banks or sheltered spots adjacent to buildings, in the vicinity of which food may be secured. Burrows are commonly found here and there along the banks of streams, especially near towns, in moats surrounding walled cities or châteaux, and along the banks of canals.¹

A favorite site for burrows is in the shelter afforded by the angle of the wall at a lock. The great system of canals in France affords natural routes for the dispersion of rats, and it is probably along some of these that many of the first rats reached the trenches in the zone of operations. A few rats entering the trenches at many points found the vital elements, food and shelter, in abundance, and through rapid reproduction soon produced probably the greatest colony of these rats the world has ever known.¹



FIG. 148.—Head of rat left in trap. Body devoured, showing cannibalistic habits of the animals. Trap, an American all-metal type, used to a limited extent in France

In the war zone rats found many sheltered sites for holes along the sides of trenches and about dugouts, or even around the shattered edges of a shell hole. Food is always abundantly supplied through scraps scattered about by an army holding stabilized lines, and this scattering of fragments is difficult to control, since men under stress of war conditions are largely out of hand as regards sanitary matters. If unguarded stores or fragments of ordinary food or kitchen waste become scarce, dead draft animals or even the buried bodies of soldiers may be fed upon. In addition to all this, food for rats is derived from unburied fecal matter, and, finally, during the summer season considerable herbaceous vegetation is consumed by them.¹

The cannibalistic tendency of rats was well shown during the progress of trapping operations. Many individuals caught were partially or completely devoured by others. In some instances only the head or a few fragments of fur or claws were left. It seemed clear that any rat dying of disease or becoming

weakened thereby would be liable to be attacked by its fellows, who in devouring the body would acquire any parasites present.¹

The very small number of black rats (*Rattus rattus*) met with in the course of the work in France is noteworthy. None were seen among those destroyed at Camp Le Courneau, and few were apparently able to maintain themselves in the ports, but occasional individuals were taken in depots, especially at Gievres, where, owing to the very systematic elimination of shelter, there were few brown rats to compete with.¹

While local migrations are no doubt frequent, studies of tracks indicate that the brown rats as a rule do not wander far from their burrows if food is within easy reach. In the vicinity of their holes they may pass and re-pass in a single night many times over the same well-beaten paths. Wherever tracks may be distinctly seen, marks made by the dragging tail are usually also in evidence.¹

In the late spring and early summer of 1918, few brown rats were breeding at Camp Le Courneau, but breeding was resumed in the early fall. Along the former war front, where harder conditions were evidently being met with specimens examined in January and February, 1919, indicated that little breeding was in progress. During the same period, however, young were being brought forth in considerable numbers about depots, this reproductive functional activity being apparently associated with favorable environmental conditions.¹

MAMMALS OTHER THAN RATS AND HOUSE MICE INVADING A. E. F. DEPOTS

Systematic trapping in storage warehouses at our great internal depots surrounded by open country soon revealed the presence of various species of native mammals, which, like the house rats and house mice, were very recent invaders. Slight damages to flour and forage by several of the rodents were detected, but owing to the small numbers of these animals as compared with the house mice, they were not regarded as a serious menace. Specimens of four species of insectivorous mammals were captured, of which only the mole appeared to be in any way injurious. Two species of weasel were doubtless beneficial, acting here as natural enemies of the various rodents. The number of certain rodents destroyed, as shown by the following annotated lists, affords some idea of the relative abundance of the more important species. The smaller totals of embryos as compared with *Mus musculus* indicate slower breeding than in that species during the same season (November, 1918, to April, 1919).¹

Apodemus sylvaticus (deer mouse).—In certain warehouses at Gievres deer mice were found burrowing in stacks of flour, but their inroads were soon checked, partly by trapping and partly by having the invaded flour moved and the ground beneath thoroughly cleared.¹ The species was found in smaller numbers in warehouses at Is-sur-Tille and at Montoir. At both localities it is common and generally distributed in the country adjoining the depots. The burrows are usually located under bushes, but may open in bare ground. Several examined were in sandy places, the entrances leading down obliquely about 18 inches to a clean cavity several inches in diameter from which the animal was dislodged. Competition by house mice may check the increase of this species about depots. In eight pregnant females the average number of embryos was 5¾, the highest number recorded being 7; the lowest 3.

Males destroyed.....	202
Females destroyed.....	115
Embryos destroyed.....	104
Total.....	421

Micromys minutus (*harvest mouse*).—When stacks of forage at Is-sur-Tille were removed, small colonies of these mice were found living in bundles of branches used as dunnage.¹ They seemed to be limited to certain places, mainly, beneath piles of sacked oats, where they cut holes in the sacks and fed upon the grain. As usual under such conditions, more grain was wasted, however, than actually eaten by the rodents.

Eliomys quercinus (*dormouse*).—One only was captured in a storeroom at Is-sur-Tille.¹ Some damages to stores were reported by this species by the French.

Microtus arvalis (*meadow mouse*).—In the fall and early winter of 1918-19, this meadow mouse was excessively abundant in the fields surrounding several of our depots, especially that at Is-sur-Tille.¹ Numbers invaded the warehouses, where numerous burrows and tunnels or runways were made in the moist ground beneath slabs laid as dunnage. They appeared to be as plentiful under baled hay as under stacks of oats in sacks. Damage by these mice appears to result more from the cutting of sacks in gathering nesting material and the consequent wasting of grain, than from grain actually consumed by them. After the severe weather of January and February, 1919, evidence of excessive numbers of mice in the fields had disappeared in such widely separated points as Is-sur-Tille, Cote-d'Or, and Montoir near St. Lazaire. Moderate infestation of forage continued, however, and the species bred rather freely throughout the winter. In five pregnant females examined, the average number of embryos was 4½, the highest number noticed being 6, and the lowest 3.

Males destroyed.....	243
Females destroyed.....	244
Embryos destroyed.....	271
Total.....	758

Evotomys glareolus (*red-backed meadow mouse*).—Smaller numbers of red-backed meadow mice were trapped, mainly in piles of flour in warehouses at Gievres during the winter of 1918-19, where they were associated with *Mus musculus* and *Apodemus sylvaticus*.¹ A few were found breeding, but the species evidently was unable to gain a strong foothold, and little damage could be attributed to it.

Males destroyed.....	28
Females destroyed.....	16
Embryos destroyed.....	16
Total.....	60

Talpa europaea (*European mole*).—Moles are very numerous nearly everywhere in France, and damaged stores piled on dunnage to a limited extent by burrowing under and throwing up hills of wet earth, which, coming in contact with sacks of grain or flour, or bales of hay, created moldy conditions so that sacks rotted, and the contents were apt to be spilled.¹ In some places this was guarded against, however, by laying canvas over the dunnage.

Crocidura leucodon.—This shrew was fairly common under dunnage in the wetter places where forage was stored at Is-sur-Tille. Like the other shrews, it appeared to be harmless.¹

Sorex araneus.—Like *Crocidura leucodon*, this shrew inhabited damp places under dunnage on which forage was piled at Is-sur-Tille, but was found in smaller numbers.¹

Sorex minutus (*minute shrew*).—This small shrew was relatively rare as compared with the other species at Is-sur-Tille.¹ It was associated with *Sorex araneus* in wet places under stacks of forage.

Mustela nivalis (*weasel*).—During the winter, weasels were rather common in and around warehouses and stacks of forage at several large depots, and doubtless destroyed many rodents, thus tending to check the abnormal increase of these animals. Weasels about warehouses should, as a rule, be protected everywhere.¹

Mustela erminea (*ermine*).—The ermine appears to be much less numerous than the weasel in France. Several, however, were observed in trenches and in warehouses and around stacks of forage at Is-sur-Tille, where, like the weasel, they were doubtless an aid in controlling the numbers of rodents.¹

That the two vital elements, food and shelter, are necessary in order that rats and mice may thrive, and that efforts directed toward the curtailment of either or both of these elements tend to check their numbers, was demonstrated anew in the course of the destruction and control work in France; as also was the importance of eliminating the first arrivals and thus preventing these animals from acquiring a foothold and establishing themselves in places not already heavily infested. The brown rat, naturally a burrowing animal, is especially adapted to a life in the trenches. Ample food and shelter provided there quickly attracted the few inhabiting the general region, and although some were killed by the soldiers, they increased in numbers at a prodigious rate. When the trenches were abandoned by the men, however, most of the food supply was cut off and the rats became at once exposed to the attacks of many prowling foxes, cats, weasels, and other animals. Under these suddenly adverse conditions, many were obliged to move, breeding was interfered with, and their numbers seemingly decreased.¹

Our depots, hurriedly laid out and constructed under war conditions on a gigantic scale for the reception of the greatest accumulation of supplies in history, afforded an especially favorable environment for the development of mouse as well as rat colonies. While little proper rat-proofing could be attempted, it was found that much could be accomplished by giving special attention to floors. In many places flour, rice, potatoes, and many other subsistence supplies were piled upon slabs or rough, temporary floors laid upon the bare ground. Where these were moved frequently, the ground beneath swept clean before the space was again occupied, and all trash in the vicinity eliminated, rats and mice were slow in acquiring a foothold, but where stores were left a considerable time undisturbed, the increase of the rodents was more rapid.¹

Some damage to grain in sacks resulted from the invasion of comparatively small numbers of rats and mice, which in seeking nesting material cut away sections of sacking, permitting far more grain to be scattered than was actually

eaten by the animals. It was found that much of this waste could be prevented by placing a layer of heavy canvas under the lowest tier of sacks with projecting edges folded upward around the sacks in such a manner that any grain scattered would be caught and recovered on the canvas.¹

Thus the campaign about camps and depots resolved itself mainly in the taking of preventive measures to protect the vast stores required by the Army.¹

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- (3) Letter from the Surgeon General, February 19, 1918, to the chief surgeon, A. E. F. Subject: Additional men for Army Laboratory No. 1. On file, A. G. O., World War Division, Medical Records Section. File No. 729.5.
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CHAPTER XV

AN ANALYSIS OF THE INCIDENCE OF COMMUNICABLE DISEASES^a

Conclusions, estimates, and opinions based upon current study of disease incidence in the American Expeditionary Forces were subject to considerable error, owing to the important differences between the experience of such forces and the experience in relatively stable populations with a fairly permanent location. The rapid alterations in strength of the American Expeditionary Forces as a whole, and of its larger component groups, the frequency of change in location of organizations, the constant change in designation and numbers of many of the elements in the Services of Supply troops, the fluid state of tables of organizations, all contributed materially to errors in epidemiological studies.

Despite the fact that the current reports of the diseases in question (i. e., the diseases specified in The Manual for Sick and Wounded Reports, Section XII) were not wholly accurate or prompt enough for epidemiological purposes prior to March 11, 1918, the completed hospital records of cases were subsequently so coded and tabulated in the chief surgeon's office, A. E. F., that the statistical statement of incidence of the diseases can be accepted as of equal value with those collected later.

The official figures for the strength of the American Expeditionary Forces by months as of the middle of each month beginning July, 1917, are here given, as they are the basis for morbidity incidence per 100,000 strength, which will be used throughout this chapter.

The strength figures given out by G-1, G. H. Q., and later by G-1, Hq. S. O. S., for the first of each month are used as standard and are approximately correct.

Strength of the American Expeditionary Forces by Months

1917	
July.....	15, 555
August.....	26, 703
September.....	44, 744
October.....	70, 079
November.....	106, 990
December.....	141, 995
1918	
January.....	188, 652
February.....	229, 316
March.....	286, 521
April.....	437, 063
May.....	503, 265
	1919
June.....	739, 042
July.....	988, 015
August.....	1, 077, 595
September.....	1, 516, 386
October.....	1, 741, 593
November.....	1, 854, 523
December.....	1, 911, 141
January.....	1, 806, 033
February.....	1, 661, 000
March.....	1, 479, 000
April.....	1, 200, 000

^a This chapter is based on two reports made by Col. Haven Emerson, M. C., chief of the section of epidemiology, division of sanitation, chief surgeon's office, A. E. F. One of these reports, General Survey of Communicable Diseases in the A. E. F., was published in *The Military Surgeon*, 1921, xlix, No. 4, 389; the other, Minor Communicable Diseases, was published in *The Military Surgeon*, 1921, xlix, No. 6, 642.

The monthly strength figure was calculated by adding to or subtracting from the strength given for the first of a month half of the difference between this figure and the strength as given for the first of the next month.

Although in the case of measles, which up to June, 1918, was reported only by mail, and, therefore, reports were received two to seven days after actual diagnosis, and exceptionally in other diseases the reports were delayed, in the statement of incidence by weeks, which appear for the diseases below, the cases are recorded according to day of origin and not by the day of receipt of the report.

DIPHTHERIA

Weekly figures for diphtheria before December, 1917, are considered too unreliable to report; therefore, only the monthly record of the disease is given for the first five months of the American Expeditionary Forces. With such a small number of troops as formed the basis of our rate per 100,000 strength from July to November, 1917, the exaggerated effect of a few cases in the organizations than in France and England leads to erroneous conclusions as to the prevalence of disease. A rate of 83.6 per 100,000 strength for July, 1917, based on a strength of 15,555, is of much less reliability statistically than a similar rate in March, 1918, based on a strength of 286,521. The first important episode which gave a sudden rise in the diphtheria rate occurred in the week ending March 17, 1918, when the 32d Division, arriving in France with a considerable number of cases, and the probability of numerous carriers in its component organizations, developed by the prevalence of diphtheria in its camp in the United States, passed from the base port across France to its training area between Dijon and Langres.

The 35th Division was the only other organization in the American Expeditionary Forces which, coming with such a definite history of diphtheria prevalence during training camp experience in the United States, developed widespread incidence of the disease for several months after its arrival in the American Expeditionary Forces.

From the middle of June, 1918, until May, 1919, the incidence rate of diphtheria varied but little from week to week, and the epidemics that occurred were local in area and small in numbers.

The epidemic of influenza may have been a factor in causing a general rise in diphtheria in the weeks from October 13 to December 15, 1918, but, regardless of influenza, these are months when diphtheria is apt to prevail.

There were many observations indicating that gas intoxication of sufficient intensity to cause lesions of the throat and larynx caused a predisposition to diphtheria. On the other hand, it is quite possible that the reason for the spread of diphtheria among gassed men was that the sloughing and membranous lesions, the results of excoriations, were not frequently examined for the *Bacillus diphtheriæ*, and thus cases and carriers were developed without early control.

At the Mesves Hospital Center especially, and to some degree in other hospitals, wound diphtheria was found in considerable numbers under such

conditions that infection of wounds by carriers among hospital personnel was considered probable in the majority of cases.

The most interesting observations of the experience at Mesves in this connection was that infection of wound surfaces with the diphtheria bacillus does not generally exhibit the characteristic toxemia of the disease, nor is the development of the bacillus in wounds materially affected by the use of anti-toxin therapeutically.

A total of 4,714 cases of diphtheria and 62 deaths were reported between July 1, 1917, and April 30, 1919, inclusive, giving a case mortality per cent of 1.3. The case mortality in the French Army (zone of army and interior) was 1.61 per cent, January, 1915 to October, 1918.

The monthly diphtheria incidence rates per 100,000 strength in the British Expeditionary Forces and in the French armies were at all times far below the rates of the American Expeditionary Forces.

In the British Expeditionary Forces in 1915 the monthly rate per 100,000 ranged from 2.6 in July to 9 in February, averaging 5.1 for the year. In 1916 the lowest monthly rate was 3.1 in April, the highest 11.8 in November, with an average for the 12 months of 6.7. In 1917 the lowest monthly rate was 6.5 in November, the highest 13.5 in March, with an average of 9.7 for the 12 months. From October, 1918, to April, 1919, inclusive, the rate varied between 3.2 in October to 9.8 in November, with an average rate of 7.3 for these 6 months.

The reports from the French armies were divided into case incidence in the zone of the armies and case incidence in the interior. The monthly incidence rates for diphtheria for 100,000 strength in the zone of the armies varied in 1917 from 5 to 7, in 1918 from 4 to 8, in 1919 from 2 to 7. The comparable rates for troops in the interior were in 1917, 16 to 29, in 1918, 17 to 38.

The incidence rates for diphtheria in the American Expeditionary Forces per 100,000 of strength by months were:

	1917			1918
July.....	83.6	June.....	45.0	
August.....	37.5	July.....	25.4	
September.....	40.3	August.....	33.8	
October.....	11.4	September.....	20.6	
November.....	4.7	October.....	19.6	
December.....	12.7	November.....	26.3	
		December.....	25.0	
	1918			1919
January.....	9.0	January.....	21.1	
February.....	20.1	February.....	22.7	
March.....	92.9	March.....	22.4	
April.....	53.1	April.....	16.3	
May.....	65.4			

The British armies as a whole, in France and Belgium, and the French troops, in the zone of the armies escaped, because of the scattered character of civilian population in the occupied territory, such a degree of contact with and infection from the French civilian population as our troops were exposed to.

Comparison between our case incidence of diphtheria and its incidence among the French troops in the interior would be more profitable and just. The average French rate for diphtheria per 100,000 troops in the interior for July to December, 1917, was 19.5; for the American Expeditionary Forces, 34.3. The comparable French rate for 1918 was 30.5; for the American Expeditionary Forces, 25.1.

MALARIA

No cases of malaria were reported in the American Expeditionary Forces before June, 1918. Between June, 1918, and February, 1919, inclusive, 851 cases of malaria were reported, with four deaths. The cases were distributed as follows:

1918		1919	
June.....	61	January.....	41
July.....	94	February.....	18
August.....	136	March.....	22
September.....	200	April.....	28
October.....	128		
November.....	81		
December.....	42		

The four deaths were reported in July and September, 1918, and in January and March, 1919.

One of the deaths occurred almost immediately after arrival of the patient at a port in England. His condition had been diagnosed on shipboard as acute jaundice.

The first cases which were reported in June, 1918, were undoubtedly recrudescences of the disease in men who had been enlisted from the Southern States (Alabama), where the disease is prevalent, since the time of year and location of the organizations precluded any recent new infection by anopheles.

It is, of course, a bare possibility that some of the cases of malaria were of indigenous origin in France, since malaria was brought to and distributed in France rather widely by infected men invalided home from Saloniki. The anopheles breeds rather widely, but not vigorously or abundantly, in France, and the nighttime is usually so cool, even during the breeding season for mosquitoes, that they are not very active or aggressive, even where they could be found on the wing in the parts of France mostly occupied by our troops.

It may be taken for granted that our troops brought their malaria with them, that they did not spread it among themselves or in the civil population in France or England, and that the fatigues and exposures or their various occupations were chiefly responsible for the development into clinical manifestation of the great majority of the cases reported.

MUMPS

In terms of sick wastage, and measured by the number of days lost from military service on account of sickness, mumps was the most important disease in the American Expeditionary Forces. Approximately 1,021,636 days were

lost from service on account of mumps. Between July 1, 1917, and April 30, 1919, inclusive, 81,899 cases and 43 deaths from mumps were reported. They were distributed by months as follows:

		Cases	Deaths			Cases	Deaths	
1917				1918				
July	236	.....	July	3,626	.....	1	.....
August	337	.....	August	3,359	.....	3	.....
September	307	.....	September	5,674	.....	8	.....
October	330	.....	October	7,694	.....	8	.....
November	980	.....	November	8,076	.....	21	.....
December	2,302	.....	December	10,958	.....	.....	.....
1918				1919				
January	5,855	.....	January	8,901	.....	5	.....
February	5,245	.....	February	4,160	.....	1	.....
March	3,805	.....	March	3,973	.....	4	.....
April	1,155	.....	April	1,697	.....	.....	.....
May	1,500	Total		81,899	43
June	1,709						

The monthly incidence rates for mumps per 100,000 strength in the American Expeditionary Forces and among the French troops in the zone of the armies and in the interior are as follows:

		A. E. F.	French zone of the army	French zone of the interior			A. E. F.	French zone of the army	French zone of the interior
1917				1918					
July	1,517	.....	33	.....	179	.....	.....	.....	.....
August	1,262	.....	31	.....	119	.....	231	.....	39
September	686	.....	25	.....	99	.....	367	.....	37
October	477	.....	29	.....	127	.....	311	.....	28
November	916	.....	35	.....	89	.....	734	.....	.....
December	1,621	.....	45	.....	154	.....	441	.....	.....
1918				1919					
January	3,103	.....	79	.....	291	.....	.....	.....	.....
February	2,289	.....	93	.....	277	.....	492	.....	.....
March	1,328	.....	112	.....	261	.....	250	.....	.....
April	262	.....	129	.....	210	.....	268	.....	.....
May	298	.....	110	.....	232	.....	141	.....	.....

Just as with us, the French rate depended upon the presence among the troops of new recruits who had not been previously exposed to the disease, or at least had had no previous attack. The enrollment of each new class of recruits caused an immediate increase in the rate, as can be seen in the first five months of 1918. This increase in rate among the French troops appeared first and to the greatest degree among those in the interior, and affected the rate of the troops in the zone of the armies in proportion to the numbers of new recruits who were sent to this zone before they had passed through an immunizing attack of the disease. The case mortality from mumps in the French Army (zone of army and interior) was 0.12 per cent, January, 1916, to October, 1918.

A case mortality per cent of 0.05 and a loss of 43 lives attributed, but probably not really due, to mumps uncomplicated by some other condition may seem an unimportant loss in forces the size of the American Expeditionary Forces, but the loss of time, work, service, and what it represented in money spent and loss of effective force in battle or in supply services, due to the segregation and care of 81,899 men for an average of 12.5 days each is well worth

every effort to prevent, avoid, or diminish, so far as possible. The prolonged incubation period, the long and uncertain period of infectivity, our ignorance of the virus or etiologic agent and its mode of usual conveyance, lack of early and accurate clinical criteria for recognition or identification of suspected cases or exposed persons, and the very general susceptibility of young adult males when well exposed, all combine to defeat the measures of segregation usually employed.

MEASLES

There were reported 8,207 cases and 86 deaths from measles between July 1, 1917, and April 30, 1919, in the American Expeditionary Forces, giving a case mortality of 1.05 per cent. The case mortality from measles in the French Army (zone of army and interior) was 1.32 per cent, January, 1916, to October, 1918.

The high incidence rates in the first months, up to and including January, 1918, as compared with the rates after that, are probably to be explained by the fact that among the troops which came over before the spring of 1918 there was a very much higher percentage of men who had not been through exposure to, and epidemics of, measles in the training camps in the United States than was the case with troops arriving in the American Expeditionary Forces after February, 1918.

In the first 18 months of the American Expeditionary Forces measles was very largely confined to troops just arriving at base ports, or to detachments of these newcomers at the replacement camps, or even among the combatant units, to which they were often hastily forwarded without even being held to pass the incubation period, although they may have been known to have been exposed during the voyage to infection on shipboard.

Between 50 and 80 per cent of all cases in the American Expeditionary Forces from week to week up to the signing of the armistice were reported from the base ports. The incidence of the disease varied widely from week to week, according to arrivals of transports or convoys.

After the discontinuance of new troop arrivals, and with the greater stabilization of commands as to location and personnel, measles played but an insignificant part in disease incidence in the American Expeditionary Forces, and nowhere developed any important epidemics. There is no reason to believe that measles in the American Expeditionary Forces was to any noticeable extent due to infection acquired from the French civil population. What cases there were after January 1, 1919, were chiefly in the other parts of the American Expeditionary Forces than the base ports, especially in the armies and in the advance section.

Comparison with the incidence rates of measles per 100,000 per month in the British and French Armies shows, as in diphtheria, very much higher rates in the American Expeditionary Forces. For the French troops in the zone of the armies the rate in 1917 varied between 2 and 7, for the troops in the interior from 31 to 147; in 1918 the rates in the zone of the armies were 10 to 21, in the interior 49 to 464, the latter high rate resulting from recruiting the class of the youngest new troops.

In the British Expeditionary Forces the monthly rates from October, 1918, to April, 1919, varied between 2.7 and 16 per 100,000 strength.

The incidence rates for measles in the American Expeditionary Forces per 100,000 of strength per month were:

1917		1918	
July	145.2	June	42.3
August	118.1	July	27.6
September	179.6	August	55
October	225.2	September	73.6
November	463.5	October	64.6
December	359.6	November	53.6
		December	20.8
1918		1919	
January	358	January	8.5
February	14.4	February	8.4
March	42	March	13.8
April	22.6	April	15.1
May	44.5		

The relative youth of our troops, the recruiting of so many of them from parts of the United States where measles was less universal than it is in childhood in France and England, and the extensive contact of our troops with civilian populations in England and France, are thought to explain such excessive rates as prevailed in the American Expeditionary Forces in comparison with those of the British and French.

Measles as a precedent to or contributing cause of pneumonia played a very unimportant rôle in the American Expeditionary Forces, as can be seen from the case mortality of the disease. Pneumonia following measles was rare in the American Expeditionary Forces.

SMALLPOX AND CHICKEN-POX

Thirty cases and five deaths from smallpox were reported in the American Expeditionary Forces, while 289 cases of chicken-pox were reported. The distribution of these diseases by months was as follows:

Month	Smallpox		Chicken-pox	Month	Smallpox		Chicken-pox
	Cases	Deaths	Cases		Cases	Deaths	Cases
1917				1918			
July	1			July			12
August				August			16
September	1			September		1	16
October				October	1	1	28
November				November	2		18
December			3	December	9		18
1918				1919			
January			17	January	2		20
February	1		5	February	4	2	20
March	1		9	March	1		33
April	3	1	13	April	1		28
May	2		19				
June			14	Total	30	5	289

With the exception of 4 cases in February, which developed among hospital personnel after exposure for several days to a case of smallpox which had been

considered to be chicken-pox, no 2 of the cases of smallpox reported occurred in such relation to each other, in time, place, or organization, as to make it seem at all probable that there had been infection from one case to others in the American Expeditionary Forces, or that the infection in any two or more of our cases had come from a common source in the civilian population. There is always a small amount of smallpox in France, the military alone being uniformly vaccinated.

The first death from smallpox was of an officer who was exposed to the disease while suffering from mumps, a delirious smallpox patient in the same hospital having escaped from his attendants and entered the officer's sick room. The officer was not revaccinated at the time of the exposure, and he was not previously adequately protected to prevent a fatal attack of the disease. One of the other deaths was of a nurse, one of the four hospital personnel who had been exposed to a supposed chicken-pox case. The nurse had gone on leave before the true diagnosis of the case of smallpox had been made. She returned by a long exhausting railroad journey to the hospital suffering severely from the constitutional symptoms, and with a typical smallpox eruption widely distributed on face and hands. No secondary cases are known to have resulted from the exposure of her fellow travelers.

The object of requiring the telegraphic report of cases of chicken-pox on the day of diagnosis was to call the attention of medical officers to the importance of this diagnosis in adults, in spite of the unimportance of chicken-pox *per se* in the Army. To be on guard against making a false diagnosis, to be ready at all times to consider a case of chicken-pox in adults as possibly smallpox, or even probably so until proved the contrary; in such ways is an early diagnosis of smallpox, when it does occur, better assured. Such cases of smallpox as occurred in the British and French Armies were rare and widely scattered. Cases of chicken-pox were not the subject of mutual report between the armies.

MENINGOCOCCUS MENINGITIS

There were no extensive epidemics of meningococcus meningitis in the American Expeditionary Forces, although a number of organizations in which the disease had prevailed to a serious degree in training camps in the United States continued to show relatively high incidence and to give evidence, from the way the cases developed, that carriers were numerous and the organism virulent. High carrier rates were rarely found, and certainly not in such relation to high case incidence in an organization as to justify the belief that the presence of carriers compared in importance with the alterations in susceptibility, through which groups of men passed apparently as a result of changes in environment, occupation, and climate. Crowding, extreme fatigue, cold, wet, exposure, inadequate, cold, and unsuitable food, all appeared to play important parts in developing increased susceptibility to meningitis.

Rarely were cases so grouped that one case could be shown to have originated from another among his messmates, his company, or other companions. Scattered distribution in large organizations was the rule, even in divisions where the disease was relatively prevalent.

It was commonly noted that more than 50 per cent of the cases reported in any week, up to the cessation of troop shipments from the United States, were reported from the base ports, and in most of the cases the infection originated and often developed upon shipboard, where the allowance of floor space per capita on troop decks was frequently not more than 9 square feet.

The high rate of incidence in the American Expeditionary Forces in November, 1917, was due to outbreaks in organizations which brought the disease with them from their training camps.

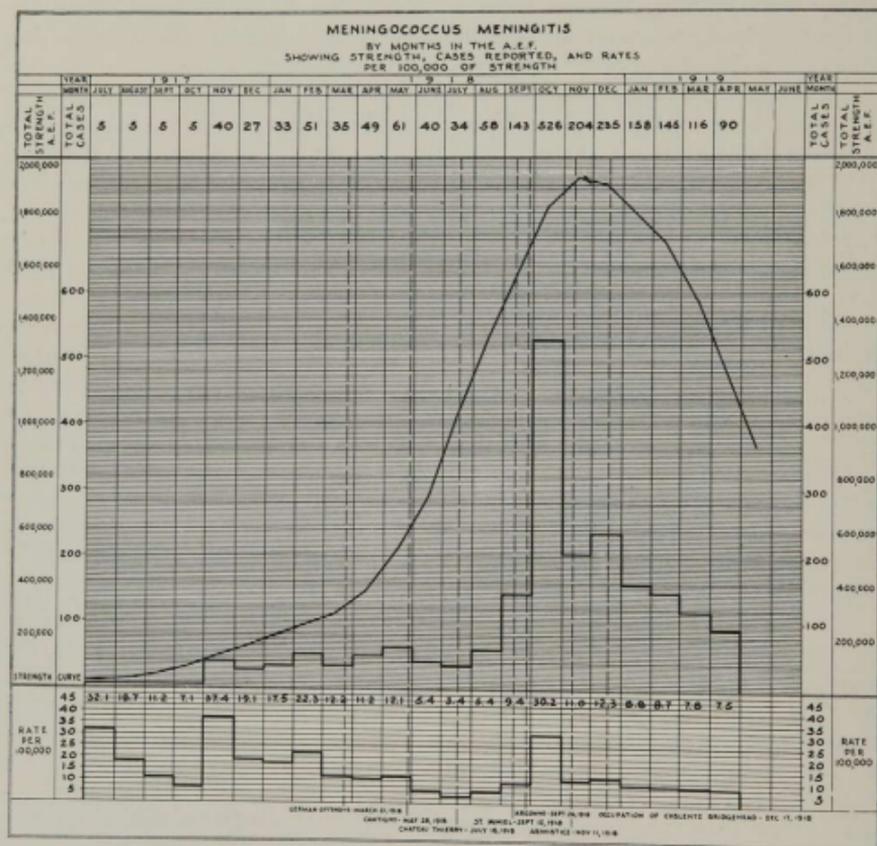


CHART IV

The high rate in October, 1918, followed three weeks after the highest incidence of influenza, and it was considered probable that the widespread lowering of resistance, apparently to various infectious diseases, resulting from influenza, the prevalence of upper respiratory tract inflammations of a great variety accompanying or following influenza, the continuous inclement, cold, wet weather, the serious overcrowding of most of the quarters provided for troops in the American Expeditionary Forces, and the exhaustion of many of the combat troops incident to the extreme battle activities, all contributed to the sudden increase in meningitis at this time.

There were reported, from July 1, 1917, to April 30, 1919, inclusive, a total of 1,965 cases of meningococcus meningitis, and 911 deaths, giving a case mortality of 44.14 per cent. The case mortality from meningitis in the French Army (zone of army and interior) was 32.61 per cent, January 1916 to October 1918.

Comparison between monthly incidence rates per 100,000 strength in the American Expeditionary Forces and those in the British Expeditionary Forces and in the French armies shows almost constantly higher rates in our forces.

In the British Expeditionary Forces in 1915 the monthly rates for cerebrospinal meningitis per 100,000 strength varied between 1.6 in September and 15.0 in March, with an average rate of 5.05. In 1916 the rates were from 0.8 in November to 4.3 in April, with an average of 2.25. In 1917, the rates were from 0.5 in October to 7.4 in March, with an average of 3.04. In 1918 the rate for the last 3 months of the year were 0.3, 0.2, and 0.3, respectively. In 1919 the rates were January 0.6, February 0.3, March 0.4, and April 4.6.

In the French armies in the zone of the armies the rates in 1917 (July to December) were from 0.2 in October to 0.9 in December, with an average of 0.48 for the 6 months. In 1918 the rates were from 0.2 in January to 1 in February, March, and April, with an average of 6.83 for the 12 months. In the first 4 months of 1919 the rates were 0.3, 0.8, 1.8, and 0.7, respectively, with an average of 0.9 for the 4 months.

For the French troops in the interior the rates in 1917 (July to December), were from 2 in August and September to 5 in November and December, with an average of 3.3 for the 6 months.

In 1918 (January to August, inclusive), the rates were from 2 in April to 12 in May, with an average rate of 7.14 for the 7 months.

SCARLET FEVER

Scarlet fever has not been considered in the past to be of much importance as a problem in armies, but for much the same reasons as have been given in connection with measles and mumps in the American Expeditionary Forces, scarlet fever in our Army of young men, in large numbers drawn from sparsely settled or rural communities, developed considerable incidence, and persisted to some extent at all times.

Among the first large organizations which arrived in France, one developed a considerable epidemic of scarlet fever in November and December, 1917. The resultant cases were left at numerous places en route across France, and many small villages received legacies in the shape of local epidemics in the wake of the passing troops.

In the spring of 1918, also, there were several localized outbreaks among newly arrived troops in which the infection was traced with approximate accuracy to the presence of infection on shipboard, brought directly from the camp where it had existed in the organizations just prior to embarking. Here, again, the necessity for speed and the limitation of space in transports and trains were the special factors contributing to the spread of the infection.

The disease was always easily controlled by adequate frequent medical inspection of contacts, and segregation of cases and suspects.

There were reported, from July 1, 1917, to April 30, 1919, inclusive, 2,064 cases of scarlet fever, and 70 deaths, giving a case mortality of 3.39 per cent. The case mortality of scarlet fever in the French Army (zone of army and interior) was 1.77 per cent, January, 1916, to October, 1918.

Comparison with the monthly incidence rates per 100,000 strength in the armies of our Allies shows our scarlet fever rate to have been higher than theirs. In the British Expeditionary Forces the rates for October, November, and December, 1918, were 0.9, 1.8, and 1.1, respectively, and in the first 4 months of 1919 they were 1.5, 0.8, 1.3, and 1.8, respectively.

In the French troops in the zone of the armies the rates in 1917 (July to December, inclusive) ranged from 2 to 4, averaging 2.5 for the 6 months. In 1918 the rates in the zone of the armies were from 1.2 in December to 9.3 in October, with an average monthly rate for the 12 months of 4.09. In the first 4 months of 1919 the rates were 2.0, 6.9, 9.2 and 8.7, respectively.

For the French troops in the interior the rates in 1917 (July to December, inclusive) were from 15 in November to 25 in July, with an average monthly rate for the 6 months of 19.8. For the first 7 months of 1918 the rate for the troops in the interior were from 24 in February to 90 in June, with an average monthly rate for the 7 months of 49.8.

The incidence rates for scarlet fever per 100,000 of strength by months in the American Expeditionary Forces were:

1917		1918	
September.....	11. 2	July.....	10. 4
October.....	39. 9	August.....	6. 7
November.....	51. 4	September.....	4. 6
December.....	93. 8	October.....	6. 0
		November.....	5. 2
		December.....	6. 7
1918		1919	
January.....	64. 8	January.....	5. 8
February.....	44. 8	February.....	7. 3
March.....	51. 8	March.....	6. 2
April.....	54. 7	April.....	5. 0
May.....	33. 4		
June.....	15. 3		

DYSENTERY

Owing to the loose clinical use of the term "dysentery," many cases were reported under this heading for which no supplementary information as to specific etiology was received. The majority of cases of the ordinary diarrheas were treated, or recovered, without hospital care. Since the type of enteric disease, a widely prevalent epidemic diarrhea, which prevailed from July through September, 1918, in the American Expeditionary Forces, and particularly among the troops which took part in the Chateau-Thierry operation, was benign and of brief duration, and since the emergencies of combat, evacuation, and hospitalization forbade the use of hospital care for any but serious cases, there can be only estimates of the incidence of this affection, based upon reports of medical officers with troops or of those sent out from the central medical department laboratory to study the situation and direct preventive measures. It is estimated that not less than 150,000 cases of diarrhea occurred in the First Army, in July and August, 1918.

Where examinations of stools could be made early in the disease it was common to find the usual dysentery bacilli, and in a considerable number of cases the bacilli of typhoid and paratyphoid were identified as the cause of what had been supposed to be a simple acute enteritis. The more severe and persistent cases of diarrhea and those complicating the various battle casualties which reached hospitals often when examined did not show at such a late stage of the disease specific organisms which could properly be considered the cause of the disease. Thus it will be seen that any statistical statement of dysentery in the American Expeditionary Forces must be of but relative completeness and accuracy and not at all comparable to the reports of this disease among the British, where every case reported as dysentery had been proved by bacteriological methods. The records of the disease in the French armies also were based on reports confirmed by laboratory examination of stools.

There were reported from July 1, 1917, to April 30, 1919, inclusive, 6,195 cases of dysentery, of which 5,261 lacked laboratory confirmation of the diagnosis. Of the 934 cases for which laboratory proof of the diagnosis was presented, 38 were of amebic origin and 896 were due to one or more of the dysentery bacilli, well-known and rare varieties of which were identified.

Of the amebic cases the majority gave a history of a previous attack or of residence in the United States or in the Tropics, where the disease is known to be prevalent.

No cases of infection probably acquired from local French civilian sources were reported. Amebic and bacillary dysentery are fairly common in all parts of France, but no serious epidemics or foci of either kind of dysentery were reported in the French civil or military population during the period under discussion.

The distribution of the proved and undetermined cases of dysentery reported by months was as follows:

	Proved	Undetermined		Proved	Undetermined
1917			1918		
July.....			June.....	4	37
August.....			July.....	48	111
September.....			August.....	194	322
October.....			September.....	312	854
November.....			October.....	181	1,547
December.....			November.....	72	1,461
1918			December.....	38	347
January.....	4		1919		
February.....	2		January.....	17	356
March.....	2		February.....	22	93
April.....	4		March.....	15	88
May.....	2		April.....	15	45

There were 31 deaths attributed to dysentery between July 1, 1917, and April 30, 1919 (giving a case mortality of 0.50 per cent), of which one was amebic in origin, five were bacillary, and the rest (25) were of undetermined origin. These deaths were distributed as follows:

	Amebic	Bacillary	Undetermined		Amebic	Bacillary	Undetermined
1918				1919			
August.....	1		4	January.....			1
September.....		3	6	February.....			
October.....			10	March.....			
November.....			3	April.....		2	
December.....			1	Total.....	1	5	25

The case mortality of dysentery in the French Army (zone of the army and interior) was 3.37 per cent, January, 1916, to October, 1918.

The monthly incidence of dysentery per 100,000 strength among French troops in the zone of the armies in 1917 varied between 5 and 7 for the last six months of the year. In 1918 it ranged from 2 in May to 49.2 in September, with an average monthly rate for the 12 months of 13.6. In the first four months of 1919 the rates were 2.6, 2.4, 0.6, and 0.3, respectively.

For the French troops in the interior the rates for the last six months of 1917 were from 9 in July to 97 in October, with an average for the six months of 43.8. In the first seven months of 1918 the rate ranged from 5 in May and June to 105 in August, with an average for the seven months of 26.6.

TYPHOID AND PARATYPHOID

There were reported in the American Expeditionary Forces between July 1, 1917, and May 31, 1919, inclusive, 1,242 cases of typhoid fever, with 155 deaths, giving a case mortality of 13.2 per cent, and 169 cases of paratyphoid, with four deaths, one from paratyphoid A and three from paratyphoid B, or a case mortality of 2.4 per cent, and a case mortality for the two diseases combined of 11.28 per cent. The case mortality of typhoid and paratyphoid fevers combined in the French Army (zone of army and interior) was 9.76 per cent, January, 1916, to October, 1918. The cases and deaths in the American Expeditionary Forces were distributed by months as follows:

Month	Typhoid		Paratyphoid		Month	Typhoid		Paratyphoid	
	Cases	Deaths	Cases	Deaths		Cases	Deaths	Cases	Deaths
1917					1918				
July.....					August.....	45	10	5	
August.....					September.....	59	12	16	1-A, 2-B
September.....					October.....	43	7	8	
October.....					November.....	70	12	16	1-B
November.....	2				December.....	161	25	28	
December.....		1	6		1919				
1918					January.....	232	33	33	
January.....	2	1	1		February.....	169	9	9	
February.....		2			March.....	212	35	35	
March.....			1		April.....	92	4	7	
April.....	4		2		May.....	33		2	
May.....	1				Total.....	1,242	155	169	4
June.....	8		1						
July.....	109	2	1						

There is no question in the minds of those who followed the development, course, and subsidence of typhoid fever from July, 1918, to May, 1919, that up to January 1, 1919, there were many cases of typhoid and paratyphoid fevers which were not recognized or reported as such. There were several important reasons for this, among which three require special mention. During the extensive prevalence of epidemic diarrhea, in July to September, 1918, in the areas over which the advancing battle line was sweeping from Chateau-Thierry to St. Mihiel and beyond, enough cases of typhoid and paratyphoid were detected, almost accidentally in the course of diagnosis and treatment of the few cases of so-called dysentery which reached hospitals, to indicate a pretty generous seeding of these diseases among the great mass of benign nonspecific

instances of enteritis. Later, also, when the organizations which had been particularly afflicted with diarrhea in the Meuse-Argonne were searched for carriers of typhoid and paratyphoid, such numbers were found as to suggest a considerable prior undetected incidence of these diseases.

During the overwhelming epidemic of influenza which coincided during September, October, and November, with the period of the maximum American Expeditionary Forces participation in combat, all conditions were favorable for the overlooking of enteric affections in the mass of acutely sick men, of whom 99 of every 100 were suffering from influenza or pneumonia. Battle casualties and the most serious medical emergency of the American Expeditionary Forces combined to put such a strain on medical and nursing personnel, and on hospitalization and laboratory facilities, that a thorough searching clinical study and diagnosis of all patients was impracticable. That many typhoid and paratyphoid patients at this time went through their diseases to a spontaneous recovery may be fairly surmised from the fact that during the months of December, 1918, and January and February, 1919, a large number of patients came under hospital care in a convalescent or carrier stage of typhoid or paratyphoid fever, whose history made it quite clear that the onset and early stages of their diseases had been mistaken and treated for and as influenza, often as long as eight weeks earlier.

The attitude of medical officers throughout the American Expeditionary Forces was a further important contributing cause of delay or failure to detect and report typhoid and paratyphoid fevers, even when all the evidence—clinical, bacteriological, and, finally, at autopsy—was overwhelming in forcing one to a diagnosis of these diseases. Intestinal type of influenza, subacute enteritis, chronic dysentery, and many other possible but improbable diagnoses served to disguise the true presence of typhoid. It seemed to be so deeply impressed upon the consciousness of the average medical officer that typhoid fever would not be encountered in our presumably 100 per cent vaccinated Army that they were in many instances, apparently deaf to histories and blind to the symptoms of classical cases of the disease.

The educational propaganda made necessary by the steadily increasing incidence of typhoid up to January, 1919, bore fruit in the submission of a larger number of suspected and clinical cases of this disease before laboratory examinations had confirmed or disproved the diagnosis. So it was that from January to May, 1919, there were many cases of typhoid fever carried as true cases on the record in spite of inadequate evidence of the specific nature of the infection.

In the record of typhoid incidence in the American Expeditionary Forces there were three important episodes: First, the outbreak in the Camp Cody, June automatic replacement draft, which arrived (250 men) early in July, 1918, and in which 98 cases of typhoid fever developed; second the widespread occurrence of the disease in November and December, 1918, and January, 1919, in the divisions which had shared in the Meuse-Argonne operation, and more particularly in the 77th Division when it reached its training area in the advance section, and among the personnel of a number of hospitals in the advance section; third, an outbreak at Marseille in March in a motor traction park. It would be superfluous to describe here the probable and proved causes of

origin and spread of typhoid and paratyphoid in the American Expeditionary Forces, but it is worth noting that the usual and well-known causes prevailed and operated to start and continue the epidemics, and that well-ried sanitary and technical laboratory procedures sufficed to bring the outbreaks to an end.

Unusual and special exposure of our troops to typhoid and paratyphoid infection occurred in the area of France in the vicinity of Gondrecourt and Commercy, where these diseases had prevailed in the civilian population since 1915, where civilian cases were found frequently in the villages used for billeting our troops, carriers and heavily polluted village and house water sources being abundant, and in the occupied area of Germany in and about Coblenz, Trier, and along the valley of the Rhine, where for generations typhoid and paratyphoid have remained endemic in spite of persistent and intelligent efforts of the German public health authorities to eradicate them.

Probably the inoculation of our entire force with the triple typhoid-paratyphoid vaccine played the most important rôle in preventing these diseases from developing into serious epidemics, such as afflicted the Australians at Gallipoli, and the French in 1914 and 1915 in France.

The rates for typhoid in the British Expeditionary Forces which are considered in the present connection are monthly rates per 100,000 strength for the months of October, 1918, to April, 1919, inclusive, which were, October, 0.3; November, 0.3; December, 1.4; January, 1; February, 0.4; March, 0.6; April, 0.4.

Among the French armies in the zone of the armies the monthly rates per 100,000 strength ranged in 1917 (July to December) from 4 in December to 8 in September, with an average for the six months of 5.7; in 1918, from 0.6 in November to 6 in June, with an average for the 12 months of 2.4; in 1919, January, 0.6; February, 0.9; March, 0.6; and April, 0.

Among the French troops in the interior the monthly rates per 100,000 strength ranged in 1917 (July to December) from 14 in December to 60 in October, with an average for the 6 months of 29; in 1918 (January to August, inclusive) from 7 in April, May, and June, to 28 in August, with an average for the 7 months of 12.4.

The incidence rates for typhoid fever in the American Expeditionary Forces per 100,000 of strength by months were:

1917		1918	
July	0.0	June	1.1
August	0	July	11.0
September	0	August	4.2
October	0	September	3.9
November	1.8	October	2.9
December	0	November	4.5
		December	13.0
1918		1919	
January	1.1	January	17.0
February	0	February	6.3
March	0	March	12.0
April	.92	April	7.7
May	.20		

TUBERCULOSIS

Between July 1, 1917, and April 30, 1919, 4,201 cases of tuberculosis of all kinds and 433 deaths were reported in the American Expeditionary Forces. Of these, 2,113 were acute miliary tuberculosis, 102 were tuberculosis of bones or joints, 735 were incipient pulmonary tuberculosis, and 1,251 were chronic pulmonary tuberculosis. Of the deaths 225 were from acute miliary tuberculosis; 3 were from tuberculosis of bones or joints; 99 were from incipient pulmonary tuberculosis; and 106 were from chronic pulmonary tuberculosis.

The distribution of the cases and deaths by months were as follows:

Year	Acute miliary tuberculosis		Tuberculosis of bones and joints		Incipient pulmonary tuberculosis		Chronic pulmonary tuberculosis	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1917								
July							10	
August			5				10	
September	5				2		17	
October	5	2			5		12	
November	7	1	2				62	
December	7						82	3
1918								
January	20	2	10				191	3
February	15		5		2		100	1
March	15	4	2		5		30	7
April	7				2		8	7
May		4				2		2
June	76		7		27	6	94	6
July	64	5	5		35	2	120	
August	92	6	14		33	2	78	3
September	172	10	4		53	5	99	7
October	212	26	6		47	4	69	12
November	198	17	9		36	2	52	4
December	266	23	7	1	75	6	67	16
1919								
January	280	33	11		103	15	71	13
February	216	31	4		103	16	24	9
March	258	38	10	2	151	31	31	6
April	199	21	1		51	8	24	7
Total	2,113	225	102	3	735	99	1,251	106

The total cases, numbered 4,201 and deaths 433, or a group case mortality of 10.31 per cent.

The figures here presented do not represent the normal incidence of tuberculosis, nor the death rate from the disease in males of this age group. Rigid examinations had removed all but a small residue of discoverable cases of tuberculosis from the troops before they embarked for the American Expeditionary Forces. As rapidly as possible, with due consideration for the patient's welfare, all tuberculosis patients were returned to the United States as patients as soon as a positive diagnosis was established.

Deaths occurring among tuberculosis patients invalided home in whom the diagnosis was made first in the American Expeditionary Forces are not included in these figures.

It was thought that the damage to the upper respiratory tract, to the bronchi, and to the pulmonary parenchyma itself, resulting from exposure to various of the toxic gases used in battle would predispose to tuberculosis or tend to develop quiescent foci, which might have existed prior to the gassing, into an active stage. No evidence of any predisposition to tuberculosis or unusual incidence of tuberculosis among convalescent gas cases has been discovered so far.

Taking the three groups of pulmonary tuberculosis—i. e., acute miliary, incipient, and chronic—it is to be seen that no notable change in incidence rates of this group as a whole occurred after the epidemic of influenza, as might well have been expected.

Monthly incidence rates of the group of tuberculous pulmonary affections in the American Expeditionary Forces per 100,000 strength were:

1917		1918	
July.....	64.3	June.....	26.5
August.....	37.4	July.....	22.2
September.....	53.6	August.....	18.8
October.....	31.4	September.....	21.4
November.....	69.1	October.....	18.9
December.....	62.8	November.....	15.5
		December.....	21.3
1918		1919	
January.....	111.8	January.....	25.1
February.....	51.0	February.....	26.6
March.....	(*)	March.....	29.9
April.....	(*)	April.....	22.8
May.....	(*)		

INFLUENZA AND PNEUMONIA

Between July 1, 1917, and April 30, 1919, inclusive, there were reported in the American Expeditionary Forces 191,590 cases of influenza and 29,381 of pneumonia. During the same period there were 545 deaths from influenza and 12,849 deaths from pneumonia, or a case mortality of influenza of 0.28 per cent and of pneumonia of 43.7 per cent, and a combined case mortality of 6.06 per cent. The number of cases and deaths reported and the incidence of these two diseases by months per 100,000 strength were as follows:

	Influenza			Pneumonia		
	Cases	Rate per 100,000 strength	Deaths	Cases	Rate per 100,000 strength	Deaths
1917						
July.....	50	321		18	116.0	7
August.....	117	438		15	56.3	5
September.....	180	403		28	62.5	
October.....	735	1,050		98	140.0	23
November.....	2,120	1,980		192	178.0	28
December.....	3,520	2,460		508	358.0	80
1918						
January.....	3,660	1,940		980	520.0	158
February.....	2,195	958		480	210.0	52
March.....	2,420	844		625	218.0	90
April.....	1,850	428		252	57.6	91
May.....	2,500			456	72.5	93
June.....	4,520	748		660	89.3	89
July.....	5,097	516	4	620	62.7	95
August.....	8,099	751	10	971	90.1	308
September.....	37,935	2,500	56	3,580	235.0	2,444
October.....	38,655	2,200	269	7,008	402.0	4,823
November.....	22,066	1,086	85	2,621	141.0	1,467
December.....	18,201	952	28	2,629	138.0	921
1919						
January.....	15,873	878	16	2,797	155.0	600
February.....	7,388	445	8	1,064	64.0	486
March.....	10,943	739	44	1,808	122.0	553
April.....	4,466	372	25	1,089	90.7	188
Total.....	191,690		545	29,381		12,849

* Figures incomplete.

The ratio of pneumonia to influenza in the American Expeditionary Forces did not vary materially during the period of the epidemic. Pneumonia cases reported by weeks from June 15, 1918, to February 9, 1919, inclusive, were about 12 per cent of the number of cases of influenza reported during the same weeks, the exact percentages by weeks being as follows:

Percentage of pneumonia as compared with influenza cases, by weeks

Week ending—	Per cent	Week ending—	Per cent
1918		1918	
June 23.....	12.3	Oct. 27.....	15.5
30.....	12.8	Nov. 3.....	17.1
July 7.....	10.4	10.....	12.7
14.....	11.5	17.....	10.2
21.....	12.0	24.....	11.0
28.....	13.7	Dec. 1.....	12.2
Aug. 4.....	11.8	8.....	13.8
11.....	11.9	15.....	15.4
18.....	10.8	22.....	15.5
25.....	10.8	29.....	12.5
Sept. 1.....	11.3		
8.....	8.1	1919	
15.....	9.2	Jan. 5.....	15.6
22.....	7.4	12.....	15.5
29.....	13.7	19.....	11.1
Oct. 6.....	11.6	26.....	11.2
13.....	12.4	Feb. 2.....	11.1
20.....	18.1	9.....	14.3

In October, November, and December, 1917, and in January, 1918, the incidence of infectious respiratory diseases, so-called "clinical influenza, pneumonia, both lobar and bronchopneumonia," reached very high rates, but, owing to the small number of American troops then in France, and because detailed study of communicable diseases in camps or hospitals had not yet been made, no comparison of rates was made, and the seriousness of the condition was not appreciated at the time. It may well be that the unusual conditions which the troops had to face, especially the crowded and ill-prepared living quarters, combined with very severe winter weather, were responsible for a more than usual seasonal expression of these diseases.

During February and March, 1918, the usual subsidence of influenza occurred, and in April the incidence was low. During the latter half of April, epidemics of a benign, acute, febrile infection appeared, first (April 15) at a camp near Bordeaux. In one week the affection, which resembled mild influenza, reached its height, and in two weeks more it disappeared from the camp without any secondary pneumonia or other complications, and having caused no deaths. Several camps and detached groups of white and negro troops in the vicinity of Bordeaux similarly were affected, from 2 to 10 per cent of the command developing the disease suddenly on the same day.

The onset was sudden, with symptoms altogether like those of influenza. The patients were afebrile in two to three days and back at work in four to five days. In about 10 per cent of the cases there was a mild bronchitis, but there were no other signs or symptoms of pulmonary involvement.

On May 1 the disease appeared in Tours, and by May 24 the episode at this post was at an end. The clinical picture was identical with that at Bordeaux. On May 3, the disease, commonly called "three-day fever," appeared

at Langres, at a camp hospital. On May 22, a base hospital at St. Nazaire passed through a similar experience, and from this group of cases the influenza bacillus was found in nasal and bronchial discharges in a high percentage of the cases. May 13-24, the disease appeared and ran its course at Chaumont. May 20-24, it appeared at Bourbonne-les-Bains.

By June 1, the disease was widespread throughout the American Expeditionary Forces, and evidence of civilian physicians was very definite to the effect that the disease had prevailed mildly in the civil population in France during March and April.

The disease showed sometimes one and sometimes another predominating symptom, but a typical clinical picture was as follows: Abrupt onset with headache, usually occipital, severe, and at times with meningeal symptoms, severe backache and general muscular pains, fever, general soreness in the chest, especially substernal, with a mild sore throat and a slight cough. No distinct chill occurred, but the temperature often rose to 103° F., and sometimes to 104° or over. There was extreme prostration, and in some instances men fainted while on duty and had to be carried to bed. Recovery was rapid. There were no complications.

During July, the disease disappeared largely from among the troops in the American Expeditionary Forces, and until the middle of September there was the usual seasonal freedom from respiratory infections.

In September, influenza in a much more severe form reappeared, and may be said to have raged in the American Expeditionary Forces, reaching its height in the third week of September. It was at this time that the disease, which had meantime spread to England and the United States, appeared in its most serious form on the crowded transports arriving at our base ports in England and France.

The seriousness of the situation may be judged from the fact that in several convoys of transports, carrying a total of about 100,000 troops, there was a loss by death from pneumonia, complicating influenza on shipboard, of 2 per cent of the strength within three weeks from the date of embarkation in the United States.

After the severe recrudescence of the disease in September, October, and November, the cases fell off, until in December, 1918, the rate was much lower than for December, 1917. In January, 1919, there was a third wave of less severity and affecting a smaller proportion of the American Expeditionary Forces.

During all the period from September, 1918, to February, 1919, the clinical manifestations of the disease were extraordinarily severe, the complication of pneumonia developing in 5 to 10 per cent of the cases, and the deaths among the cases complicated with pneumonia running as high as 50 per cent. The cases often were overwhelmed by the infection and died within 24 hours of the onset. The lungs showed a picture of coalescing, patchy pneumonia, often with hemorrhagic tracheobronchitis. Empyema as a complication was rare.

Infection and resistance are subjects concerning which there was more opinion than fact in dealing with influenza, but experience with large bodies of

men of practically the same age group, under a variety of environmental, occupational, and climatic conditions justifies the following general conclusions:

The infection is conveyed by direct discharge of nasal, mouth, and tracheo-bronchial secretions of patients from at least the earliest observable moment of appearance of symptoms until a week after the subsidence of fever in uncomplicated cases, or until the cessation of cough or other catarrhal symptoms in cases complicated by bronchitis or pneumonia.

The infection may be conveyed by the hand, and by utensils and toilet articles when these vehicles have been soiled recently by moist respiratory discharges of an infected individual.

The chances of infection are increased with close and continuous personal contact, as in crowded barracks, mess halls, or meeting places.

The severity of infection appears to bear a close relation to so-called "lowered resistance," a condition apparently developed by fatigue, exposure to wet and cold, worry, strain, insufficient or irregular food and sleep.

Infection can be diminished in severity and extent in a command by providing not less than 40 square feet per capita in living quarters, securing separation of sleeping bunks so that heads are separated by a partition, requiring boiling water for washing mess kits, preventing promiscuous coughing, sneezing, and spitting in and about quarters, and particularly by segregating under hospital conditions all men found with the slightest symptoms of cold, malaise, or fever, on medical inspection, carried out upon the entire command each morning and afternoon.

MINOR COMMUNICABLE DISEASES

According to Section XII of Manual for Sick and Wounded Reports, A. E. F., which went into effect June 15, 1918, and thus continued in force Circular No. 13, issued from the chief surgeon's office, March 11, 1918, only certain communicable diseases were to be reported directly to the chief surgeon's office by telegram or telephone on the day of the diagnosis. Not infrequently, however, various other diseases which were rare, or were capable of causing much inconvenience if unchecked, were reported to the chief surgeon's office by telegram, and in the section of epidemiology of that office attention was given to the occurrence of all the communicable diseases, including those of which report was made only through the medium of the daily nominal roll of the sick and wounded by mail.

Owing to the long time which generally elapsed between the development of most of these diseases and the receipt of report at the office of the chief surgeon, A. E. F., there was rarely any adequate opportunity to make studies competent to verify the diagnosis or to discover the origin and path of infection of primary and secondary cases.

ANKYLOSTOMIASIS

Ankylostomiasis was given as a diagnosis in three cases in 1917, one each in August, October, and December, in 37 cases in 1918, one each in February and June; the others as follows: July, 2; August, 7; September, 16; October, 4; November, 2; December, 6; and 8 cases in 1919, of which 6 were reported in

January and 2 in February. These cases were discovered while examining the stools of patients with severe anemia, in cases of acute or chronic intestinal inflammation of undetermined origin in which the ankylostoma or eggs were found incidentally, and in the course of routine laboratory examination of stools in hospitals. The organisms were found in soldiers whose homes had been in the hookworm belt in the United States, and there was no good reason to believe that ankylostomiasis developed as the result of exposure or contact with carriers among fellow soldiers in France, although there were in many places such neglect of latrine and mess sanitation that the occurrence of direct hand-to-mouth infections need not have caused surprise. One death from ankylostomiasis was reported in October, 1918, but, failing autopsy confirmation, this can hardly be accepted as conclusive.

ANTHRAX

Although the published experience of the British Army and of the Local Government Board of England with anthrax in 1915 and 1916, caused by the use of shaving brushes made from an inferior grade of bristles imported from Siberia, Manchuria, and Argentina, might well have put the American Medical Department on its guard, surprise at the appearance of a number of cases in the United States and in the American Expeditionary Forces was not unnatural.

No cases were reported in the American Expeditionary Forces until March, 1918; however, 65 cases were reported in the next 12 months as follows: March, 2 cases, 1 death; April, 5 cases, 2 deaths; May, 8 cases, 4 deaths; June, 8 cases, 2 deaths; July, 13 cases, no deaths; August, 7 cases, no deaths; September, 11 cases, 1 death; October, 7 cases, no deaths; November, 3 cases, no deaths; December, January, 1919, February, 3 cases each and no deaths; March, 4 cases; April, 1 case and no deaths.

With rare exceptions the initial lesion was on the shaving area of the face, and a new shaving brush recently had been used. In a number of instances the brushes were examined and the *Bacillus anthracis* was found. Although it is possible that the organisms on the brush may have come from the face lesion of the already infected patient, enough instances of discovery of the organism in new, unused brushes were met with in the United States and in the American Expeditionary Forces at Liverpool and Dijon to make quite clear the origin of the infection. The fulminating cases with hemic and meningeal involvement were diagnosed as septicemia and meningitis; one case was treated for several days and until just prior to death as mumps, and several were unrecognized until just before death, when a diagnosis of cellulitis of the neck was changed to that of anthrax. Some cases originally diagnosed as anthrax were found to be cases of streptococcus abscess and meningitis.

The total absence of anthrax among animals in the places in England and France where our troops were billeted lent little support to the common belief of the men, and of their medical as well as line officers, that the infection came from the stables often used for billets, or from horse blankets.

The fact that the great majority of the cases of anthrax were discovered soon after the arrival of troops at base ports in England and in France gave rise to the suspicion that troop decks and holds adapted in cattle ships for troop

transport purposes might have been the place of origin of infection from infected cattle or hides. Information sent to the Office of the Surgeon General at Washington coincided with observations made in the United States, and orders were issued which adequately protected the men against the distribution or purchase through the Quartermaster Department of shaving brushes which had not been so treated as to destroy any anthrax bacilli or spores.

Several makers of low-grade shaving brushes were found to have made use of bristles from known infected foreign areas and to have used insufficient precautions during manufacture to obtain complete sterilization of the bristles.

FAVUS

Seven cases of favus were reported, one each in the months of October and December, 1918, and February, 1919, and two each in November, 1918, and January, 1919. No information was obtained as to whether these were cases with origin prior to enlistment and undetected at that time or, if developed since enlistment, whether a possible or probable source of infection was found in any case from among French civilians in the billeting areas.

GLANDERS

Ninety-eight cases of glanders were reported between June, 1918, and March, 1919, with one death in October, 1918. It may well be doubted whether any but the one fatal case were cases of glanders.

In spite of the fact that glanders among the draft animals in the American Expeditionary Forces was very prevalent and attained extensive epidemic proportions so that there were many opportunities for infection of the personnel handling horses and mules, it is presumed that change of diagnosis from glanders was made in most of the cases and that there was the common failure of reporting the correct or final diagnosis.

LEPROSY

Leprosy was reported first in a case of the anesthetic facial type in a man in July, 1918, and the diagnosis in this case was definitely determined. In September and October, 1918, 5 cases each were reported; in November 1 case; in December, 4 cases; in January, 1919, 1 case with a death; and in February, 2 cases. These cases were not confirmed, and together with the death attributed to this disease it is most likely that these cases should be put down as unproved.

POLIOMYELITIS

Fourteen cases of poliomyelitis were reported, 1 each in the months of May, July, and September, 1918; 2 each in June, August, and October, 1918, and February, 1919; and 3 in January, 1919. Two deaths were due to poliomyelitis as proved by autopsy, one in May, 1918, and one in September, 1918.

The diagnosis was considered very doubtful in a number of the cases in which the paralysis was of but brief duration and confined to small muscle groups. In others the disease was severe enough to be mistaken for acute epidemic meningitis. No two cases occurred in such relation to each other or sufficiently definite relation to cases in the civilian population to justify any conclusions as to probable contact origin of infection.

It was suspected by the consultants in neurology that some of these cases were really cases of lethargic encephalitis, which appeared in small epidemics among the French and British in civil and military populations during 1917-18.

RABIES

One case with death from rabies was reported in May, 1918, 2 cases were reported in June, and 1 case each in August, October, and December, 1918, and 1 in January, 1919, with no deaths. Positive proof of the existence of rabies in the attacking animal was lacking in several of these 6 cases, notably in 1 case where the injury was said to have been made by a cow. The cow did not develop rabies. Rabies, although always endemic in France, was reported as particularly prevalent in Paris in the spring of 1918, and widely throughout France in the spring of 1919, whence it was taken to England by the surreptitious introduction of dogs past the quarantine restrictions by returning troops, and in one notable instance by an aviator.

RUBELLA

Rubella, or so-called German or "Liberty measles," was reported in 46 cases between July, 1918, and February, 1919. The reporting of this disease by telegram was called for, although even as a differential diagnosis in suspected measles and scarlet fever it is of hardly more than academic interest when it appears among troops.

SPIROCHETAL JAUNDICE (ICTERHEMORRHAGIC OR INFECTIOUS JAUNDICE)

The first case of spirochetal jaundice was reported in April, 1918, the source of infection not being discovered. Seventy-nine more cases were reported as follows: 1918—June, 5; July, 6; August, 8; September, 20; October, 19; November, 10; December, 8. 1919—January, 10; February, 1. Five deaths were reported; one each in the months of June, August, September, October, and December, 1918.

In a very few of the cases only was there obtained adequate laboratory confirmation of the diagnosis, and in no instance was the presumed infecting organism found in rats collected where the infection was supposed to have originated. That there was considerable laxity in use of terms for diagnosis of acute febrile diseases accompanied by jaundice can be understood from the fact that yellow fever was given as cause of death of a member of the American Expeditionary Forces in October, 1918, and 10 cases of yellow fever were reported between June 15, 1918, and February 28, 1919, all of which cases it may fairly be said were something other than yellow fever.

Infectious jaundice occurred in small epidemics at various times and places in the armies of our British, French, and Italian allies, and exposure to infectious discharges of men and rats doubtless offered opportunity for infection among our troops.

TETANUS

Twenty-three cases of tetanus were reported with nine deaths, distributed as follows:

	Cases	Deaths		Cases	Deaths
1918			November	0	1
July.....	1	1	December	6	1
August.....	3	1	1919		
September.....	4	1	January	0	1
October.....	7	3	February	2	0

In almost all cases of tetanus it was shown that preventive inoculation with tetanus antitoxin had not been given at all or had been given at a time so long after the injury that protection could not reasonably be expected.

In almost all cases where it was shown that protective inoculation had not been given or if at all, had been given too late, the explanation was to be found in the emergencies of service and of supplies which were inevitable under the conditions of active combat and evacuation of wounded prevailing at the time.

TRACHOMA

One hundred and thirty-nine cases of trachoma were reported, distributed as follows: 1917—December, 2. 1918—January, 5; February, 0; March, 2; April, 0; May, 0; June, 3; July, 13; August, 19; September, 20; October, 19; November, 17; December, 12. 1919—January, 11; February, 16.

Inasmuch as practically every case of trachoma was seen, the diagnosis established or corrected, and the treatment directed by the chief consultant in ophthalmology or by one of his assistants, there is good reason to believe the reports of these cases are accurate. Although there was a great deal of trachoma among the Chinese labor troops employed by our British and French Allies and by ourselves, there is good reason to believe that the great majority of the cases of this disease reported in the American Expeditionary Forces had originated prior to entry into the Army and were not acquired in France or England. The conditions of neglected personal hygiene and of exposure to dust and dirt were in all probability responsible in large measure for such recrudescence as occurred in cases supposed to be cured, and accepted at the time of enlistment as free from disease.

TRENCH FOOT

Although trench foot is now generally accepted as a preventable form of damage to the skin, underlying soft parts, and the blood vessels of the feet and legs owing to prolonged exposure to cold and wet, the affection occurred under such conditions as to bring it under study as an infection. In fact various microorganisms, bacterial, spirochetal, and mycotic, were said by various authors to be the true cause of the condition. When once the responsibility for preventing this serious disability, which often resulted in crippling for life, was placed upon the regimental and battalion line officers, the incidence of the disease, even among the British in trench positions where it was most difficult to avoid, fell to a very low figure. The disease never played any important

rôle in noneffectiveness in the American Expeditionary Forces chiefly because our participation in the holding of trench lines was only to an insignificant extent during the months of the year when the cold and wet were of such severity and continuousness as to develop cases in any numbers. The largest number of cases occurred during the Meuse-Argonne operation in October and November, 1918, when it was impossible to get relief, dry clothing, sound shoes, shelter, or warmth to men who were fighting continuously day after day and for several weeks, exhausted, chilled, and wet. Among the cases reported as trench foot the great majority consisted of minor grades of inflammation and frost bite, ulcerations and erosions of water-logged skin, and not the serious deep gangrene and sloughing which marked many of the cases among the British in the early years of the war.

The 1,842 cases were distributed as follows: 1917—October, 20; November, 95; December, 28. 1918—January, 35; February, 8; March, 18; April, 5; May, 6; June, 7; July, 22; August, 15; September, 82; October, 529; November, 599; December, 152. 1919—January, 165; February, 56.

Five deaths were attributed to trench foot: Two each in October and November, and one in December, 1918.

TRICHINIASIS

Thirteen cases of trichiniasis were reported with no deaths: 1 case in September, 1917; 1 in July, 1918; 8 cases in December, 1918; and 3 in January, 1919. The prevalence of domestic and farmyard slaughtering of hogs, and thus the frequent escape from any official examination of pork and pork products for presence of infection with the trichina, offered many opportunities in France for infection. However, the universal custom of thorough cooking of pork products is a great protection against the disease.

TYPHUS EXANTHEMATICUS

Typhus fever was reported once in October, 1917, twice in August, 1918, and once in December, 1918. The best opinion available in the American Expeditionary Forces and from the French was to the effect that the case reported in October, 1918, was a case of true typhus, although the source of infection or opportunity for exposure was never discovered. There was much room for doubt in the diagnosis of each of these cases, and equally competent observers held different opinions as to the diagnosis. No one of these four was considered to be a typical case. No one was traced even to a probable source, and no secondary cases are known to have arisen from these cases. Eleven cases were reported in February, 1919, but it is supposed that these were reported as suspects at a time when cases were being discovered among repatriated French and German prisoners in Alsace and Lorraine, and the corrected diagnosis was never reported. Certainly the office of the chief surgeon, American Expeditionary Forces, was never notified of any such occurrence, and no special investigation of such a group of cases was made. It is presumed the diagnosis of these 11 cases was an error.

VINCENT'S ANGINA

There is so much looseness in the use of this term that it is more than doubtful if any reliance can be placed upon the reported incidence of the disease in the American Expeditionary Forces. The term Vincent's angina when properly used applies to lesions, membranous or ulcerative and destructive, caused by the specific spirochete of Vincent upon tonsils and in the pharynx, giving rise to angina, similar to that caused by diphtheria.

The same organism is very constantly found along the gum margins in ulcerative gingivitis and in stomatitis associated with or resulting from bad oral hygiene. The members of the Dental Corps almost universally, and medical officers in the American Expeditionary Forces very commonly, used the term Vincent's angina to describe the lesions of stomatitis or gingivitis from which the Vincent's spirochete was recovered, even when, as was true in the overwhelming majority of cases, the lesions did not involve tonsils or pharynx or any part of the upper respiratory or alimentary tract other than the gums and buccal surfaces. Vincent's stomatitis would be a less inaccurate term than Vincent's angina if applied to most of the cases reported by the latter term in the American Expeditionary Forces. Careful bacteriological examinations were made of the lesions in several considerable groups of cases and Vincent's organism was commonly found. It was shown that excessive use of tobacco and persistent neglect of daily brushing of teeth were responsible for the contributing bad oral hygiene. A low state of nutrition and general debility due to fatigue, exposure, and improper variety and character of food were found also to be important contributing factors. The spread of the disease among groups of men was obviously due to lack of proper sanitation of messes or boiling of mess kits after use. Common use of pipes, drinking cups, eating utensils, towels, etc., was in all probability the direct means of transmission of the infection, as well as the common soiling of hands by salivary discharges on door knobs and objects handled in common. Sixteen cases were reported in 1917, 590 in 1918, and 311 in 1919, distributed as follows: 1917—July, 0; August, 0; September, 2; October, 2; November, 5; December, 7. 1918—January, 2; February, 10; March, 12; April, 18; May, 20; June, 38; July, 59; August, 56; September, 80; October, 90; November, 96; December, 107. 1919—January, 163; February, 148. One death was attributed to Vincent's angina in December, 1918.

PERTUSSIS

Twenty-two cases of pertussis with no deaths, were reported. One case each in the months of October and November, 1917, May, July, and October, 1918; 5 in August, 5 in September, and 2 in December, 1918.

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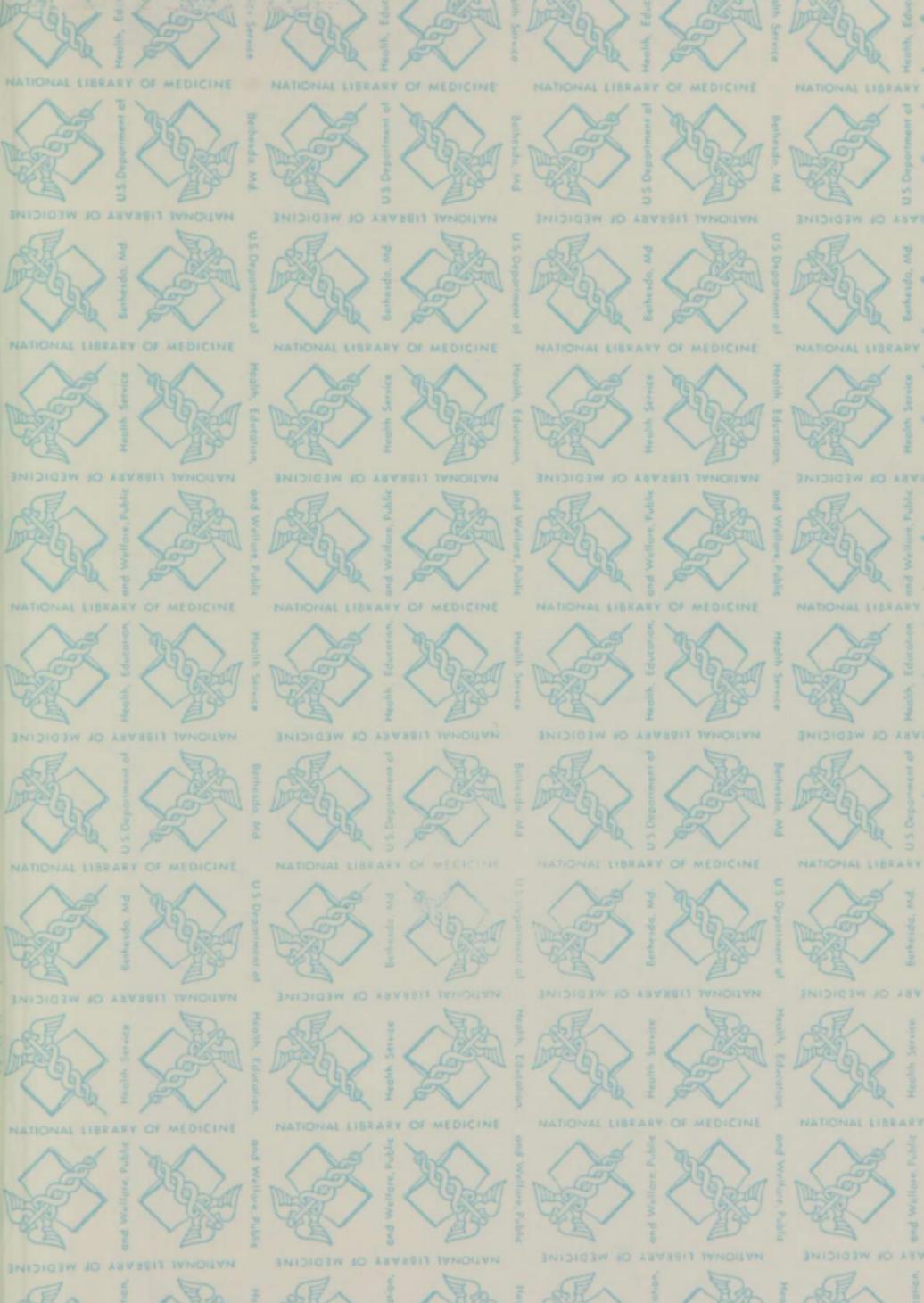
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