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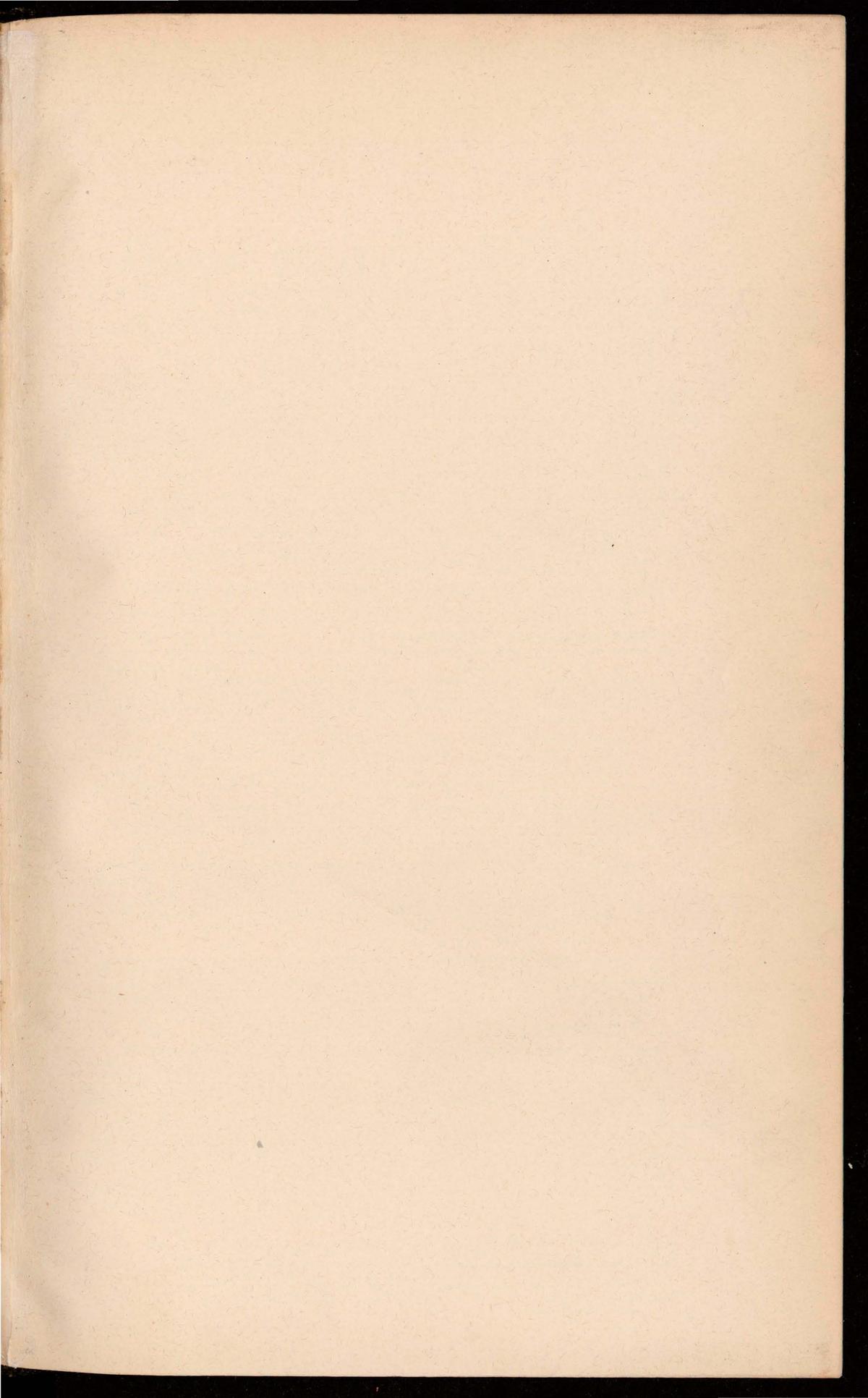
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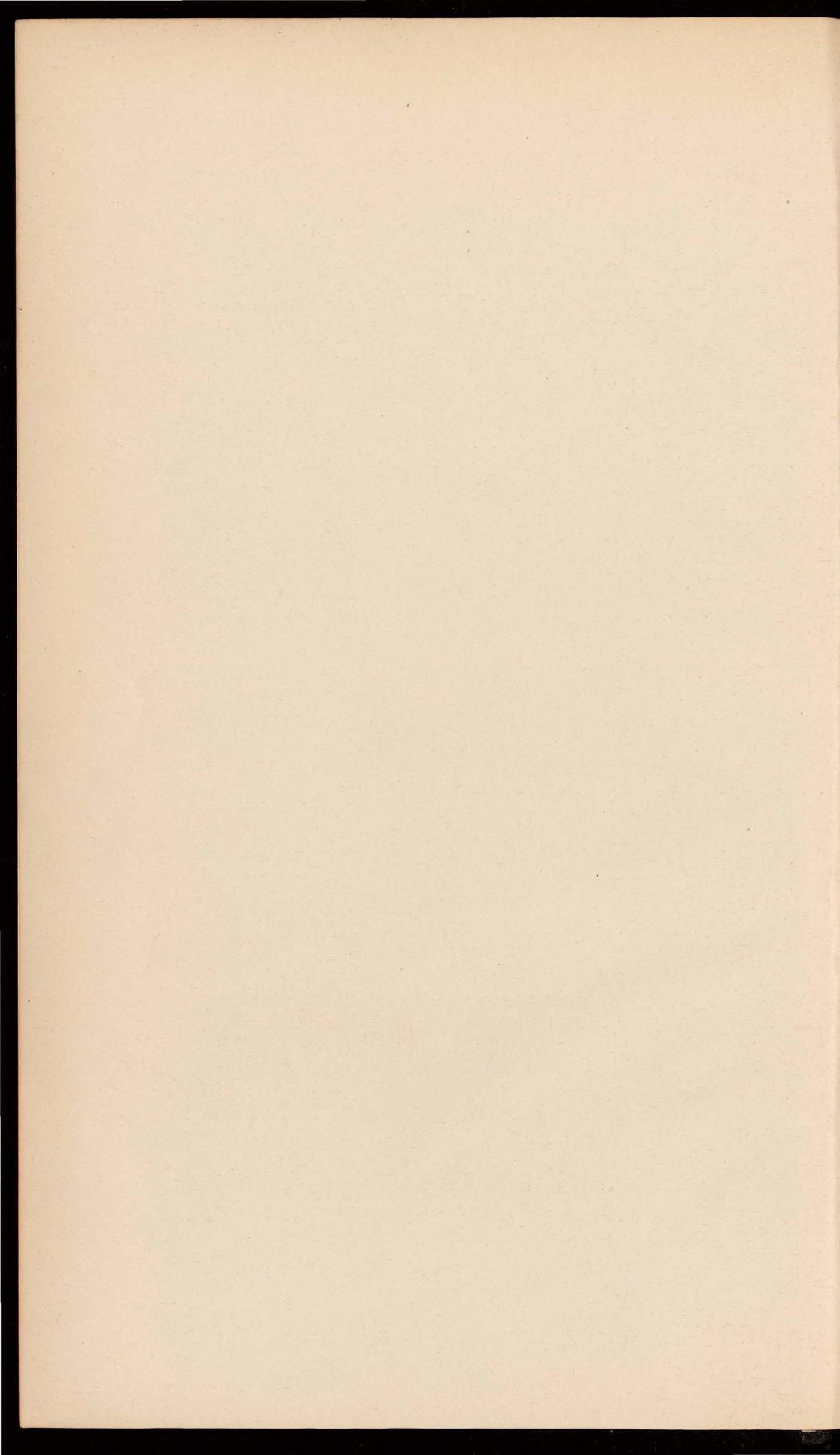
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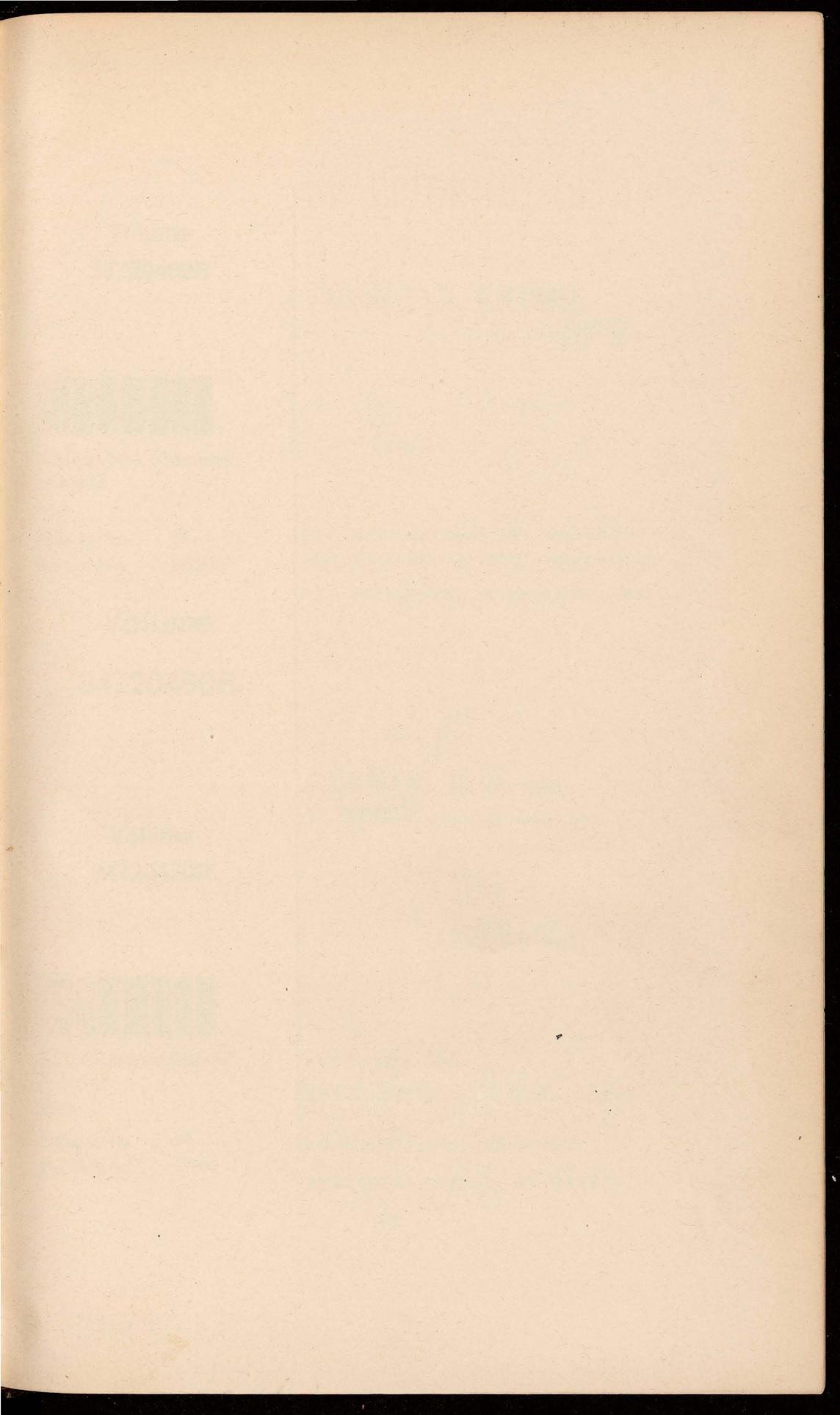
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No. 145262









THE CHOLERA EPIDEMIC OF 1892
IN THE RUSSIAN EMPIRE.

WITH

NOTES UPON TREATMENT AND METHODS OF DISINFECTION IN
CHOLERA, AND A SHORT ACCOUNT OF THE CONFERENCE ON
CHOLERA HELD IN ST. PETERSBURG IN DECEMBER 1892.

BY

FRANK CLEMOW, M. D. Edin.

MEMBER OF THE EPIDEMIOLOGICAL SOCIETY OF LONDON, ETC.



Ст.-Петербургъ.

КНИЖНЫЙ МАГАЗИНЪ К. Л. РИККЕРЪ.

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LONDON AND NEW YORK: 15 EAST 16th STREET

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THE CHOLERA EPIDEMIC OF 1892
IN THE RUSSIAN EMPIRE.

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Дозволено цензурою. С.-Петербургъ, 5 Юня 1893 г.

ТИПОГРАФІЯ ИМПЕРАТОРСКОЙ АКАДЕМІИ НАУКЪ.

(Вас. Остр., 9 лин., № 12.)

PRINTED AT THE PRINTING - OFFICE OF THE IMPERIAL ACADEMY OF SCIENCES,
ST. PETERSBURG.

ЕГО ПРЕВОСХОДИТЕЛЬСТВУ

ЛЪВУ ФЕДОРОВИЧУ РАГОЗИНУ

Директору Медицинскаго Департамента Министерства
Внутреннихъ Дѣлъ.

Свой трудъ

Съ глубокимъ уваженіемъ

посвящаетъ

Авторъ.

TO HIS EXCELLENCY

DR LEV FEDOROVITCH RAGOZIN

The Distinguished Director of the Medical Department of the
Ministry of the Interior.

This work is dedicated,

In token of sincere regard,

by

The Author.

THE UNIVERSITY OF CHICAGO

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Errata.

- Page 13, line 8, *for* people *read* people.
» 34, » 2, *for* p.p. 35 and 36 *read* p.p. 36 and 37.
» 35, in third column of first table *for* June 7th, *read* June 17th.
» 47, in second foot-note *for* 4 $\frac{1}{2}$ poods *read* 14 $\frac{1}{2}$ poods.
» » in same foot-note, last sentence, *for* poods *read* pood, and *for* pound
read pounds.
» 81, line 3, *for* 1870 *read* 1890.
» 89, » 18, *for* are *read* is.
» 103, » 4 of contents of chapter, *for* aigainst *read* against.
» 104, last line, *for* distrcts *read* districts.
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misinterpretations even in a single translation. In a second translation they are liable to be doubled, if not quadrupled.

The task which I set myself in writing the following chapters was twofold; firstly, to give a plain, unvarnished account of the epidemic of cholera which last summer swept over the Russian Empire; and, secondly, to bring together information bearing upon this subject *directly* from the most authentic Russian sources, to which a knowledge of that language has alone allowed me access.

PREFACE.

To the English medical world Russia is almost a closed book. Owing to the difficulties of the Russian language medical news from this interesting country is rarely taken directly from the original source. It but too often passes first through the German press, and appears in English, if at all, as a translation of a translation.

Only those who have had much to do with the rendering of a foreign language can appreciate what this double process implies. The cares of the most faithful interpreter can with difficulty prevent the occurrence of errors and misinterpretations even in a single translation. In a second translation they are liable to be doubled, if not quadrupled.

The task which I set myself in writing the following chapters was twofold; firstly, to give a plain, unvarnished account of the epidemic of cholera which last summer swept over the Russian Empire; and, secondly, to bring together information bearing upon this subject *directly* from the most authentic Russian sources, to which a knowledge of that language has alone allowed me access.

At the same time I am glad to be able to draw attention to the energetic efforts of the Russian authorities to cope with the disastrous visitation of what proved to be the most virulent and fatal form of cholera that has ever visited the Empire. The general measures adopted by the Government may be left to speak for themselves in the chapter devoted to their description. Exigencies of space and time forbade any account of the action taken by local authorities. I may however take this opportunity of speaking of the value of local measures, where alone I was able to see them in force. In St. Petersburg it was undoubtedly owing to the active efforts of the municipal and police authorities, of the permanent Sanitary and Hospital Commissions, and of the Commissions formed to meet the special danger, that the capital escaped with so comparatively mild a visitation.

Many of the following chapters have already appeared in the columns of the „*Lancet*“, in the form of a series of articles upon the Cholera Epidemic in Russia. The Editors of that journal have kindly permitted me to re-print them; and I here gratefully record my indebtedness to them for this permission. I have also to thank them for the use of the blocks for the diagrams and maps which illustrated those articles, and which I am here enabled to reproduce.

With regard to the authenticity of the statistics of last year's epidemic, it should be stated that they were obtained directly from the authorities at the Medical Department of the Ministry of the Interior in St. Petersburg. The liability to error, particularly where the figures are derived from distant and sparsely inhabited regions, such as Central Asia

and Siberia, is obvious; but the Russian Government spared no effort to obtain as complete returns as possible, and I am assured that in no case does the error exceed 10 per cent. I would here acknowledge my deep obligation to Dr. Ragozin, the courteous Director of the Medical Department, who kindly placed at my disposal these statistics, as well as much other valuable material relating to the epidemic.

I have to express my thanks to M. Batalin, the distinguished Inspector of the Medical Administration of the Capital, for details of the epidemic in St. Petersburg; to Dr. Grebentschikof, who is in charge of the Statistical Division of the Medical Department, for a quantity of interesting information and for his assistance in preparing some of the diagrams; and to Dr. Krupin for demonstrations of the methods of disinfection in use at the Alexander-Hospital-in-memory-of-Botkin in St. Petersburg.

I am glad also to have this opportunity of thanking the physicians in charge of the St. Petersburg and Cronstadt Hospitals for their courtesy and kindness in allowing repeated access to, and clinical examination of, their patients, and for the readiness with which they communicated their views upon cholera and its treatment. The results of their experience in the treatment of the disease I have endeavoured to summarise in a short chapter devoted to that purpose. Of the many physicians whose opinions are there briefly expressed, it will not, I hope, be thought invidious to mention Dr. Levin of the Obuchovski Hospital; Dr. Dobroklonski the *Главный Врач* (Senior Physician) of the Alexander-Hospital-in-memory-of-the-Emancipation-of-the-

Serfs; and Dr. Golbek, who holds the same position in the Military and Naval Hospital at Cronstadt.

Finally I have to thank my friends, Dr. Richard Sisley and Mr. John Richmond, for much valuable advice and encouragement in writing these pages.

The English Hospital
 Cronstadt, St. Petersburg.

May 24th 1893.

CHAPTER I.

THE EPIDEMIC IN CENTRAL ASIA AND SIBERIA.

Cholera imported from Persia. Description of Meshed. First cases in Russia at Kaachka. Influence of the Transcaspian Railway. Nature of the soil in Transcaspia. Sudden and severe outbreak in Askhabad, associated with great heat and atmospheric stagnation.

Between the years 1873 and 1892 no wide spread epidemic of cholera occurred in the Russian Empire. In May 1892 the disease was once again imported across her frontiers, and rapidly spread to almost every corner of her immense territories. From Russia cholera passed to Germany, Austro-Hungary, Belgium, Holland and France. With the course of the epidemic in these countries the present volume does not attempt to deal. It is confined to a brief account of the facts of the epidemic as observed in the land of the Great White Tsar.

The cholera reached Russia direct from Persia. It threatened her frontiers as soon as it appeared in Meshed, which is little more than 100 versts from the line which separates the two countries. As Meshed may be looked upon as the nidus from which the disease spread to Russia, it may be worth while to look a little closer at the nature

of this town. Meshed is a place of considerable importance; it is the capital of Khorassan and is one of the most densely populated cities of Persia. It is joined by a good road with Askhabad, the chief town of the Russian province of Transcaspia. In Meshed are found the mosque and tomb of the holy Imam Riza, a highly venerated saint amongst the Shiite Mohammedans, and consequently there is an almost constant flow of Mussulman pilgrims visiting the shrine from various parts of the country. That they come from both sides of the frontier is proved by the fact that on the Transcaspian Railway a time-table has been published in the Persian language and bearing a portrait of the Shah to induce the faithful to avail themselves of the railway in their pilgrimages.

Cholera appeared in Meshed in May, 1892. A telegram in *The Times*, dated May 26th, stated that up to that date thirteen cases had been reported¹). It may have existed there for some time before this date, as on the 31st (19th, Old Style) it had passed the frontier and appeared in Kaachka, 130 versts (eighty-seven miles) from Meshed.

Kaachka was the starting-point of the epidemic in Russia, the point of inoculation whence the disease spread throughout the country. The local manifestations were not, however, very severe. From May 19th²) to June 10th there were, in all, forty-five cases with forty-one deaths. It is not unlikely that there were more cases, but unreported, which would reduce this appalling death-rate. Kaachka is a town lying in the midst of a more or less barren steppe north of the Persian frontier. It consists of an *aul*, or Turkoman settlement, a Russian town, and a

1) It is stated (*Brit. Med. Jour.*, vol. i. 1892, p. 1153) that thirteen cases occurred in Meshed between May 10th and 14th. These dates were probably Old Style dates. The 14th, Old Style, is the 26th, New Style.

2) Henceforth all dates mentioned are Old Style dates.

station on the Transcaspian Railway, about 120 versts from Askhabad on the west and 200 versts from Merv on the east.

The effect which the opening of new railways or other means of communication has on the course of epidemics is an interesting problem. The present epidemic of cholera has spread through Russia with unprecedented rapidity, which may be most plausibly explained as the result of the laying down of many new railways and of the increase in the number of people who travel by rail. By far the most important of the new lines which have been opened since the epidemic of 1872—73 is the Transcaspian Railway. This line, it will be remembered, was projected in 1880 and carried out by General Annenkoff, through whose energy the last part of the line was finished in an incredibly short space of time, and the completed railway to Samarcand was triumphantly opened on the anniversary of the Tsar's coronation in the spring of 1888. Originally intended as a purely military railway, and still under the control of the Ministry of War, it has proved, nevertheless, of great commercial importance, and carries large quantities of goods and passengers. It has shortened the journey between Samarcand and the Caspian Sea from the many days which were formerly needed, when camels formed the sole carrying power, to the comparatively short period of sixty hours. Beginning at Oozoon Ada on the Caspian Sea, the line runs through Askhabad, Merv and Bokhara to Samarcand, where, for the present, it ends. For the greater part of its course it runs over almost barren steppes, bordering the desert of Kara Kum, until it crosses the great Amu Daria river (the ancient Oxus) and enters the rich and fertile valley of the River Zerafshan, along which it runs to Samarcand. Kaachka is a station about 370 miles from the Caspian terminus of the railway, and for this distance the line runs to the north of, and parallel

with, the Kopet Dag mountains, which here form the natural frontier of Persia.

As the soil (or, rather, variation in the moisture of the soil) has been thought to play an important part in the spread of cholera, it may be interesting to note its nature in this district. The correspondent of *The Times*, who travelled over the line immediately after its opening, writes¹⁾: „The best characterisation of the whole surface of the country is to divide it into sand steppes, salt steppes and grass steppes, the last-named being the so-called oases interspersed between the other two..... With few exceptions all the sand steppes manage to nourish the short and knotty shrub called the „saxaul“, which strikes its hardy roots down to a wonderful depth, sometimes ten or twelve feet, into such soil as it can find, and appears on the surface like a thin and scanty gooseberry bush, varying from a foot to five feet in height, at intervals of five, ten, twenty, or perhaps forty feet, all over the plains as far as the eye can see. As soon as the great heats come on, the saxaul gets scorched up and assumes a similar colour to that of the dusty drab steppes“. Where there is none of this plant the sand steppes „present nothing but shifting sand, driven up by the winds into hills of all shapes and sizes, destitute of vegetation and interspersed with salt lakes and pools“. The salt steppe is even flatter than the sand steppe, as it is unaffected by the wind. It is „caked over with a thick crust of whitish clay or marl, impregnated and faced with salt, which crystallises perfectly white on the surface, like snow, especially in the sunken spots or salt-pans left by the rainpools. Salt here for the most part takes the place of sand and glitters brightly in the glare of the sun“. In the oases, on the

1) Russia's Railway Advance into Central Asia, by George Dobson, p. 147. London, 1890.

other hand, which form about 10 per cent. of the whole of the country of Transcaspia, the soil is very rich and fertile. It has received in Russian the special name of „loess“, or white earth, in contradistinction to the „tchernozem“, or black earth, which gives the southern provinces of Russia their fertility. It is found only near the streams which water this sandy plain. In the stretch of country between Kaachka and the Caspian Sea (the highway by which cholera entered Europe last year) the watercourses are very small and few in number, thus differing from the eastern section of the railway, where the large streams of the Tedjent, the Murghab, the Amu Daria and the Zerafshan produce a fertile soil and allow of a growth of luxuriant vegetation. The small streams of the western half of the line come from underground sources at the foot of the northern slopes of the Kopet Dag mountains, where the rainfall is only about half of what it is on the southern, or Persian, slopes.

Another important feature of this district is the occurrence at times of inundations from the overflow of these usually small and insignificant streams. After severe storms they become rushing torrents and overflow the country in an extraordinarily brief space of time. In the early days of the railway these inundations were almost as great a difficulty to contend with as the shifting sands, and it not unfrequently happened that considerable stretches of the line were torn up by the violence of the floods; but the water subsides as quickly as it rises, either absorbed by the sands or evaporated by the great heat, and in a few days land that was completely under water may be seen beginning to split into cracks and fissures from the heat of the sun.

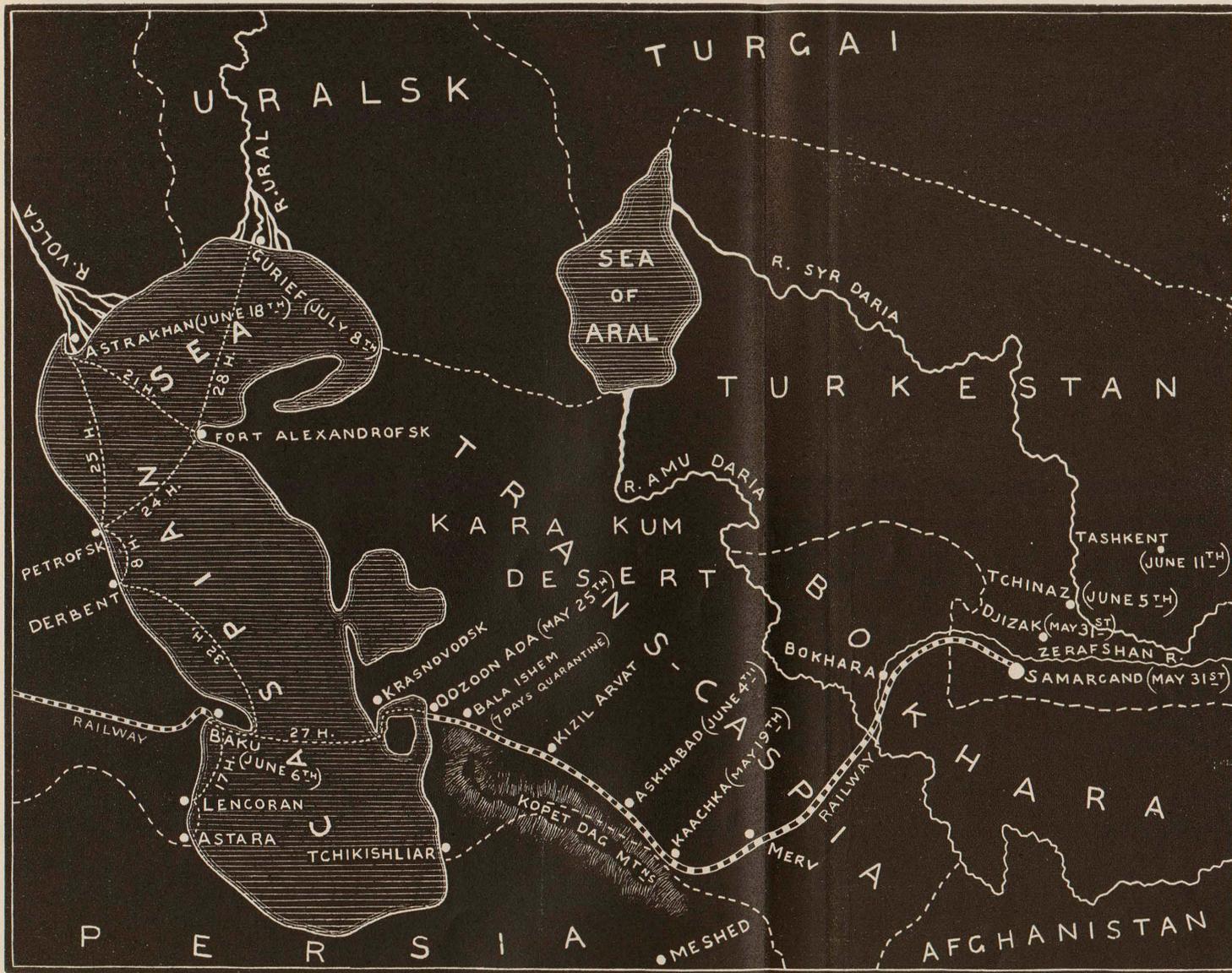
It is interesting to note the behaviour of the cholera epidemic in this salt and sandy desert. Mr. Macnamara, in his „History of Asiatic Cholera“ writes: „After a careful

study of the history of the disease a desert appears to me to be the only country in which cholera is unable to establish itself; the disease speedily dies away in an arid waste of this description“. The epidemic of last summer lingered for some three months in the province of Transcaspia, but, with the exception of the town of Askhabad, no part of the province suffered severely from the disease. The total number of cases reported was 2800 and of deaths 1517, the ratios per 100,000 inhabitants being 400 and 217 respectively, figures which indicate a comparatively light visitation when contrasted with those furnished by the neighbouring fertile provinces of Turkestan. I proceed to trace in more detail the course of the epidemic.

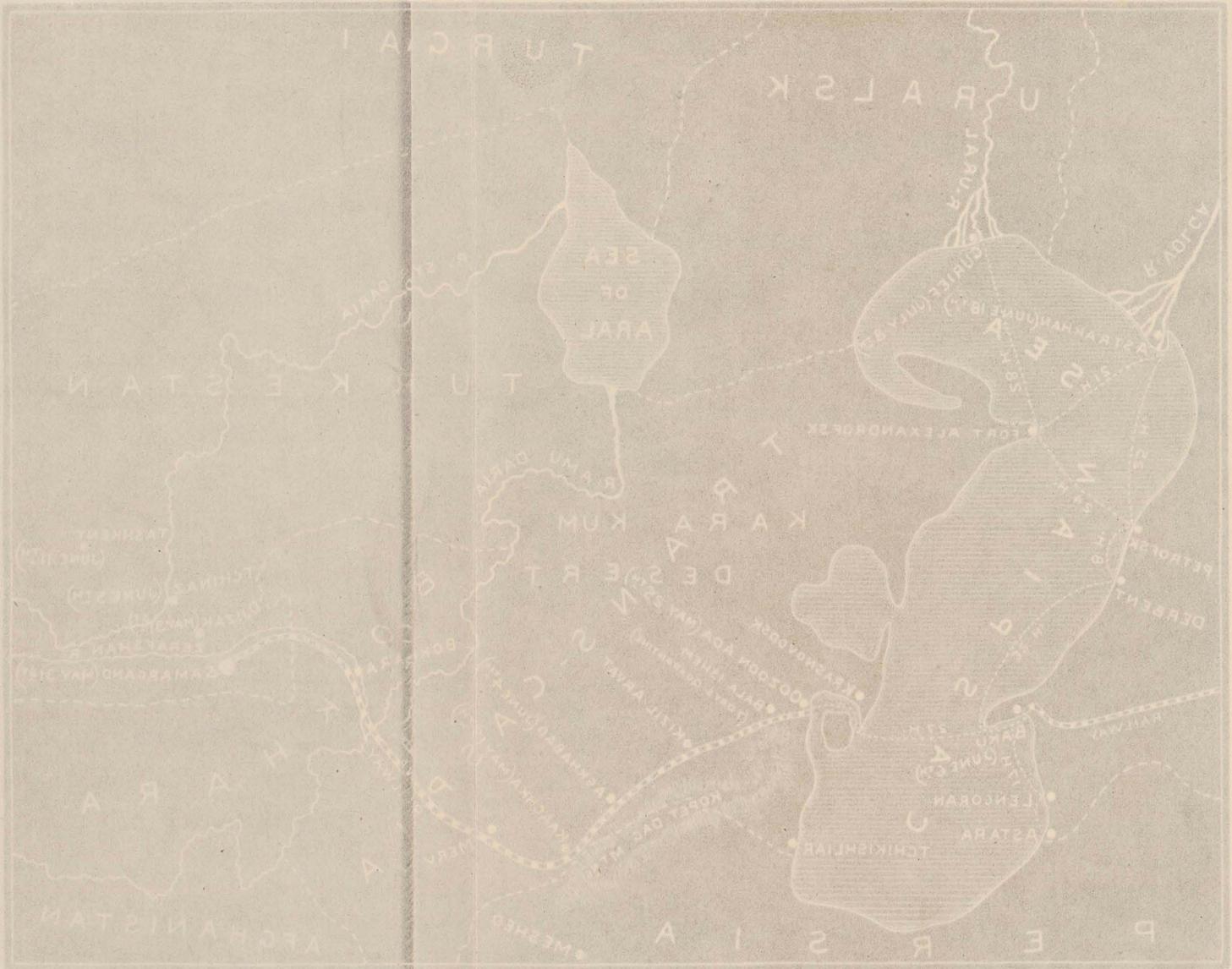
As stated before, there were in Kaachka between May 19th and June 10th forty-five cases with forty-one deaths. Between June 10th and 30th there were, in addition, thirty-one cases with thirteen deaths. After the 30th Kaachka ceased to appear in the official lists, so that presumably the epidemic had ceased there. On May 25th cases occurred in Oozoon Ada, the sandy terminus of the Transcaspian Railway on the shores of the Caspian Sea, and in the next three days three Persians died of cholera. Apparently the intervening stations were not affected so early as the terminus. Whether this was the fact, or whether cases occurred which have not been officially reported, it is impossible to say. It is conceivable that the Persians contracted the disease in Kaachka and did not sicken till after their arrival in Oozoon Ada, the journey taking twenty-two hours and a half by fast train and less than thirty-six hours by slow train.

The next reported cases occurred amongst a detachment of troops coming from Merv and going into camp near Askhabad. Between June 4th and 10th four men died, and on the last date there remained nine severe cases and twenty-three suffering from diarrhoea. During that time

SKETCH-MAP OF CENTRAL ASIATIC RUSSIA.



The dates indicate the occurrence of the first case of cholera. The dotted lines on the Caspian Sea mark the steamer routes; the length of time of crossing is marked against each route in hours. The total length of the Transcaspian Railway is 900 miles.



The dates indicate the occurrence of the first eastward crossing of the Caspian Sea on the railway. The dotted line on the Caspian Sea marks the eastern limit of the route. The total length of the Transcaspian Railway is 2,000 miles. The time of crossing is marked against each route in hours. The total length of the Transcaspian Railway is 2,000 miles.

Map of Transcaspian Railway and its extension to the east. The dotted line indicates the first eastward crossing of the Caspian Sea. The total length of the Transcaspian Railway is 2,000 miles.

two children died from cholera in Askhabad. This town is the capital of Transcaspia; it contains a population of 10,000 and is the most important station on this section of the line. It was destined later to be the scene of a most violent outbreak of the disease, but at the beginning the numbers were small. On June 14th and 15th there were seven cases but only one death, whilst in the neighbourhood (presumably in the camp before mentioned) there were thirteen cases with five deaths. On the 18th, cases first appeared amongst the Turkomans in the *aoul* of Askhabad and in four days there were twenty-four cases with eleven deaths. Onwards to the end of June there were, in all, fifty cases, but the number of deaths is not stated. During the first half of July the numbers remained comparatively light, but on the 23rd there was a sudden and extreme rise in the numbers of cases and deaths. At that period there was intense heat and a close and sultry atmosphere throughout the day and night, and it is not unimportant to note that there was also an unusual abundance of ripe melons, of which the Russians are at all times extremely fond. On July 23rd there were no less than 372 cases with 110 deaths; on the 24th there were 172 cases with 168 deaths; and on the 25th 117 cases with 63 deaths in a population numbering only 10,000¹⁾. After this date the numbers slowly diminished. I have dwelt thus in detail on the epidemic in Askhabad, partly because of the importance of the town, but chiefly from the interesting fact that the disease remained there in insignificant proportions for several weeks and only assumed a severe aspect after extremely hot and stagnant weather.

In the accompanying chart the relation of the rise in the intensity of the cholera epidemic in Askhabad to the

1) The significance of these figures may be best appreciated by supposing that the same proportion to population had been observed in St. Petersburg. In that case we should have heard of 37,200 cases in one day, and 16,800 deaths.

rise in temperature is shown diagrammatically. For the daily temperatures I am indebted to the secretary of the Central Physical Observatory in St. Petersburg.

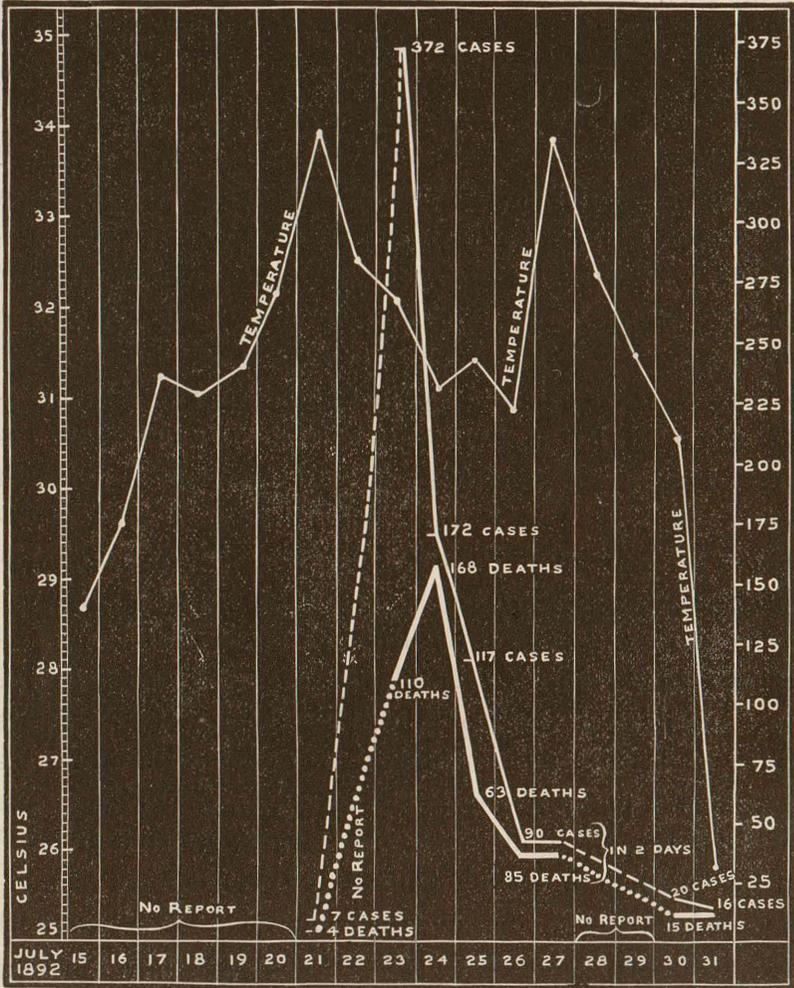


Diagram to illustrate the course of the cholera epidemic in Askhabad during the last half of July, 1892, and the temperature of the place for the same period. The average daily returns for the first half of July were six cases and three deaths. From the 15th to the 21st no returns had been received. The temperature curve has been obtained by taking the average of three daily observations.

Between Askhabad and Oozoon Ada there is no town of any size save Kizil Arvat, which has never appeared se-

parately in the lists, any cases which occurred there being included under the general heading of Transcaspian province. Oozoon Ada, important only as being the terminus on the Caspian Sea of the Central Asia Railway, was at no time severely affected, the total number of cases between May 25th and July 9th being seventy, and of deaths twenty-five. It may be mentioned in passing that the chief water-supply of this town, as also of Krasnovodsk, which lies a short distance to the north, is stated to be derived from the distillation of sea water.

It need scarcely be said that in this province there is no system of drainage. Throughout the Central Asiatic provinces there exist the so-called „Persian“ or „dead wells“, which receive all excreta. These are deep pits or wells, often as much as eight sajenes (fifty-six feet) in depth. „Besides these deep holes human excrement in no case remains on the surface of the earth, as in accordance with the local customs it is dug into the soil as soon as possible“¹⁾.

1) Report of the Medical Department of the Ministry of the Interior for the year 1889, St. Petersburg, 1891.

CHAPTER II.

THE EPIDEMIC IN CENTRAL ASIA AND SIBERIA. (CONTINUED).

The spread of the Epidemic Eastward. Bokhara unaffected by the disease. Samarcand lightly affected. Tashkent severely visited. The inhabitants of Central Asia. The Turkomans. The Sarts. The Karakalpaks. The Uzbeks. Their mode of life and prevailing diseases. Spread of Cholera to Uralsk, to Turgai and to Siberia. Statistics of the Epidemic in these regions.

Having traced the progress of the cholera epidemic from Kaachka westward to the shores of the Caspian Sea, it will be of interest to review its course from the same point eastward along the Transcaspian Railway.

On June 8th a conductor of one of the trains was taken ill on the train and removed at Bokhara station, where he died next day; and about the same time two privates of the railway battalion of troops died at the same station. The town of Bokhara lies fifteen versts (ten miles) from the railway station, round which, however, has grown up a small Russian settlement. From the Khanate capital no official figures have been published either of cases or deaths. It is possible that there were no cases there; if this be so it is a high tribute to the radical measures of sanitation carried out in the winter of 1891—2 at the instance of M. Lessar, the Russian diplomatic resident in Bokhara.

From Merv equally no official figures have appeared, though at the time of the excessive mortality in Askhabad it was stated that there was also a considerable number of cases in Merv.

One of the earliest places to be affected in Russian Turkestan was Djizak, between Samarcand and Tashkent. Cases occurred there as early as May 31st, and from this date till June 20th there were in all 356 deaths from cholera. Samarcand escaped lightly; from May 31st till July 16th — when reports from there ceased — there were 148 cases with 88 deaths. This comparative immunity it probably owes — at least, in part — to its high position on the banks of the Zerafshan river.

From Samarcand the infection spread eastward and reached Tchinaz on June 5th. Tchinaz is a town on the left or western bank of the Syr Daria river, and there is here a ferry which carries the traffic between Samarcand and Tashkent. In this last-named town, the capital of Russian Turkestan, the first cases were reported on June 11th. Tashkent was much more severely affected than Samarcand; from the beginning of the epidemic till Aug. 20th, when reports ceased, there were 1058 deaths from cholera.

A word as to the inhabitants of these provinces may not be out of place here. In the Report of the Medical Department of the Ministry of the Interior for 1887 (published in 1889) some interesting details are given as to the tribes in the regions of the Amu Daria. The chief tribes are the Turkomans, the Sarts, the Karakalpaks and the Uzbeks.

The Turkomans live in *ouls*, in dome-shaped *kibitkas* or huts built of rushes or twigs; each *kibitka* is in the centre of a court or yard surrounded by a clay or mud wall. These courts are said by the report to be „evil-smelling, and to abound in excrement and filth, as the Turkomans do not remove their refuse on to the fields; there is no vegetation in the *ouls*; water is taken from the *ariks*, or artificial irri-

gation channels, or from lakes; it is, of course, dirty, as the cattle drink from and bathe in it. At the end of the summer there is very little water left in either the *ariks* or lakes; the people suffer from want of water, but do not dig wells“. The reason why they do not dig wells is probably to be found in the fact that water in the wells, whether deep or superficial, is always either salt from the first or very soon becomes so.

The Sarts are more inclined to commerce than the Turkomans, and „always live near the towns and bazaars and adapt themselves to the local customs of the inhabitants“.

The Karakalpaks „live on the banks of rivers in *kibitkas* summer and winter, and are so hardy that even with 20° of frost Réaumur (—13° F.) they do not complain of the cold or wish to change their tent life. During the time of the inundations of spring and autumn they move their tents to the highest-lying land and live as on islands, constantly occupied in catching fish, on which they live and in which they trade. In consequence of this mode of life they suffer from intermittent fever, rheumatism and leprosy“.

The Uzbeks, a more settled race, live constantly in the same place in *saklii* or huts, close to broad *ariks*, and occupy themselves with agriculture. „Their huts are built of clay, are six to seven arshins (fourteen to sixteen feet) in height, with an opening in the roof for escape of smoke; there is a hearth in the centre of the hut, where the fuel is the knotty saxaul wood. About the hearth are spread mats, or among the rich, carpets, and near it is a hole or ditch into which slops are thrown, and which is not unfrequently soiled by the dejecta of the children. Beds are only found among the well-to-do, and generally the Uzbeks sleep on the mats side by side, without distinction of sex. The foul smells, the flies and mosquitoes, the high temperature in summer and the cold in winter make a *saklia* not only an unpleasant but also a dangerous habitation. The

excreta and refuse are heaped together round the houses, mixed with sand which contains a quantity of lime, and in the spring removed on to the fields as manure. Each *saklia* has a garden and rice plantation, which require abundant watering. The prevailing diseases among the Uzbeks are intermittent fever, trachoma, gastro-intestinal catarrh and cutaneous diseases“. The occurrence of the last may not be unconnected with the personal habits of these people, who, like the Caucasian highlanders, change their linen only once a year, on the Feast of Bairam! In summer the children suffer greatly from choleraic diarrhoea and dysentery, and the mortality is very high. Very many families are the subjects of syphilis.

Amongst a population of this nature it is not surprising that the epidemic of cholera was severe, as shown not only by the numbers attacked but also by the percentage of fatal cases. From the table given below it will be seen that the proportion of cases to the population was very markedly higher in the provinces of Turkestan than in any other district in Central Asia. In Ferghana (the former Khanate of Khokand), out of every 100,000 inhabitants 2415 suffered from the disease, and in the province of Samarcand out of the same number 2138 were attacked, figures representing a sufficiently severe visitation, and only exceeded in last year's epidemic in certain districts of the Caucasus and in the government of Astrakhan.

Tracing the further course of the epidemic to the more northerly districts of Central Asia and Siberia, it appears that the province of Uralsk was first affected early in July. This province lies to the north of the region between the Caspian and Aral Seas. The first cases occurred on July 8th amongst the Kirghiz inhabitants of the town of Gurief at the mouth of the Ural river. The province suffered somewhat severely, the proportion of cases and deaths per 100,000 inhabitants being 1023 and 524 respectively.

In marked contrast with the comparative intensity of the epidemic in Uralsk was its mildness in the province of Turgai, lying immediately adjacent on the east. The first cases were reported from there on July 24th, and the whole province escaped with the small loss of 296 cases with 167 deaths.

The inhabitants of both these provinces are mostly Kirghiz and Kalmuk Tatars, living a more or less nomadic life. Their water-supply is derived from rivers and wells; the river water is said to be of satisfactory quality, but the well water is less so; whilst in the dry season the tribes drink extremely polluted water from lakes, not, however, without a rough process of filtration or, rather, straining.

As early as July 14th cases were reported from Omsk and the large district of which it is the principal town. This district contains the three provinces of Akmolinsk, Semipalatinsk and Semiretchinsk, and is known officially as the General Governorship of the Steppes. The numbers of cases and deaths were at no time very high from any of these provinces, of which Akmolinsk was the greatest sufferer. The totals for the whole of this immense district were only 2133 cases with 1124 deaths, representing a case-rate of 118 and a death-rate of 62 per 100,000.

These figures sink into insignificance when compared with those of the neighbouring province on the north. In this province, the government of Tobolsk, the epidemic raged with great violence. The first cases occurred on July 17th, and the total number reported was 26,301, of which 12,729 proved fatal; the proportion of cases and deaths to the population being expressed by the figures 1865 and 903 respectively.

In the middle of July cases of cholera were reported amongst exile prisoners in the town of Tomsk, and from this distant government there were, in all, 4697 cases and 2272 deaths.

Finally, the disease was reported from Irkutsk on Aug. 2nd and from Yeniseisk on the 4th, but in neither of these northerly governments did it attain any hold.

The following table gives the numbers of cases and deaths, the proportion of both to the population, and the ratio of deaths to cases in each division of Asiatic Russia beyond the Caspian Sea during the whole course of the epidemic.

Statistics of the Cholera Epidemic in Asiatic Russia, excluding the Caucasus, from the beginning of the Epidemic to Nov. 1st (Old Style).

Province.	Cases.	Deaths.	Per 100,000 Population.		Percentage of deaths to cases.
			Cases.	Deaths	
Turkestan —					
Syr Daria Prov.	12,455	8,785	1,038	732	70·5
Samarcand »	14,960*	7,480	2,138	1,069	—
Ferghana »	19,320*	9,600	2,415	1,207	—
Transcaspia	2,800	1,517	400	217	54
Uralsk	6,135	3,119	1,023	524	50·8
Turgai	296	167	74	42	56·5
Akmolinsk	2,133	1,124	118	62	52·5
Semipalatinsk					
Semiretchinsk					
Total for Central Asiatic Russia	58,099	31,802	—	—	54·7
Tobolsk	26,301	12,729	1,865	903	48·4
Tomsk	4,697	2,272	345	167	48·3
Yeniseisk	50	20	10	4	40
Irkutsk	28	8	7	2	28·6
Total for Siberia	31,076	15,029	—	—	48·4
Total for Asiatic Russia, without the Caucasus	89,175	46,831	—	—	52·5

* Calculated from the return of deaths, supposing a 50 per cent. death-rate.

From these figures it will be noted that the intensity of the *cholera process*, indicated by the proportion of fatal cases, has borne no constant relation to the intensity of the *epidemic*, as shown by the proportion of population attacked by the disease. Thus in Transcaspia, where out of every 100,000 inhabitants 400 suffered from cholera, 54 per cent. of the cases proved fatal; whilst in Tobolsk, where out of the same number of inhabitants 1865 persons, or nearly five times as many as in Transcaspia, suffered from the disease, only 48.4 per cent. of the cases succumbed. The extraordinarily high death-rate of 70.5 in the Syr Daria province cannot but raise the suspicion that many cases which recovered have not been reported from this district.

Province	Cases	Deaths	Per 100,000	
			Population	Cases Deaths
Transcaspia	400	54	1,000	54
Tobolsk	1865	48.4	100,000	48.4
Syr Daria Province	70.5	70.5	1,000	70.5
Samarkand	1,000	70.5	1,000	70.5
Yarkand	1,000	70.5	1,000	70.5
Transcaspia	400	54	1,000	54
Turkestan	1,000	70.5	1,000	70.5
Almaty	1,000	70.5	1,000	70.5
Semipalatinsk	1,000	70.5	1,000	70.5
Semiretchinsk	1,000	70.5	1,000	70.5
Total for Central Asiatic Russia				
Tobolsk	1865	48.4	1,000	48.4
Tomsk	1,000	70.5	1,000	70.5
Yeniseisk	1,000	70.5	1,000	70.5
Irkutsk	1,000	70.5	1,000	70.5
Total for Siberia				
Total for Asiatic Russia without the Caucasus				

* Calculated from the return of deaths, supposing a 50 per cent. death-rate.

CHAPTER III.

THE EPIDEMIC IN THE CAUCASUS.

Some geographical considerations. The Northern Caucasus flat, the Southern or Transcaucasia mountainous. The Cholera Epidemic more severe in the first. The province of Daghestan an exception. The Eastern provinces more severely visited than the Western. The Inhabitants of the Caucasus. Description of an underground dwelling. Mohammedans and Dissenters. Prevalence of gastro-intestinal catarrh in Russia. The Epidemic in Baku. The effects of panic. The Caucasian mineral spas. Statistics of the Epidemic in the Caucasus.

Geographically the great mountain chain of the Caucasus is generally considered to be the dividing line between Asia and Europe; but administratively the whole of the Caucasus, including a considerable portion of the steppe lying to the north of the mountain chain, is included in Asiatic Russia. In the preceding chapters the cholera epidemic was traced throughout the Central Asian provinces and Siberia from its first introduction to Russian soil at Kaachka. In the present it is proposed to deal with it in the Caucasus in a similar manner.

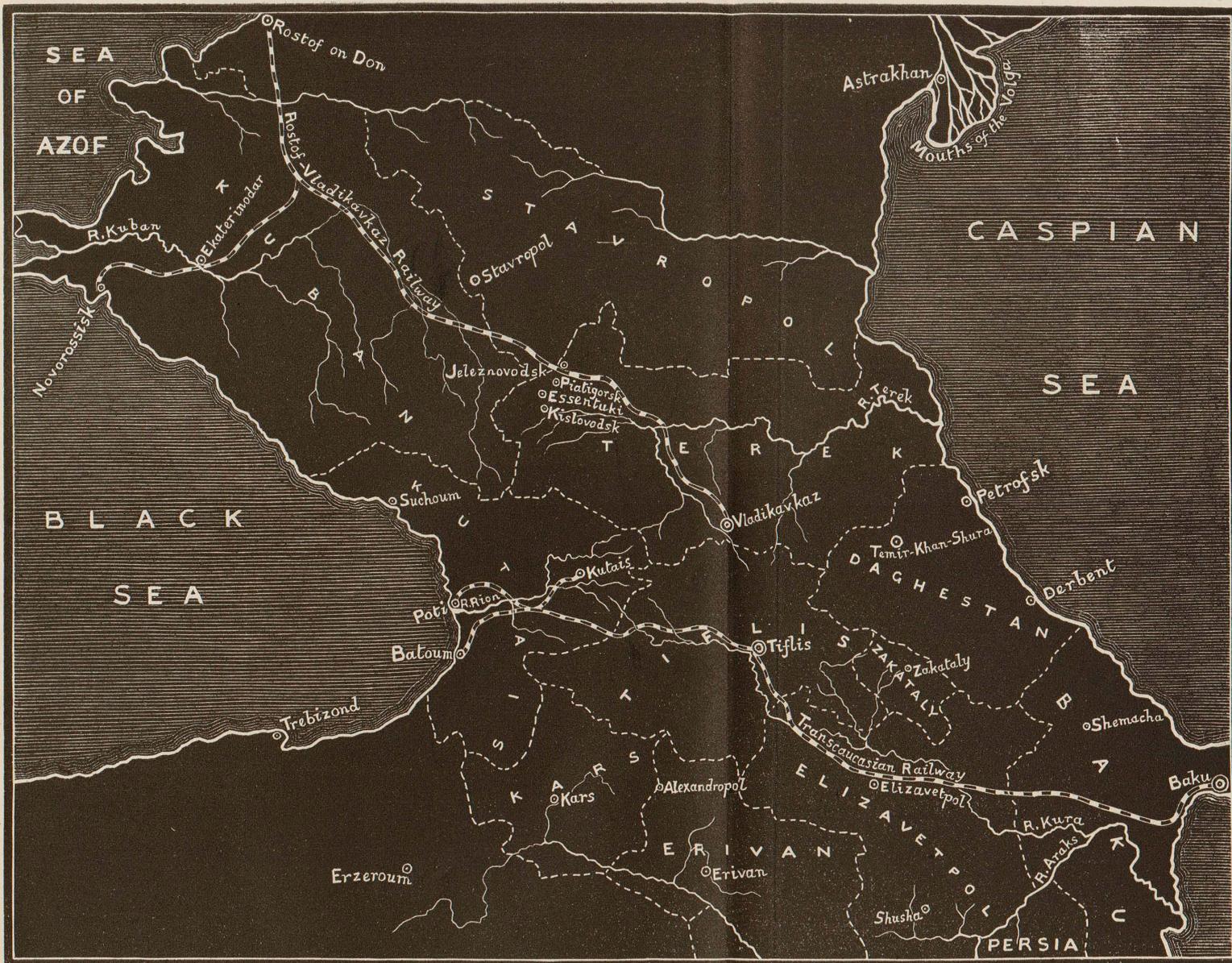
The Caucasus occupying the stretch of country between the Black and the Caspian Seas has a superficial area but little smaller than that of France or Spain. It is continuous on the north with the country of the Don Cossacks, from

which it is separated by two small rivers; whilst on the south another river—the Araks—forms the natural boundary between this part of Russia and Persia. The country is further clearly divided into two parts, not only by an administrative division, but by marked geographical differences, which played an important part in affecting the relative intensity of the cholera epidemic in the two districts during the past summer.

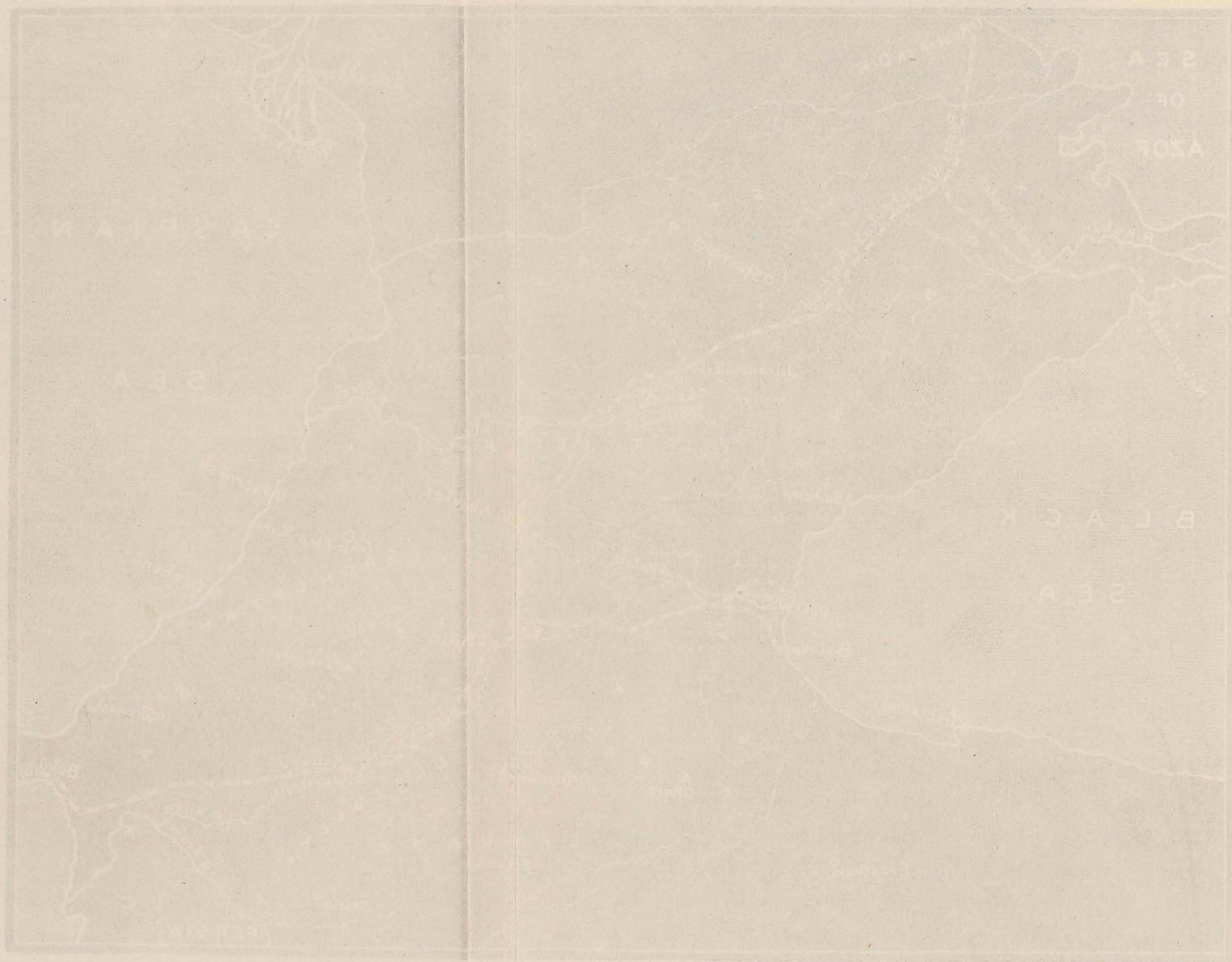
The Northern Caucasus is, for the most part, a flat but fertile steppe, watered by few and sluggish streams, and in part by artificial irrigation canals; but at its southern edge, as it approaches the mountainous region of the Southern Caucasus, the character of the country changes. It becomes sub-mountainous, with rapid streams flowing into the channels of the rivers Terek and Kuban. The Terek flows into the Caspian Sea, the Kuban into the Black Sea; neither receives any tributary from its northern bank, both being fed entirely by the mountain streams from the south.

The Southern Caucasus, or Transcaucasia, is in many respects in marked contrast with the northern division of the country. Briefly, it consists of a series of immense mountain chains, culminating in the peaks of Elbruz and Kazbek, and watered by innumerable rushing streams, which mostly unite to form the channels of the River Kura, flowing eastward into the Caspian Sea, and of the River Rion, which empties itself into the Black Sea.

That elevation has an important influence in modifying the intensity of a cholera epidemic has been very generally admitted, and is to a great extent supported by the behaviour of the present epidemic in the two divisions of the Caucasus. In general terms the flat, low-lying plains of the Northern Caucasus were very much more severely visited than the high and mountainous regions of Transcaucasia. This is clearly seen from the figures given below. In the three northern provinces, out of every 100,000 inhabitants



MAP OF THE CAUCASUS.



MAP OF THE BLACK SEA

2390 were attacked by the disease, whilst in the southern only 1831 suffered.

There is, however, one district which forms an important exception to this general statement, and proves that elevation is not the sole factor that determines the severity of a cholera epidemic. In the province of Daghestan, which borders the Caspian Sea and which, as its name implies, is a most mountainous province, the proportion of population attacked by the disease was higher than in any other district of the Caucasus. Further, in this province and in that of the Terek, lying adjacent on the north, cholera raged with greater violence than in any other part of Russia, European or Asiatic.

From a comparison of the figures in the table with the position of the provinces on the map it will be clearly seen that the cholera epidemic was very much more intense in the eastern districts of the Caucasus than in the western. In the southern division of the country this difference was very marked. In the province¹⁾ of Daghestan and the government of Baku, lying on the east, the proportion of cases per 100,000 inhabitants was, in the first, 3911; in the second, 1593. In the government of Kutais, lying on the Black Sea littoral, the proportion was represented by the insignificant number of 6, whilst the intervening governments were affected in ratios varying from 726 in Tiflis to 1344 in Kars. The same gradation appears in the northern Caucasus. The numbers in the three districts, into which this part of the country is divided, were as follows: In the easterly provinces of the Terek and of Stavropol in every 100,000 inhabitants there were respectively 3383 and 2115 cases of cholera, whilst in the westerly province of the Kuban there were only 1911.

1) The Russian administrative terms «oblast» and «gubernia» are throughout rendered province and government respectively.

This difference may have been partly due to the intensity of the epidemic becoming weaker as it travelled further; but it is not uninteresting to note that there is a considerable difference in level between the eastern and western coasts of the Caucasus, the whole country trending downwards from the Black Sea to the Caspian Sea. The average level of the Caspian Sea has been estimated to be 85·45 feet below the level of the Black Sea¹). It would be asserting too much to say that in this difference in level is to be found the sole explanation of the difference in intensity of the cholera epidemic, but it is at least an interesting and suggestive coincidence if nothing more.

The climate of the Caucasus is most varied. Owing to the mountainous nature of a great part of the country almost every degree of temperature may be experienced by the traveller in simply passing from shore to shore. The heat in summer, particularly in the northern steppes, is often very great, and the cold in winter is frequently extreme. In many parts a difference of as much as 60° or 70° F. is observed between the *average* temperatures of the hottest and coldest months, whilst the range between the *absolute* maximum and minimum may be nearly twice as great.

The inhabitants of the Caucasus are as varied as the climate. The country has been proverbial from the time of Pliny for its confusion of tongues. Great as the number of races is, it appears to be greater from the fact that every tribe is known by a different name to each of its numerous neighbouring tribes, the names being thus multiplied many fold. A further confusion arises from the existence of many dialects in a single language, the Armenian alone being said to possess no less than twelve.

1) This fact was established by the scientific expedition sent by the St. Petersburg Academy in the years 1836—37.

The majority of the inhabitants of the mountainous regions is made up of Armenians, Georgians, Ossetins, Kurds, Turks, Turkomans, Tcherkesses, Tchetchentsy, and Kalmuck and Nogai Tatars, in addition to the Russian population that has settled there since the country came under the rule of the Tsar. In the steppes the population consists almost entirely of Cossacks of the Terek and the Kuban. The larger number of these races lead a half-settled, half-nomadic life, occupied partly in agriculture, partly in pasturage, and partly, though now to an insignificant extent, in brigandage and robbery. Their social customs and their religious prejudices have probably each played their part in assisting the wide spread of the recent epidemic. I take their social customs first.

Throughout the Caucasus there is no system of drainage, the „Persian“ or „dead well“ being the sole method in use for disposing of sewage matter. These, as described before, are very deep wells or holes in the ground, which are gradually filled with human excrement. The harmful effect of this system has been pointed out in the Annual Report of the Medical Department. The accumulation of such enormous masses of human excreta in the earth and the consequent pollution of the soil have gone so far, the report states, that a foul odour is observable in the basements of many houses and in some ice cellars in towns where this system is in use. In the flat plains of the Northern Caucasus it is easy to understand how the wells or springs, which are the sole source of the water-supply, may become contaminated by this method of disposal, or, rather, preservation of sewage.

The houses of most of the hill population are flat-roofed *saklii* or huts, badly built of wood, stone or clay, and in many cases very much more than half underground. On the high table lands throughout nearly the whole of Transcaucasia the Georgians, Tatars and Armenians live in the

so-called *zemlianki* or underground „earth huts“. Dwelling at a height of some thousand feet above the sea, where the thermometer in winter may fall to 30° or 40° below the Fahrenheit zero, such houses provide the greatest amount of warmth at the smallest cost. A short description of one of these dwellings, taken from the Journal of the Imperial Caucasian Medical Society, may be of interest.

Each house always contains more than one room and may sometimes form a labyrinth of rooms connected by passages. The floor is generally about one sajene (seven feet) below the surface of the earth. The roof is about two feet above the surface and is covered with brushwood and then with a thick layer of earth. A few small openings exist in the roof for the admission of light and air, but in winter these are almost invariably closed at night to keep in the warmth. There is generally one door leading to the men's rooms and a second to those occupied by the women, who, as in all Mohammedan countries, live apart. In the centre of the establishment there is generally one large room devoted to the cattle, which share the same roof as their masters for at least six months in the year. In the living rooms there is generally a hearth in which dried cow-dung is used as fuel.

In such a house the Caucasian Highlander spends at least half the year, in an atmosphere that, to anyone not used to it, is quite intolerable. Heated by the fires and by the warmth of the cattle, almost unchanged by ventilation, polluted by the breath and by the exhalations from the bodies and from the excreta of many human beings and of a number of cattle, varying from units up to hundreds, the air becomes fouled to such an extent that it seems incredible that life can be supported. Dr. Uspenski, a Russian who was forced by stress of weather to seek the hospitality of the owner of one of these dwellings, relates that the atmosphere was so unbearable that, notwithstanding that a

fearful snowstorm was raging outside, he was obliged to rise, mount his horse and face the weather as being the lesser evil of the two. The cattle suffer terribly from the confinement and when let out in the spring are little more than living skeletons, as the result of the darkness, want of exercise, scanty food and foul air.

The soil must be no less foul than the air; the „dead well“ receives the human excreta and the surface of the earth must be considerably polluted by the excreta of the animals, although these are carefully collected every day in order to serve as fuel. When it is added that the well which affords the sole water-supply is usually under the same roof, it is obvious that to polluted air and polluted soil must be added polluted water.

That people living in such surroundings were severely visited by the cholera epidemic is not surprising. If unhygienic domestic conditions seemed to invite the introduction of the cholera infection, religious prejudices were doubtless powerful aids in propagating it. The predominant religion in the Southern Caucasus is Mohammedanism, professed by 48 per cent. of the inhabitants; members of the orthodox Greek Church form 29 per cent., Armenians 20 per cent., and the remainder is made up of Russian sectarians, Roman Catholics, Jews and followers of other faiths in insignificant numbers.

The fatalism of Mohammedans is proverbial and must have had much to do with the spread of cholera in a country where nearly half the population are followers of the Prophet; whilst their religious objections to seeking medical aid, their peculiar rites in disposal of the dead, and their occasional inflictions of self-torture must have been powerful factors in disseminating the epidemic.

Scarcely less fatalistic than the Mohammedan is the Russian sectarian. Of the Cossack population of the Northern Caucasus more than half belong to one or other of

the numerous sects of the *Raskol* or Dissent. Many of them are descendants of dissenters exiled to the Caucasus by the Emperor Nicholas for refusing to disclaim their heretical opinions and subscribe to the Orthodox Church. Whilst some, as the Molokany and Dukhobortsy, are rationalistic in their tenets and live a quiet industrial life, others as the Khlysty, are highly fanatical, their so-called services being in many cases merely disgusting exhibitions of sensuality.

The prevailing disease in the Caucasus is malarial fever, but the cause of the greatest number of deaths is gastro-intestinal catarrh, connected, it is supposed, with the frequently polluted water-supply and with the custom of the inhabitants of eating large quantities of unripe fruit and vegetables.

The prevalence and fatality of gastro-intestinal catarrh are by no means confined to this part of Russia. It is responsible for a larger total of deaths than any other single disease or group of diseases in almost every town throughout the empire. In the six towns — St. Petersburg, Moscow, Vilna, Saratof, Odessa and Baku — which may be taken as fairly representing all parts of European Russia and the Caucasus, in the three years 1887—89 there were 41,649 deaths from this one disease; from the next most fatal group of diseases, those of the respiratory organs, there were 31,821 deaths; and from tuberculosis, 27,916.

This widespread existence, particularly during the summer, of gastro-intestinal catarrh is a fact of the first importance in the epidemiology of cholera in Russia, and probably in it is to be found the reason why the cholera infection, once fairly introduced into the country, has generally spread unchecked throughout the whole of the empire. So long as the cause of it exists, and particularly so long as the water-supply of the towns and villages remains what it is and the local authorities continue indifferent as

to its source and purity, the Russian people must form a happy hunting-ground for the cholera bacillus, and in all probability all efforts to check its spread when once it has passed the frontier will be futile.

The cholera was imported to the Caucasus at its most vulnerable point. The town of Baku lies on the coast of the Apsheron peninsula, which juts into the Caspian Sea almost exactly opposite the terminus of the Transcaspian Railway at Oozoon Ada on the east coast of that sea. Between the two ports there is frequent communication; they lie 132 miles apart and the crossing takes about twenty-seven hours. The first cases of cholera occurred in Baku on June 6th¹⁾, eighteen days later than the appearance of the disease on Russian soil at Kaachka and twelve days later than the first cases in Oozoon Ada.

Baku is a large town that has increased immensely in the last few years. In 1888 the population was less than 46,000; a year later it had nearly doubled itself, and last year the town was reckoned to contain 108,000 inhabitants. This rapid growth is closely connected with the extraordinary development in the trade in naphtha, which is found in large quantities in the neighbourhood. The air reeks with its fumes, and the water of the harbour is covered with a film of it. If one may believe a recent correspondent of a Russian newspaper the naphtha fumes have a disastrous effect on all vegetation. The town, it is said, „contains gardens without grass, trees without leaves, sea without water, and steppes without air, for it is as impossible to call air that kerosene vapour which blows round Baku for many versts as it is to call water that mother-of-pearl-tinted, heavy mud which creeps into the harbour, taking every colour of the rainbow in the sun“.

The water-supply of Baku appears to be a matter of

1) All the dates mentioned are according to the Old Style.

difficulty. It is obtained from wells, but, lying as the town does on a bare and sandy peninsula surrounded by the sea, the well water is hard, rich in salts and deposits a sediment. The inhabitants of the hills at the back of the town have a much better water-supply from springs and streams.

The town has, besides its Russian part, an Asiatic quarter surrounded by old fortifications and inhabited by the poorest of the labouring classes, a population consisting of Tatars and Persians living in a state of indescribable Oriental filth and innocent, it need scarcely be added, of the most rudimentary measures of hygiene or sanitation. It is not surprising that the cholera, when once introduced into Baku, spread rapidly and almost at once assumed serious proportions, especially as no measures of precaution were taken by the local authorities until the disease was well established in the town. Then panic rendered firm or united action on the part of those in power impossible. The hospital accommodation was found to be inadequate, the number of medical men insufficient, and a total absence of disinfectants rendered still more hopeless any efforts on the part of the sanitary officials. All who could fled the town, the trains were besieged, the stations packed with crowds unable to find room in the trains, shops and factories were closed and business came to a complete standstill.

One of the few measures taken by the authorities was that of watering the streets with *mazut*, the refuse from the naphtha refineries, presumably under the impression that it possessed disinfecting properties. Its utter failure in Baku to check the epidemic is a practical confirmation of the experiments of Koch, who found that neither pure petroleum ether nor benzol had any effect on spores exposed to their action for five and for twenty days respectively.

During the seventy-eight days that the epidemic lasted in Baku there were 1834 deaths from the disease.

From Baku the infection spread as from a centre. A consecutive itinerary of its course is impossible, as it was not following one line but was appearing at the same time in many towns widely apart. In Tiflis, in Elizavetpol, in Zakataly, in Petrovsk and in many other places the earliest cases were amongst refugees from Baku and preceded by some days cases amongst the residents of those towns. The Transcaucasian Railway, which connects Baku with Batoum and Poti on the Black Sea, was one important channel of infection, but the disease appears to have spread as much, if not as rapidly, by road and sea as by rail.

Tiflis, one of the earliest towns affected, lies on the railway about eighteen hours' journey from Baku. With a population of 102,000, it possesses the great advantage of a good water-supply derived from springs in the hills ten versts away and brought to the town by an aqueduct. The water is stated to be remarkably pure, and it is doubtless owing to this fact, together with the high position occupied by the town, that Tiflis suffered so comparatively lightly from the epidemic. The first cases occurred on June 13th and the total number of cases reported was 570 and of deaths 261.

On June 14th cases occurred in Petrovsk on board a steamer coming from Baku; on the 16th the disease was reported from Shusha and on the 18th from Elizavetpol. Before the end of June it had reached the Northern Caucasus and cases occurred in the Terek province and the government of Stavropol. Early in July the disease appeared in Erivan and in Kars, and before the middle of the month every district of the Caucasus was suffering more or less severely. In the three northern provinces the epidemic was raging violently, between two and three thousand cases and half as many deaths being reported daily.

In the province of the Terek, in particular, the numbers were very high. The capital of this province is Vladikavkaz, important as being the terminus of a line of railway connecting it with Rostof-on-Don.

A little to the north of Vladikavkaz, on the Rostof line, lies the group of inland watering-places which have long attracted crowds of visitors every summer by the fame of their mineral springs. Piatigorsk with sulphurous waters, Essentuki with alkaline, and Jeleznovodsk and Kislovodsk with ferruginous and acid waters respectively form the chief centres. At the beginning of the summer a larger number of visitors than usual flocked to the springs, hoping thus to escape the cholera; but, as the epidemic rapidly spread through the Caucasus and approached within a hundred versts of Piatigorsk, there was a sudden panic. People fled in all directions and the watering-places were speedily emptied.

In the following table the statistical details of the epidemic are given down to Nov. 1st.

It will be seen that during the five months from June to October inclusive there were reported 133,781 cases of cholera in the Caucasus, and 68,353 deaths. If to these figures be added those already given for the Central Asian provinces and Siberia, it will be found that the final totals for the whole of Asiatic Russia were 222,956 cases and 115,184 deaths.

*Statistics of the Cholera Epidemic in the Caucasus to Nov. 1st,
1892 (Old Style).*

Province or Government.	Cases.	Deaths.	Per 100,000 Inhabitants.		Percentage of deaths to cases.
			Cases.	Deaths	
Terek *	27,095	13,127	3,383	1,639	48·5
Stavropol	14,802	7,280	2,115	1,040	49·2
Kuban	28,659	15,045	1,911	1,003	52·5
Total for the Northern Caucasus	70,556	35,452	2,390	1,203	50·3
Daghestan	23,467	10,456	3,911	1,743	44·55
Baku	11,154	6,831	1,593	976	61·25
Kars	2,688	1,203	1,344	601	44·75
Zakataly	988	594	1,308	792	60·0
Erivan	8,939	4,845	1,277	692	54·2
Elizavetpol	9,711	5,684	1,079	632	58·53
Tiflis	5,808	3,032	726	379	52·2
Kutais	470	256	6	3	54·0
Total for the Southern Caucasus	63,225	32,901	1,831	953	52·0
Total for the Caucasus	133,781	68,353	2,090	1,068	51·1

* To October 15th.

CHAPTER IV.

THE EPIDEMIC IN EUROPEAN RUSSIA.

Cholera entered European Russia by two channels, by sea to Astrakhan, and by rail to Rostof-on-Don. It spread northwards up the Volga and westward to the Ukraine. Much more rapid progress by the first route than by the second. Every government of European Russia, with five exceptions, invaded by cholera. The spread of the disease much more rapid than in previous years. Full statistics of the Epidemic.

The epidemic of 1892 entered European Russia, as did many earlier outbreaks, mainly, but not entirely, through the mouths of the Volga. A second route followed by the disease may be indicated by a line drawn across the Caucasus from Baku to Rostof-on-Don, thence to the southern governments bordering the Sea of Azov and the Black Sea, and to the south-western group of governments known as the Ukraine ¹).

A comparison of the dates upon which the earliest cases of cholera occurred in each of the governments marking these two routes shows very clearly that the epidemic spread with much greater speed by the first route than by the second. The immense waterway of the Volga formed a

1) The district known as the Ukraine comprises the six governments of Volhynia, Podolia, Kief, Tchernigof, Poltava and Kharkof.

channel along which the infection travelled with almost startling rapidity. The earliest case of cholera in the government (not in the town) of Astrakhan occurred on June 13th ¹⁾. On the 14th the disease appeared in the government of Saratof, on the 23rd in that of Samara, on the 24th in that of Simbirsk; and on the 25th cases of cholera were reported in the government of Kazan. The epidemic had thus travelled in a northerly direction, along the course of the Volga, a distance of 1784 versts (nearly 1200 miles) in the space of twelve days.

In what may for brevity be termed the south-western branch of the epidemic, the first town to be affected on the European side of the Caucasian frontier was Rostof-on-Don, one of the chief towns in the territory of the Don Cossacks, and situated, as its name implies, on the River Don. Cholera manifested itself here on June 28th. In the neighbouring government of Kharkof no case was reported until ten days later (July 8th). On July 12th the infection spread to the adjoining government of Poltava. For a considerable period the epidemic travelled no further in this direction. Not until July 23rd was cholera reported from the government of Ekaterinoslav (situated to the south of Kharkof and Poltava, and to the west of the Don Cossack province). On August 3rd the disease appeared in the Taurida (the government which includes the Crimea); on the 8th in Kherson; on the 16th in Kief; whilst it did not spread to the border governments of Bessarabia and Podolia until the 26th and 30th of August respectively.

Whilst the infection was thus travelling comparatively slowly along the shores of the Black Sea, it was also passing from Rostof-on-Don in a northerly direction. On July 2nd, only four days later than the occurrence of the

1) As in the previous chapters every date mentioned is according to the Old Style.

first case of cholera at Rostof, the disease appeared in the town and government of Voronezh. Between Rostof and Voronezh is a distance of 610 versts (about 400 miles). The two towns are connected by a line of railway. They are also connected by the River Don¹, which drains the whole of the government of Voronezh. The Don is navigable by steamer for half the distance between the towns of Rostof and Voronezh and by smaller craft for the remainder of the distance. Communication by the railway is, of course, much more rapid than by the river, the journey taking exactly twenty-four hours. There is evidence to prove that in this instance the railway was the means of conveying the infection. Cases of cholera occurred at stations on the Rostof-Voronezh Railway on July 1st, and on July 2nd the disease appeared in the town of Voronezh.

The rapidity with which cholera spread up the Volga was in striking contrast with the comparative slowness with which it followed the course of the Dnieper, if, indeed, that river can be said in any way to have formed a channel by which the infection was carried. The Dnieper is almost unnavigable. The wide estuary below Kherson is too shallow to allow of large vessels entering the river from the sea. To the south of Ekaterinoslav the course of the river is interrupted for a distance of seventy versts by a series of falls varying in height from eight to twelve feet. To the north of this the river is navigable with safety only in the spring; in the summer the many and constantly shifting sandbanks render navigation difficult and at times impossible. The earliest case of cholera in any town on the banks of the Dnieper occurred at Ekaterinoslav on July 28th. The first case in the town of Kief, about 350 versts (240 miles) higher up the river, is stated to have been on

1) The town of Voronezh lies on a river of the same name at no great distance from the junction of this river with the Don.

Aug. 16th; in the governments of Tchernigof and Mogilef, through which the Dnieper flows, the disease appeared on Sept. 5th and Aug. 30th respectively; whilst in Smolensk, the government in which the river takes its rise, no case of cholera was reported before Sept. 26th.

It will be well to briefly recapitulate these facts. Along the channel of the Volga, upon whose waters almost the whole of the traffic of Central and Eastern Russia is carried during the summer, the cholera infection travelled a distance of nearly 1200 miles in twelve days. On the Dnieper, on the other hand, a river which is in no sense a great channel of communication, an interval of nineteen days elapsed between the dates of the appearance of cholera in two towns only 240 miles apart; whilst the long period of sixty days separated the dates of invasion by the disease of Ekaterinoslav and Smolensk, distant (by the river) about 600 miles the one from the other.

Having traced the epidemic along the Volga as far as Kazan, it will be convenient to continue a brief itinerary of its course beyond that ancient capital of the Tatars. A few versts to the south of Kazan the Volga is joined by the immense stream of the Kama, which drains the three large governments of Viatka, Perm and Ufa. From Viatka the first case of cholera was reported on June 27th, from Perm on July 6th and from Ufa on July 18th.

From Kazan the main channel of the Volga may be traced to its source through the following governments in the order named: Nijni Novgorod, where the earliest case of cholera occurred on July 7th; Kostroma, first affected on July 18th; Yaroslavl, first affected on July 21st; and finally, Tver, where the disease appeared on Aug. 5th.

It is scarcely necessary to repeat here in detail the dates upon which the first cases of cholera occurred in each of the remaining governments. They will be found stated, with as near an approach to accuracy as possible

in the last column of the table of statistics upon pages 35 and 36.

The further course of the epidemic may be briefly summarised as follows: Before the month of July was over, nearly all the central governments had been overrun by the disease, which had also appeared in St. Petersburg. On Aug. 1st cases occurred in Lublin, one of the ten Polish governments. During August cholera invaded most of the southern and south-western governments, and in the north those of Tver, Novgorod, Vologda and Olonetz. During September, October and November all the remaining governments of European Russia were returned as affected by the disease, with the following exceptions: the governments of Archangel, Esthonia (including the important port of Reval) and Kovno, the two Polish governments of Suvalki and Kalisz, and the Principality of Finland. These governments have remained free from cholera throughout the epidemic.

Before leaving this branch of the subject it will be of interest to compare the speed with which the cholera epidemic of last year travelled with that attained by earlier epidemics. In Chapter I it was stated that the recent outbreak had spread through Russia with unprecedented rapidity. Unfortunately the records of past epidemics in the regions then under notice — that is to say in Central Asia and Siberia — were not available for the purpose of comparison. But the case is different in European Russia. Thanks to the labours of Dr. Archangelski, we possess in his invaluable work on „Cholera Epidemics in European Russia during the Fifty years 1823—72“¹⁾ an exhaustive account of all the previous outbreaks of the disease so far as concerns their course on this side the Caspian Sea and the Ural Mountains. By the aid of these records it is possible

1) St. Petersburg, 1874.

to substantiate the statement just made as to the relative speed of the epidemic of 1892. In 1830 and 1847, years in which cholera followed the same route as it did last year, the first case recorded in Astrakhan was, by a curious coincidence, on the same date, July 4th, in each year. The further course of the three epidemics is shewn in the following tables.

Table showing the Number of Days which elapsed between the occurrence of the First Case of Cholera in Astrakhan and that of the First Case in each of the Towns named under the Three Years 1830, 1847 and 1892.

Name of town.	1830.	1847.	1892.
Astrakhan	July 4th.	July 4th.	June 7th.
Tsaritzin	12 days later.	12 days later.	5 days later.
Saratof	18 »	38 »	1 »
Samara	36 »	66 »	6 »
Simbirsk	43 »	70 »	7 »
Kazan	51 »	63 »	8 »
Nijni Novgorod	38 »	67 »	20 »
Moscow	57 »	76 »	33 »

Table showing the Rapidity with which the Cholera spread from Rostof-on-Don to the South and West in each of the Three Epidemics. The dates, as before, are those of the first cases in each place.

Name of town or government.	1830.	1847.	1892.
Rostof-on-Don	Aug. 6th.	July 12th.	June 28th.
Kief	62 days later	73 days later	49 days later.
Podolia	88 »	81 »	63 »
Volhynia	123 »	131 »	67 »

These figures prove conclusively that the latest epidemic of cholera has overspread European Russia in a consi-

derably shorter period than did either of the earlier outbreaks. They further show that this increased rapidity in the spread of the disease was not confined to its course along the Volga, but was manifested, though to a less striking degree, in its march westward to the Ukraine¹).

Statistics of the Cholera Epidemic in the Russian Empire to Dec. 1st, 1892 (Old Style).

No. in Map.	Name of Government or Province.	Cases.	Deaths.	Per 100,000 inhabitants (in round figures).		Percentage of deaths to cases.	Date of occurrence of first case of cholera.
				Cases.	Deaths		
1	Astrakhan*	21,960	10,980	2,494	1,247	—	June 13th
2	Don Cossacks* . . .	37,680	18,295	1,812	880	48·5	June 28th
3	Saratof †	41,887	21,091	1,721	866	50·3	June 14th
4	Samara †	41,369	18,115	1,556	682	43·8	June 23rd
5	Simbirsk †	17,143	7,347	1,028	440	42·8	June 24th
6	Voronezh †	24,046	12,082	894	449	50·2	July 2nd
7	Orenburg †	10,304	5,339	746	387	51·8	July 8th
8	Tambof	21,284	9,078	733	313	42·7	July 16th
9	Lublin	5,683	2,275	536	214	40	August 1st
10	Penza †	7,727	3,514	483	219	45·5	July 8th
11	Kursk †	10,164	4,247	397	166	41·8	July 14th
12	Kazan †	8,337	3,703	380	169	44·4	June 25th
13	Ufa †	7,359	3,511	353	168	47·7	July 18th
14	Viatka*	10,307	4,681	343	156	45·3	June 27th
15	Kief	10,562	3,720	336	118	35·2	August 16th
16	St. Petersburg † . .	5,423	1,602	290	86	29·5	July 20th
17	Nijni Novgorod † . .	4,347	1,917	280	124	44	July 7th
18	Ekaterinoslav † . .	4,281	1,896	258	114	44·3	July 23rd
19	Kharkof †	6,280	2,569	255	104	41	July 8th
20	Taurida †	2,454	1,365	215	120	55·6	August 3rd
21	Kherson	4,802	2,224	219	101	46·3	August 8th
22	Bessarabia	3,070	1,285	194	81	41·8	August 26th
23	Podolia	3,864	1,423	148	54	36·8	August 30th
24	Perm †	4,205	2,052	150	73	48·7	July 6th
25	Yaroslavl*	1,241	548	104	46	44·1	July 21st
26	Riazan †	1,752	893	90	46	51	July 10th
27	Tula †	1,270	368	84	24	29	July 26th
28	Orel †	1,514	630	71	30	41·6	July 17th
29	Poltava	1,992	863	70	30	43·2	July 8th
30	Tchernigof	1,562	484	70	22	31	Septemb. 5th
31	Radom	759	331	99	43	43·6	Septemb. 19th
32	Moscow †	1,515	783	68	35	51·7	July 20th
33	Kielce*	364	191	52	27	52·5	Septemb. 13th
34	Volhynia	1,162	453	49	18	39	Septemb. 3rd

1) Continued on page 38.

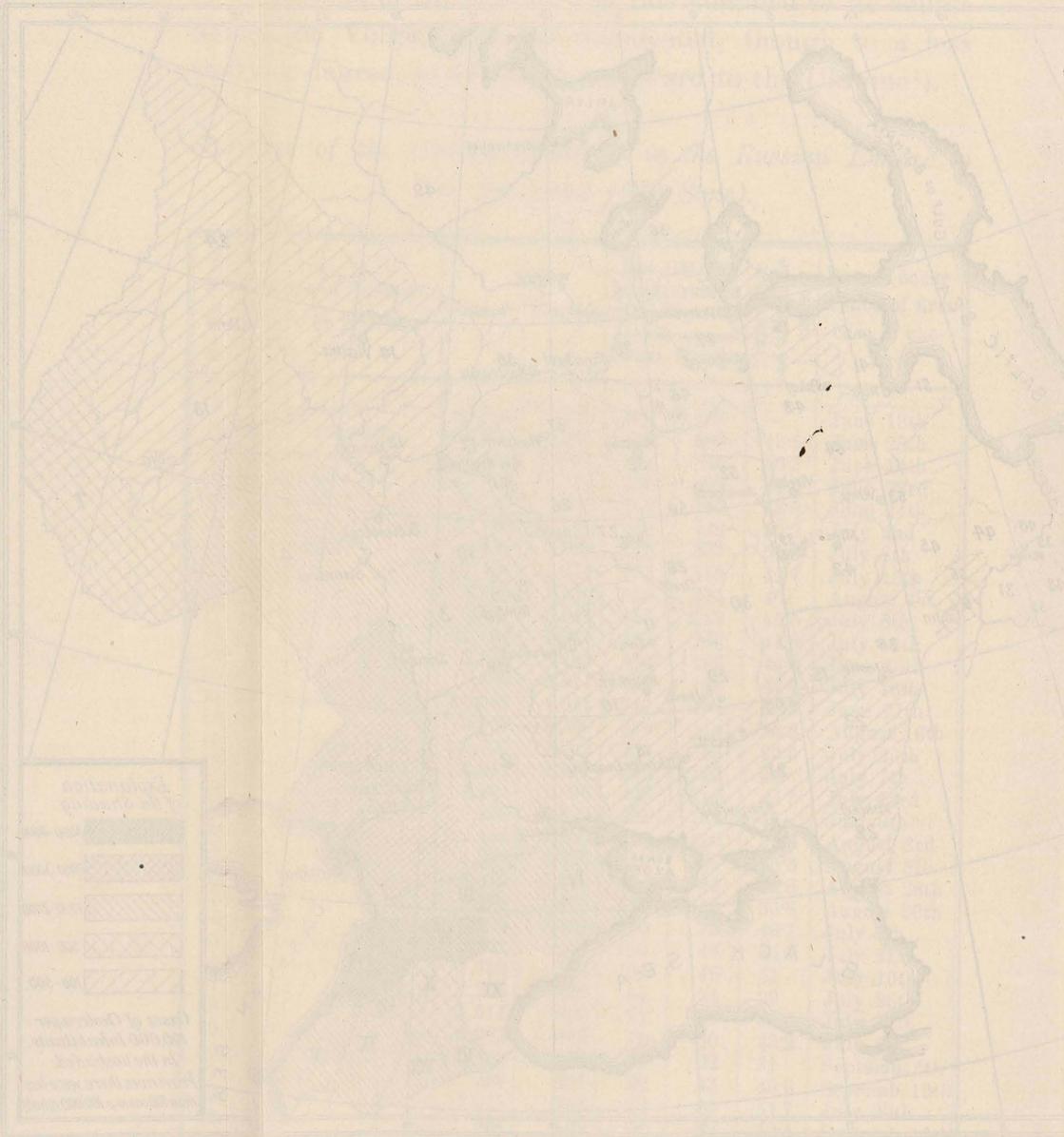
MAP OF RUSSIA, TO ILLUSTRATE THE DISTRIBUTION OF THE EPIDEMIC OF CHOLERA.



The shading represents a varying ratio of cases of cholera per 100,000 of population. The figures refer to the table on pages 36 and 37, where the names of the corresponding governments and provinces will be found.

(In the government of Yaroslavl (25) the shading has been inadvertently omitted. It should have indicated between 100 and 500 cases per 100,000 inhabitants.)

MAP OF RUSSIA TO ILLUSTRATE THE DISTRIBUTION OF THE EPIDEMIC OF CHOLERA.



The shading represents a varying rate of cases of cholera per 100,000 of population. The figures refer to the table on pages 36 and 37, where the names of the corresponding governments and provinces will be found. In the government of Yaroslavl (25) the shading has been faintly omitted. It should have indicated between 100 and 500 cases per 100,000 inhabitants.

No. in Map.	Name of Government or Province.	Cases.	Deaths.	Per 100,000 inhabitants (in round figures).		Percentage of deaths to cases.	Date of occurrence of first case of cholera.
				Cases.	Deaths		
35	Kostroma*	428	212	31	15	49·5	July 18th
36	Olonetz*	107	52	27	13	48·6	August 21st
37	Vladimir*	281	160	19	11	57	July 19th
38	Warsaw*	170	71	17	7	41·8	Septemb. 11th
39	Mogilef †	221	99	16	7	44·8	August 30th
40	Plock	78	52	12	7	66·6	October 14th
41	Livonia*	93	48	8	4	51·6	Septemb. 5th
42	Minsk	150	70	8	4	46·6	Septemb. 19th
43	Pskof	62	31	6	3	50	Septemb. 23rd
44	Lomza	51	24	8	4	47	October 22nd
45	Grodno	69	37	5	3	53·6	Septemb. 12th
46	Tver*	46	15	3	1	33	August 5th
47	Novgorod*	17	12	2	1·4	70	August 15th
48	Piotrkow*	10	2	1	0·2	—	Septemb. 29th
49	Vologda*	10	4	1	0·4	—	August 20th
50	Kaluga*	7	7	0·6	0·6	—	October 17th
51	Courland*	7	3	1	0·4	—	October 10th
52	Smolensk*	4	4	0·3	0·3	—	Septemb. 26th
53	Vilna*	7	4	0·5	0·3	—	November
54	Vitebsk	2	2	0·1	0·1	—	November
55	Siedlec	1,588	862	211	114	54	September
Total for European Russia (excluding Finland)		331,077	151,626	331	152	45·8	
I	Daghestan*	23,471	10,457	3,912	1,744	44·5	June 18th
II	Terek †	27,071	13,114	3,384	1,639	48·5	June 18th
III	Stavropol*	14,802	7,280	2,115	1,040	49·2	July 29th
IV	Kuban †	28,759	15,100	1,944	1,020	52·5	June 18th
V	Baku †	11,251	6,876	1,607	982	61·1	June 6th
VI	Kars †	2,937	1,378	1,468	689	46·9	July 20th
VII	Zakataly †	991	598	1,309	793	60·3	June 21st
VIII	Erivan †	9,153	5,504	1,308	786	60·1	July 7th
IX	Elizavetpol †	9,715	5,690	1,079	632	58·5	July 18th
X	Tiflis †	5,995	3,118	749	390	52·0	June 13th
XI	Kutais †	613	308	6	3	50·2	July 22nd
Total f. the Caucasus		134,758	69,423	2,105	1,084	51·5	
Central Asia and Siberia		89,175	46,831	—	—	52·5	
Total for the Russian Empire		555,010	267,880	—	—	48·2	

* The epidemic was at an end by Dec. 1st.

† The epidemic was almost but not quite extinct by Dec. 1st. In the remaining governments the epidemic was still active in December.

In 1830 there were no railways in Russia; in 1847 there were 343 versts of railway lines, insufficient to affect in any way the spread of an epidemic; in 1892 there were 30,366 versts of line in the Empire, and of these 28,191 were in European Russia. Facility and speed of communication by water have advanced in like proportion. The conclusion appears inevitable that herein is to be found, partly, if not wholly, the explanation of the more rapid course of last year's epidemic as compared with that of former years.

One feature of the epidemic must not be passed over. In some instances the disease appeared to be carried from one government to another at a considerable distance, and even to obtain no small hold there, before the intervening governments were attacked. Thus, in the Polish government of Lublin a case of cholera occurred on Aug. 1st, and during the month of August there were reported from that government 1125 cases and 337 deaths. On Aug. 1st the epidemic had travelled in the direction of Lublin only as far as the governments of Ekaterinoslav, Kharkof and Poltava. Between these governments and that of Lublin lie the governments of Kief and Volhynia, which remained free from the disease until Aug. 16th and Sept. 3rd respectively, or fifteen and thirty.-three days later than the date of the first case in Lublin. In like manner cholera appeared at Moscow and St. Petersburg on the same date (July 20th), whilst the intermediate governments of Tver and Novgorod were not affected until sixteen and twenty-six days later respectively.

Up to the present only the direction followed by the cholera epidemic and the rapidity with which it overspread the country have been considered, without reference to the amount of sickness and death caused by it in the various governments named. In the table on pp. 36 and 37 will be found the full statistics of the epidemic from its commencement to December 1st (Old Style). The numbers of cases and

deaths and the ratios which these bore to the population in every government affected by the disease in European Russia and the Caucasus are there stated. The number of cases recorded per 100,000 inhabitants has been taken as the standard of intensity of the epidemic, and the governments have been arranged and numbered in descending order of the intensity with which they were affected.

In order to present more clearly the distribution of the epidemic I have prepared a map of the country, and have endeavoured to show by a scheme of shading the relative hold obtained by cholera in each of the governments in which there were more than 100 cases per 100,000 inhabitants.

The further history of the epidemic after December 1st may be briefly summarised. Although the past winter was one of a severity almost, if not quite, unprecedented even in Russia, cholera lingered in many parts of the country throughout the whole winter. The following figures complete the statistics of the epidemic to May 1st 1893.

	Cases.	Deaths.
1892 December	2974	1195
1893 January	1145	414
„ February	759	266
„ March	1326	428
„ April	80	30.

The governments which contributed most to these figures were those of Podolia, Bessarabia, Kief and Tambof.

bordering the Volga. In the Ukraine this passing in intensity of the epidemic as it travelled farther did not present the same degree of regularity as in the course of the disease along the Volga. Were the behaviour of the epidemic in the governments through which the Volga flows alone considered, it might be stated as a general law that the further a given district from the source of the epidemic the later was it

CHAPTER V.

THE DISTRIBUTION OF THE EPIDEMIC.

Centre of intensity in the South East. Diminution in intensity as the Epidemic travelled further from its source. Some exceptions. The course of the disease in any given locality. Phenomena exhibited by the weekly „curves“ of the Epidemic. The Epidemic of 1892 compared with those of previous years. The proportion of fatal cases greater than in any earlier Epidemic.

From even the most cursory glance at the map and table on p.p. 36 and 37 it will be seen that the centre of intensity of the cholera epidemic was in the south-eastern corner of European Russia and the immediately adjacent provinces of the Caucasus. An almost regularly progressive diminution in the numbers attacked by the disease — in proportion to the population — may be traced from the provinces of Daghestan and the Terek (those most deeply shaded in the map) through Stavropol to Astrakhan, and thence to the territory of the Don Cossacks and to the governments bordering the Volga. In the Ukraine this lessening in intensity of the epidemic as it travelled further did not present the same degree of regularity as in the course of the disease along the Volga. —

Were the behaviour of the epidemic in the governments through which the Volga flows alone considered, it might be stated as a general law that the further a given district from the source of the epidemic the later was it

invaded and the less was the amount of suffering and death caused by the disease. From the following table it will be seen that there was but one exception to this rule in this particular group of governments. The governments are named in the order of their geographical position from the mouth to the source of the Volga:

Name of government.	Date of occurrence of first case of cholera.	Number of cases per 100,000 inhabitants
Astrakhan	June 13th	2494
Saratof	„ 14th	1721
Samara	„ 23rd	1556
Simbirsk	„ 24th	1028
Kazan	„ 25th	380
Nijni Novgorod	July 7th	280
Kostroma	„ 18th	31
Yaroslavl	„ 21st	104
Tver	Aug. 5th	3

In the remaining governments of European Russia this rule was applicable only to a limited extent. In general terms it is true that, whilst the south-eastern governments suffered the most from the ravages of cholera, those in the north-west suffered the least, some escaping altogether, and that the central governments were affected to a lesser degree than the first group but to a greater degree than the last. Further, the central governments showed amongst themselves quite a distinct tendency to adhere to the law of relation between geographical position, date of invasion and intensity attained by the epidemic. At the same time, however, there were some marked exceptions. In certain governments, where presumably conditions existed favourable to the growth and diffusion of the cholera bacillus, the cholera attained much greater proportions than in others nearer to the source of the epidemic. The most striking instances of this were the Polish govern-

ments of Lublin and Siedlec, and the government of St. Petersburg. They will be seen as islets of shading in the map facing page 36.

With regard to the behaviour of the epidemic in any given district, it appears that, as a rule, it took the following course. For the first few days after the appearance of the disease the cases and deaths reported were few in number. After the first week the numbers gradually increased, until the maximum was reached in the course of from four to eight weeks. The maximum was rarely maintained for more than one week and the decline was generally progressive and rather less rapid than the ascent.

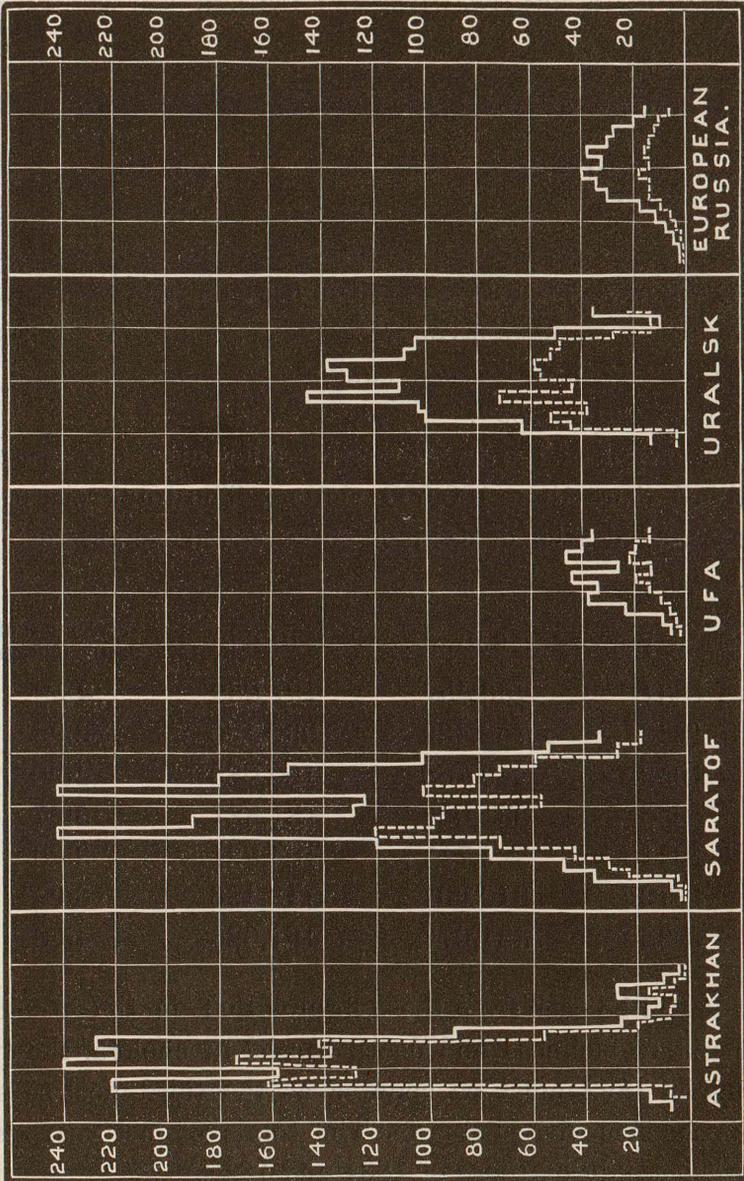
In many governments a slightly different course was followed. In these the „curves“ representing the weekly records of cases and deaths showed, after the first unbroken ascent, a fall, followed by a second rise, in some cases to a height as great as, or even greater than, that of the first rise. This double ascent, with a temporary intermission, was noticed in the governments of Astrakhan, Voronezh, Lublin, Orenburg, Perm, Samara, Saratof, Tambof, Ufa, Kherson and Tchernigof in European Russia, and in those of Elizavetpol, Kars, Tiflis, Tomsk and Uralsk in Asiatic Russia.

In the accompanying chart I am able to reproduce the curves in four of the governments where the phenomenon in question was most marked, and the like weekly curve for the whole of European Russia, which, it will be seen, presents a distinctly noticeable double rise and intermission. The week in which the curve for European Russia reached its highest point was that between Aug. 9th and 15th (inclusive), the second rise occurring in the week Aug. 23rd to 29th.

I am not aware that any explanation has been offered of this phenomenon. It has occurred sufficiently often to demand some attention. In two governments I am able to

state that the rise and fall in the epidemic intensity did not coincide with the like variations in the atmospheric temperature. A careful comparison of the temperature

Chart showing the weekly course of the Cholera Epidemic in four governments and in the whole of European Russia.



The curves show the numbers of cases (clear line) and deaths (dotted line) per 100,000 inhabitants in successive weeks.

curves with the curves of the epidemic in the governments of Saratof and Astrakhan fails to establish any correspondence between them.

The total number of cases of cholera reported in the Russian Empire from the beginning of the epidemic to Dec. 1st was 555,010, and of these 267,880 proved fatal. Of these totals 331,077 cases and 151,626 deaths occurred in European Russia. It will be of interest to compare these figures with those furnished by former epidemics.

In the year 1823 cholera first appeared on Russian soil and since that date there have been at least twenty-seven years in which the disease has been present over a more or less wide extent of the country. Its name has become a by-word of terror to the Russian peasant, and *cholera* has long been with him a favourite expletive and term of abuse. It is the modern Russian equivalent of our ancestors' — „A plague upon you“.

In seven of the twenty-seven epidemics the disease claimed more than 100,000 victims. The total returns of cases and deaths in each of these seven years were as follows: —

Epidemic year.	Cases.	Deaths.	Percentage of deaths to cases.
1831	466,457	197,069	42·2
1848	1,742,439	690,150	39·5
1853	249,788	100,083	40·0
1855	331,025	131,327	39·7
1871	322,711	124,831	39·0
1872	310,607	113,196	36·4
1892	331,077	151,626	45·8.

It will be seen from these figures that, in the absolute amount of sickness and death caused by cholera, the epidemic of 1892 must be counted as the third most severe that has ever visited Russia. The totals of last year were exceeded only by those of 1831 and 1848.

Unfortunately the ratios borne by the numbers of cases and deaths to the population are not available for the earlier epidemics. Were they so, it would probably be found

that in each of the years 1855, 1871 and 1872 a larger proportion of the population was attacked by cholera than in 1892, as the number of inhabitants must have greatly increased since those years. The proportion of deaths to population, on the other hand, would probably be found to exceed by little, if at all, that attained by last year's epidemic, as the percentage of fatal cases in each of the three years named was markedly less than that observed last year. Indeed, if this percentage be taken as the standard, it will be found that the cholera of last year was much more fatal than that of any preceding year. The percentage mortality last year was 45·8; the highest in any earlier epidemic was 42·2 in 1831.

The value of this comparison must, of course, rest upon the accuracy of the returns made of the numbers of cases and deaths. The figures in every case are only approximate, and the errors, particularly in the earlier records, may be considerable. It is worthy of note, however, that the tendency of the errors would be towards an understatement of the number of cases rather than of the number of deaths (cases which died being more certain of record than those which recovered); and that therefore the percentages of fatal cases, as expressed in the table, would be rather above than below the truth. It may be asserted with confidence that in no earlier outbreak have the numbers been recorded with so near an approach to accuracy as in that of last year. The conclusion then is more than justified that the percentage of deaths to cases was greater in the recent epidemic than in any that preceded it. In other words, the cholera was more virulent and the chances of recovery in any individual case were less in 1892 than they have ever before been known to be in Russia.

CHAPTER VI.

THE FAMINE AND THE CHOLERA EPIDEMIC.

The Distribution of the Famine of 1891 and the Cholera of 1892 compared. Had the first any influence over the second? Insufficiency of data for a final answer. The Statistics of the two phenomena not conclusive. Evidence of speakers at the St. Petersburg Cholera Conference. Balance of evidence against any connection between the two phenomena. Such a conclusion supported by previous instances.

The occurrence in successive years of two such widespread and death-bearing phenomena as a famine and an epidemic of cholera has naturally raised the question as to what effect, if any, the earlier event had on the later.

It was not unnatural to expect that a peasantry already weakened by want of food and suffering from various gastric disorders caused by the use of improper food (such as weeds, the bark of trees etc.) would have fallen a more ready prey to the cholera virus than a population in ordinary health.

The question is one of great complexity and many of the data upon which any final reply must be based are wanting. The amount of suffering caused by the famine is not an entity that can be expressed in figures. Neither the

percentage yield of grain in each province on the average of previous years nor even the actual production per head of the population can be taken as a true index to the resulting distress. The amount of aid given by the Government and the assistance received from private charity are factors of obvious importance; and though the statistics of the first have been published those of the second are not,¹⁾

Statistics of the Famine of 1891 and the Cholera Epidemic of 1892.

Name of government.	Percentage of harvest yield of 1891 on average of years 1886—90 (all crops except potatoes).	Harvest yield per head of population ²⁾ in poods (all crops, including potatoes).	Cases of cholera per 100,000 inhabitants.	Percentage of deaths to cases.
Voronezh	24·8	1·61	894	50·2
Kazan	40·7	3·59	380	44·4
Tambof	44·6	9·06	733	42·7
Riazan	45·0	9·5	90	51·0
Simbirsk	45·8	7·64	1028	42·8
Penza	49·0	9·79	483	45·4
Samara	51·2	5·77	1556	43·8
Saratof	52·0	10·74	1721	50·3
Orenburg	52·7	2·79	746	51·8
Kursk	65·5	14·24	397	41·8
Tula	66·8	21·13	84	29·0
Nijni Novgorod	70·0	12·32	280	44·0
Viatka	70·5	12·81	343	45·3
Orel	70·6	19·14	72	41·6
Ufa	74·5	9·92	353	47·7
Perm	75·0	14·07	150	48·7
16 distressed governments	—	—	607	46·3
44 remaining governments	—	—	197	41·4

1) Continued on page 48.

2) The weight of food-grains required for each head of population for all purposes (including distillation for alcohol) is reckoned at 4½ poods. A poods is equal to 36 pound English.

and cannot be, available with even approximate accuracy. It has therefore been necessary to ignore altogether the modifying influence of the assistance derived from both these sources.

In the table on the preceding page the sixteen governments in which the harvest yield of 1891 fell below the average are named, and I have endeavoured to discover, by placing in parallel columns the statistics of the harvest and those of the epidemic, whether any correspondence could be observed between the two sets of figures. For the information upon which the first column of figures is founded I am indebted to the exhaustive „Report to the Foreign Office on Russian Agriculture and the Failure of the Harvest in 1891“, written by Mr. E. F. G. Law. The second column of figures is borrowed directly from the same source.

From these limited data it will be seen that the sixteen famine-stricken governments of European Russia furnished a much larger proportion of cases of cholera than the forty-four remaining governments that had not suffered from dearth; and further, that the percentage of fatal cases in the distressed governments was considerably greater than in the non-distressed ones.

The number of cases per 100,000 inhabitants was higher than the average for European Russia in eleven of the distressed governments and lower in five. The percentage of fatal cases was above the average in six of the same governments and below it in ten.

But the fact that the area of greatest intensity of the epidemic coincided to some extent with the famine area is obviously not conclusive evidence that any relation of cause and effect existed between the two phenomena. It cannot escape remark that the government of Astrakhan and the Don Cossack province, neither of which had suffered from dearth, were much more severely visited by cholera than

any of the famine-stricken governments; nor that, the famine-stricken governments amongst themselves failed to show any correspondence between the statistics of the harvest yield and those of the epidemic (as expressed in the columns of the table).

Where so many factors were undoubtedly at work in determining the intensity of the epidemic more detailed observations are necessary to discover the part played by any one in particular.

Such observations were furnished to some extent in the discussions at the Conference on Cholera held in St. Petersburg last December. The majority of the speakers on this subject were unable to observe that the suffering caused by the famine had any influence whatever on the extent or fatality of the cholera epidemic. The representatives of the governments of Saratof, Kharkof, Voronezh, Simbirsk and Kazan observed an entire want of correspondence between the intensity of the famine and that of the epidemic in the various *uyezds* (districts) into which these governments are divided. In some districts, where the famine of 1891 was particularly severely felt, there were outbreaks of typhus and typhoid fever and of scurvy, but these districts suffered even less than others from cholera. Two observers only, the representatives of the governments of Perm and Tula, had noted a correspondence between the distribution of the famine and that of the epidemic.

The balance of evidence therefore points clearly to the conclusion that the weakened condition of the peasants in the famine-stricken governments did not predispose them to contract cholera. May not the further generalisation be drawn that the pre-existing state of health of a given population is a factor of little if any importance in affecting the spread or fatality of a cholera epidemic? Such a conclusion is supported by precedents both in individuals and in communities. It has frequently been observed that per-

sons of the strongest constitutions and in possession of the soundest health have been attacked by cholera and succumbed to it as readily as their weaklier neighbours. Nay, in some instances the disease has appeared to select the stronger members of a community in preference to the weaker. Thus, in an epidemic which broke out amongst the 1st Bengal Fusiliers in 1855, it was noted that „it seemed as if the disease had laid its hands on some of the finest and best soldiers of the regiment“¹⁾.

But a more obvious parallel to the present instance is to be found in the occurrences of the years 1832—33 in Russia. In the years 1832 and 1833 the southern and central governments of European Russia were visited by a famine that had never been equalled before, nor has it since, in the fearful distress which it caused amongst the peasantry. Starvation and its attendant ills, scurvy and fevers, typhus and typhoid, carried off the population by tens and even by hundreds of thousands²⁾. On June 15th, 1833, cholera appeared in the government of Voronezh and spread thence to twenty-four other governments; and yet, though the epidemic was widely spread over the area that was suffering from famine, it at no time and in no part of this area attained any great intensity. Only five governments were at all severely visited by cholera, and in none of these did the number of deaths recorded rise as high as 100 per 100,000 inhabitants. In the whole course of this epidemic there were reported only 14,428 cases and 5330 deaths. The proportion of deaths to cases was thus rather less than 37 per cent.

1) Macnamara: A History of Asiatic Cholera.

2) In 1833 the expected natural increase of the population of Russia fell short by 415,000.

CHAPTER VII.

THE METHOD OF SPREAD OF CHOLERA.

Evidence as to the means whereby the Cholera was spread. Instances of its spread by means of water; and by fomites. Instances in which no source of infection could be discovered.

The experience of last year's epidemic has added a large body of evidence to that furnished by earlier outbreaks upon which conclusions may be founded as to the means by which cholera is spread from one district to another.

In tracing the disease from its first introduction across the Persian frontier throughout the Russian Empire it has, I think, been clearly shown that cholera followed the main lines of human communication; and that where these lines coincided with a great river — such as the Volga — the spread of the disease was much more rapid than where communication was mainly by railways.

These were the conclusions to be drawn from the behaviour of the epidemic viewed as a whole. The object of the present chapter is to bring together evidence as to its behaviour in individual cases. The evidence has been col-

lected from various sources, but principally from the discussions at the Conference on Cholera held in St. Petersburg last December, and from the medical and lay press at the time of the epidemic.

In almost every instance that has been recorded where the means by which the infection was carried was known the course of events was somewhat as follows. A person coming from an infected district to one that had hitherto been free from the disease sickened with cholera soon after his arrival. The earliest subsequent cases in the town or village occurred amongst members of the household of the first patient, amongst persons who had been in contact with the first patient or with articles soiled by him, or amongst persons who had drunk water from sources polluted, directly or indirectly, by the dejecta of the first patient. I may be pardoned for giving in some detail the following instructive histories.

In the village of Ulybyshef (Vladimir government) a labourer arrived on June 29th from Kazan, where he had attended the funeral of his brother, who had died from cholera. Three days later he sickened with the disease in the morning and died in the same evening. The clothes he had worn remained in an outbuilding for a week. They were then washed in a stream from which the village drew its water-supply. In a very short time cholera became epidemic throughout the village.

In the government of Viatka five villages situated along the banks of the same stream were invaded by cholera. The infection was traced to the systematic washing of linen belonging to the early cases in the stream which provided the inhabitants of all the five villages with their drinking water. No sooner was this practice forbidden than the epidemic began to abate.

In the village of Upper Moulla (Perm government) an exactly similar relation of cause and effect was recorded.

The linen of cholera patients was washed in a pond. From the same pond the inhabitants drew their supply of drinking water, with the result that cholera raged throughout the village. As in the last instance, as soon as the washing of linen in the pond was put a stop to, the number of cases of cholera in the village began to diminish.

In the village of Borki (Samara government), lying on the River Samarka, the first case of cholera was that of a woman. After a short interval a peasant was seized with cholera upon a barque lying at anchor a short distance further down the river. The disease then became epidemic solely amongst that portion of the population which drew its drinking water from the river. The remaining inhabitants, who drank water obtained from wells, remained free from the disease with but one or two exceptions.

In Great Bereznikof, a village in the Simbirsk government, an exactly parallel instance was recorded. Cholera attacked only that part of the village which drew its water-supply from the river Kshi, whilst amongst the inhabitants of the other half of the village, whose drinking water was derived from wells, there was but a single case — that of a beggar woman to whom had been given some clothes from an infected house.

In two villages in the Tambof government, in each of which a dual water-supply existed, it was observed, in like manner, that cholera was confined to one portion of the inhabitants. In each instance it was found that this portion of the inhabitants drew its water-supply from a pond contaminated through the washing of linen of cholera patients. The rest of the village, supplied with well water not so contaminated, did not furnish a single case of cholera.

The part played by water in the diffusion of cholera was clearly illustrated at the beginning of the epidemic in St. Petersburg. It was found that the earliest cases were confined to the workmen in the large factories situated on

the banks of that branch of the Neva known as the Great Nevka. The workmen were accustomed to drink water derived directly, without filtration or boiling, from this branch of the river — water which at all times is charged with much organic matter (14 parts in 100,000), and which produces gastro-intestinal catarrh in all persons unaccustomed to its use. It was at once arranged that water should be supplied to the workmen from the town waterworks and that this water should be filtered or boiled before drinking. The effect of the change in the water-supply was immediate, and there was no further spread of cholera in that part of the city.

Another instructive case was furnished by one of the St. Petersburg prisons. A prisoner who had been in solitary confinement for more than a month was suddenly seized with all the symptoms of cholera. Bacteriological and post-mortem evidence confirmed the diagnosis. All the prisoners were supplied with boiled water, and for a time the source of infection remained an enigma, which was only solved by the discovery that the deceased had drunk a quantity of unboiled water provided him for washing purposes. Steps were immediately taken to furnish all the other prisoners with boiled water for whatever purpose required.

In every case cited hitherto water was the direct means of spreading the cholera infection. In another group of instances the same part was played by fomites. In Djigauri (Tiflis government) a woman arrived on July 9th from Tiflis, where she had lost a daughter from cholera. On the following day she asked her neighbours to help her to put her effects into a waggon. These had been brought from Tiflis without disinfection. Five of the persons who assisted her were seized suddenly on the same day with cholera.

In the village of Petropolis (Kharkof government) a woman returned on July 31st from an infected district,

where she had lost a child from cholera. She brought with her the soiled clothes and linen of the deceased. On Aug. 1st a woman who had helped her in her housework sickened with all the symptoms of cholera, and from that date the disease spread rapidly throughout the village.

A case in the Voronezh government is of particular interest. On July 25th two peasants from Rostof-on-Don, where cholera had prevailed for nearly a month, came to the house of a peasant named S— in the village of Egorovka in order to pay him a debt. The coins were held by S— *in his mouth* for a considerable time. The three men then drank to excess of *vodka* and ate a quantity of *kolbasa* (a variety of German sausage) which had been brought from Rostof. On the following day S— died from cholera. Five members of his family also succumbed to the disease. A peasant who not only read prayers over the body of S—, but also drank freely of the remaining *vodka*, was the next victim. The epidemic spread amongst the relatives and friends of this peasant, and in the village of Egorovka alone there were 175 cases and 70 deaths from cholera.

In the village of Molokhovo (Nijni Novgorod government) two women were occupied on Aug. 8th in digging potatoes in a kitchen garden. In the same garden the dejecta of a cholera patient had been buried. On Aug. 9th both women sickened with cholera and died.

In many other cases no mention is made of water or fomites as the medium of infection, but cholera spread in the first instance amongst the relatives of, or amongst persons immediately surrounding, the first patient.

Finally, in some districts the earliest cases of cholera occurred amongst persons who had not been exposed, so far as could be discovered, to any obvious source of infection. The town of Astrakhan is an instance in point. The telegrams of the time to the Russian newspapers asserted that the town remained free from cholera until June 18th,

although cases had occurred as early as June 13th upon boats coming from Baku and remaining in quarantine in the roads at a considerable distance from the town. It appears, however, from a brief pamphlet issued by Dr. Erimieief, the director of the cholera bureau at Astrakhan, that as early as June 14th a local resident was seized with all the symptoms of true Asiatic cholera, that on the 15th a second case occurred, and that neither of these persons had had any communication, direct or indirect, with any certain or suspicious case of cholera. Such instances are, however, few in number, and careful investigation would doubtless diminish them still further, even if it did not discover in every case some source of infection that had been overlooked. The evidence is, indeed, overwhelming that cholera does not originate *de novo*, but that every case of the disease is the result, directly or indirectly, of some pre-existing case.

CHAPTER VIII.

INFLUENCES WHICH DETERMINED THE INTENSITY OF THE EPIDEMIC.

An endeavour to account for the Distribution of the Epidemic. Geographical Influences. Meteorological Influences. Influence of the mode of life and Customs of the Inhabitants. Influence of the Measures taken to meet the Epidemic. Possibility of an alteration in the virulence of the Cholera Poison.

It remains to consider the relative distribution of last year's epidemic in Russia, and to endeavour to account, if possible, for its severity in one place and its mildness in another.

The extraordinary ravages which the disease wrought in the south and east and the comparative immunity of the north and west cannot be explained alone by geographical or meteorological differences, by differences in the mode of life and social and religious customs of the inhabitants, by differences in the activity of the measures taken to meet the epidemic, or by a difference in the virulence of the cholera poison. Each and all of these were doubtless factors in determining the amount of suffering and death due to cholera in any given district, but the exact influence exerted by any one of them cannot of course be measured.

It would be beyond the scope of the present volume to attempt to decipher in full the part played by either geographical or meteorological conditions in the spread of cholera; but it is at least a striking fact that the two provinces which suffered most from the epidemic, those of Astrakhan and the Don Cossacks, are two of the flattest and most low-lying provinces in European Russia. Further, the government of Astrakhan lies at the estuary of the Volga, which drains by countless mouths into the Caspian Sea. Many parts of the government and even of the town are actually below the level of the river, and are annually inundated by its overflow. Here, then, are conditions known to be favourable to the diffusion of cholera, whether Professor von Pettenkofer's theory be accepted or not.

The effect which the weather has upon a cholera epidemic is not fully known, but that heat tends to favour its development is a well-established fact. It cannot be altogether without significance that the disease was much more active in the warm southern governments than in the cooler northern ones, or that in those governments where the epidemic only appeared towards the end of the summer it obtained hardly any hold whatever.

Much might be written upon the mode of life and social and religious customs of the inhabitants of Russia and the part which they bore in fostering the cholera epidemic. Not a little has already been written upon this subject, and the insanitary condition in which the Russian peasant lives has been painted in colours sufficiently vivid to satisfy even the most Gargantuan appetite for sensation. The hygienic surroundings of the moujik are, however, neither so bad as they are painted nor so bad as those of his Oriental brethren, the Tatars, Kirghiz and other Asiatic tribes who find their home in the south and east of European Russia. In Astrakhan more than half of the population is Asiatic. All that part of the government which lies

to the east of the Volga is occupied entirely by the so-called Inner Bukeëf Horde of Kirghiz. In the governments lying on the Volga the population is largely made up of Tatars, Kirghiz, Bashkirs and Tchuvash. The mode of life, the absence of sanitation and the religious prejudices of Mohammedan nomads have been commented upon in the earlier chapters. It suffices here to point to the fact that the cholera epidemic was most severely felt in those governments where the Asiatic element predominated amongst the population.

It is not intended to deny that the surroundings of the Russian peasant are extremely bad from a sanitary point of view. The fact is admitted and deplored by no one more than by the central authorities in St. Petersburg. Much has been done and is being done to improve the state of the larger towns, but the villages remain for the most part in a very primitive condition and exhibit an almost complete indifference to the need that exists for sweeping measures of sanitation. They are inhabited by an uneducated peasantry, who are entrusted to a very great extent with the management of their own affairs, so that it need not cause surprise that the laws of hygiene and prevention of disease are simply unknown amongst them, and, being unknown are universally broken. It is upon the spread of education that hope for future sanitary reform in the Russian village must rest.

The terrible mortality from gastro-intestinal catarrh alluded to when writing of the Caucasus may be taken as an index of the insanitary condition in which the Russian peasant lives. The causes of it are not far to seek. The food which he eats may have something to do with it. The staple of the diet is rye bread. It is black, acid and causes diarrhœa in many people who are not used to it. Soup made of fermented cabbage, dried fish, meat in no great quantity, salted herring, raw cucumbers and melons, with *vodka* and

kvass for drink, complete the diet. *Vodka* is a colourless spirit distilled from rye. *Kvass* is made from the fermentation of black bread; it is frequently adulterated.

The fact that many cases of cholera in St. Petersburg last summer were traced to the use of this drink led the authorities to make an investigation into the quality of the *kvass* ordinarily sold in the public-houses. Ten samples were sent to the public analyst, who reported that every one of the ten was unfit for human use. In the sediment found in each bottle was discovered a mass of lower organisms, infusoria, dust, fragments of rag and small stones. One sample was found to swarm with the „flour tick“ (*acarus farinæ*). In some of the samples were found small shot that had been used for cleaning the bottles. If such be the condition of the *kvass* consumed in the capital it is scarcely likely that that drunk in the villages is better.

Of even greater import in the production of gastro-intestinal catarrh, however, is the quality of the water-supply in the villages and country districts. It is condemned in round terms in the Annual Report of the Medical Department in a majority of the governments throughout the empire. The water is derived from rivers, springs or shallow wells. The ease with which these may be polluted has been seen in the instances already quoted, in which cholera was spread through the washing of linen in water which was afterwards swallowed by the villagers. There are numerous other sources of pollution which need not be enumerated here.

The bearing of these facts upon the spread of cholera is obvious, but I may be permitted to give one or two instances where bad water-supply (apart from any specific infection) and prevalence of gastro-intestinal catarrh were associated with a severe visitation of cholera.

The town of Astrakhan was a most striking instance. The water-supply is worse, gastro-intestinal catarrh is

(with a single exception) more prevalent and the cholera epidemic was more severe in Astrakhan than in any other town in Russia. A few figures will prove these statements.

Dr. Erimieief states that the water distributed to the inhabitants of Astrakhan contains in solution 17·3 parts of organic matter in 100,000, more than four times the highest limit compatible with fitness for use. If, further, the suspended matters be taken into account the water is found to be seven times more polluted than the worst potable water. It is passed through filter beds, but actually becomes fouler in the process than it was before, and the inhabitants frequently refuse to use the water from the waterworks, preferring to take their supply direct from the river or from springs. Of the total annual deaths in Astrakhan one-third, and sometimes more, are due to gastro-intestinal catarrh. This proportion is only exceeded in the town of Saratof. Finally, the absolute and relative numbers of cases and deaths from cholera were higher in Astrakhan than in any other town in Russia. Amongst a population of only 95,000 there were recorded 4798 cases and 3160 deaths. The case-rate was thus 5050 and the death-rate 3326 per 100,000 inhabitants. The percentage of deaths to cases was 65·86—that is to say, very nearly two-thirds of the cases proved fatal.

St. Petersburg was a second instance in point. The Vassiliefsky Ostrof, one of the large islands at the mouth of the Neva, is supplied with water of much worse quality than that distributed to other quarters of the town. From a series of experiments made last autumn it was found that whilst the water supplied from the municipal waterworks to the south side of the city contained from 48 to 330 micro-organisms per cubic centimetre, that supplied to the island contained from 939 to 9091. Of the distribution of gastro-intestinal catarrh in St. Petersburg I am unable to give statistics; but the distribution of the cholera epidemic

was most instructive. The island contains 9·3 per cent. of the total population of St. Petersburg, but it furnished 21·4 per cent. of the total number of deaths recorded in the capital.

It may be stated in passing that the total number of cases of cholera recorded in St. Petersburg to the end of the epidemic on Dec. 11th was 4391 and of deaths 1357, giving the comparatively low death-rate of 30·9 per cent.

The association of a bad water-supply and a severe outbreak of cholera was noted also in Warsaw, in Voronezh, the Crimea and in many other parts of Russia.

Only the briefest reference must be made here to the influence which the measures taken to meet the epidemic had upon its distribution. That they had some share in controlling the later course of the epidemic must, I think, be admitted. The governments of the south and east were taken in an almost totally unprepared condition, whilst those further removed from the source of the epidemic had time to marshal their forces and to meet the danger with something like adequate measures.

The part played by panic, as a result of unreadiness to meet the disease, will probably never be fully known. An Eastern legend says that God ordered the cholera to carry off 500 victims: in the end 3000 died. Five-sixths died from fear. The moral of this apologue was never better illustrated than in last year's epidemic. Panic was the direct means of introducing the infection into European Russia by the crowds flying from Baku and the Caucasus, and panic was one of the most powerful agents in distributing it throughout Astrakhan, and thence up the Volga and throughout the country.

The terrible riots in Astrakhan, Saratof, Khvalynsk and other places, and the reign of terror which followed in each case, spread the disease not only directly by the removal of patients from the hospitals, leaving them to die in the

streets or to creep back to their homes if they were able, but also indirectly by paralysing the authorities and by rendering it impossible to carry out even the most simple measures to check the epidemic. The disastrous effects of the riots in Astrakhan, at the very outset of the epidemic in Europe (they broke out on June 21st), at the very moment when the most energetic action was demanded, can scarcely be overrated. For five days panic was absolute. It will never be known how many people were attacked with cholera during that period. All that is known is that in those five days at least 316 persons died from the disease in Astrakhan, and that when order was restored cholera had spread far beyond the control of any measures that could be taken there.

Finally, one word may be said as to the possibility of a diminution in the virulence of the cholera poison having had some share in lessening the intensity of the epidemic as it travelled further. For the present this must obviously remain a matter of speculation.

CHAPTER IX.

THE EPIDEMIC AND THE GOVERNMENT.

An outline of the Scheme of Defence. Measures on the Persian Frontier; in Transcaspia; on the Caspian Sea; in the Caucasus. Measures upon Railways; upon Waterways, particularly the Volga. Local Sanitary Commissions; their duties and value. Notification forms. Orders relating to Disinfection.

Having traced the epidemic throughout each of the divisions of All the Russias, it will be of interest to note the line of defence followed by the Government. A perusal of the series of orders relating to the epidemic issued from St. Petersburg last May and June carries the conviction that the threatened danger was fully realised, that every effort was made by the central authorities to prevent the disease passing the frontier and to minimise its effects when it had entered the country, and that the measures which they recommended are deserving of more attention than they have hitherto received.

It may conduce to clearness to describe briefly the authorities from whom the orders were issued. It will be seen that they are many. Thus the Central Asian provinces are under the entire control of the Minister of War, and for all

measures in this part of the country he alone is responsible. On the Caspian Sea the naval authorities are paramount, but the eastern coasts of this sea are under the military authorities; whilst for any measures concerning the southern or Persian shores the Foreign Minister has to concert with the Persian authorities, and on the western shores the coöperation of the Minister of War and of the Governor-General of the Caucasus is necessary. For all matters concerning railroads and waterways the Minister of Ways and Communications is responsible, whilst regulations concerning the traffic of goods touch the domain of the Minister of Finance. Finally, a vast number of affairs relating to domestic organisation are under the control of the Minister of the Interior. From these various authorities, but more particularly from the Ministers of War, of Ways and Communications, and of the Interior, a number of detailed instructions were issued, which have since been collected and published in one volume, together with the more important regulations of recent years which still remain in force with regard to cholera.

It is not intended here, even if space and the reader's patience permitted, to review in detail all the ministerial orders directed against the epidemic; in their collected form they cover 98 pages of a large octavo pamphlet¹⁾, and bear vivid testimony to the activity of the governing authorities. But a short outline of the general scheme of defence, and a summary of the more important orders may not be without interest.

From internal evidence it may be gathered that the measures recommended were based on the following principles.

- 1) The comma bacillus of Koch is the cause of cholera.

1) More than half of the orders are from the War Office and relate only to the army, they are not referred to here.

One of the earliest circulars issued (1) ¹⁾ contained full instructions on the methods of detecting and cultivating the bacilli together with a list of authorities to be consulted on the subject.

2) Human communication facilitates the spread of the disease.

3) The *excreta* contain the bacilli and are in all probability the sole agents in carrying the infection.

4) The disease is not contagious in the ordinary sense of the term.

5) Hygiene and sanitation are the greatest enemies of cholera. A town or district is liable to infection in direct proportion to its insanitary condition.

The measures recommended were consequently directed to the removal as far as possible of all sanitary deficiencies before the approach of the disease, and to the localisation and destruction of the infection as soon as it manifested itself. For the last named purpose the main reliance was placed on the so called „quarantine - observation - points“ (карантинные наблюдательные пункты) and „medico-sanitary-reception-points“ (приемно-санитарные пункты)²⁾ established along the frontiers and along the main lines of communication throughout the country. A fuller description of these will be given later when speaking of the measures taken on rivers and railways; for the present their nature and object may be briefly indicated.

The „observation points“ were stations or landing stages where the following measures were carried out. All passengers were subjected to inspection by a medical man and any person shewing suspicious symptoms was detained

1) The figures in parenthesis refer to the list of orders in the note at the end of this chapter. The full title, source and date of each order are there given.

2) For the sake of brevity these will be spoken of as «observation points» and «reception points» respectively.

until the nature of the ailment declared itself. Accommodation was provided for the isolation and treatment of patients and provision made for the inevitable bacteriological investigation. Finally all goods and passenger's luggage were here disinfected by methods to be hereafter described.

The „reception points“ were lazarets or barracks constructed for the reception and treatment of cholera patients, along the course of rivers and railways. They coincided in many instances with the observation points; in other words wherever inspection and disinfection were carried out, there was provided accommodation for the reception of patients, but the reverse was not universally the case.

It is worthy of remark that Russia is a country of forests and that every Russian peasant can not only wield an axe, but can build an excellent wooden house with the aid of almost no other tool. A perfectly habitable lazzaret or „barrack“ hospital can thus be built in a very short space of time and at a comparatively light cost.

The first measures of the government were directed to preventing the introduction of the cholera infection into the country. It is important to remember that the Russian territory was threatened from Persia, across a land frontier, an arbitrary line unmarked by any great natural barrier. Along the western half of the Russo-Persian frontier (beyond the Caspian) a range of hills, the Kopet Dag mountains, forms a natural division between the two countries; but opposite Meshed (whence the disease was introduced into Russia) there is no geographical feature, such as river or mountain, to aid in checking the course of an epidemic.

For a distance of 460 versts along this portion of the frontier communication between the two countries was prohibited on May 15th. Ten „points“ were established at

intervals along this line, and all persons wishing to cross the frontier were subjected to a quarantine of 3 days, which was later extended to 7 days. On June 28th the whole of the Persian frontier, as far as the Caspian Sea, was closed. The Afghano-Russian frontier had been closed at the end of April.

All pilgrimages were forbidden. A strict examination of grain, flour and dairy products, which are imported in large quantities from Persia to Askhabad (the capital of Transcaspia) was carried out at the nearest observation point. All goods crossing the frontier were disinfected, and certain articles, such as undressed skins and raw fruits (with the exception of lemons and pomegranates) were prohibited admission to the country.

Such were the more important measures taken to prevent the introduction of the disease into Russia. It should be added that they were the result of concerted action on the part of the Russian and Persian authorities.

On May 19th¹⁾ the first case of cholera occurred on Russian soil at Kaachka, a Turkoman settlement and Russian town close to the frontier, and possessing a station on the Transcaspian Railway. The further efforts of the authorities were directed to the protection of this line. It may be well to remind the reader that the railway is of comparatively recent construction, having been completed in 1888. It brings large quantities of Central Asiatic goods from Samarcand, its present terminus in the east, through Bokhara, Merv and Askhabad to the shores of the Caspian Sea. It formed last year the first stage in the route by which the cholera epidemic passed into Europe.

In addition to the establishment of „observation“ and „reception“ points along the railway, an endeavour was made by the local authorities to cut short the course of the

1) All the dates mentioned are according to the «old style».

epidemic by enforcing a land quarantine of seven days at Bala Ishem, the third station from the Caspian end of the line, for all passengers travelling westward. This measure proved useless; six days later than the appearance of cholera in Kaachka three Persians sickened and died of the disease in Oozoon Ada, the Caspian terminus of the railway.

On May 27th an order (2) was issued by the Minister of the Interior detailing the measures to be observed to prevent the infection from crossing the Caspian Sea. In this order the principle of compulsory quarantine on *all* vessels coming from a port infected with cholera which had previously been in force, was abandoned; and quarantine was limited to such vessels as had themselves become infected. All cases of cholera occurring on a ship or in any port on the sea were ordered to be reported to the governing authorities at Baku, Astrakhan and Oozoon Ada, the three ports representing the west, north and east coasts respectively. The patient or patients were to be removed to the nearest cholera hospital.

The order further provided that all articles belonging to the patients should be either thoroughly disinfected or burnt, and that the ship with all its passengers should remain in quarantine for fourteen days, and undergo a strict process of cleansing and disinfection. No vessel was permitted to carry passengers without having a doctor on board. If the doctor declared the vessel to be free of disease, and no one on board was found on inspection to present any suspicious symptoms, the ship was immediately allowed free *pratique* and received a certificate to that effect. Passengers were forbidden to carry on board dirty linen, clothes or bedding without a previous process of washing and disinfection. The order concluded with detailed regulations for the registration, control and disinfection of coasting vessels.

At Astrakhan the local authorities imposed a quarantine of twelve days on all vessels, whether cholera had manifested itself on board or not. This measure did not attain the desired end of keeping the disease from the town, and seems to have led to a considerable amount of suffering. At one time more than 3,000 persons were in detention in the roads outside Astrakhan; but through some unfortunate mismanagement little care had been taken to furnish them with provisions or even fresh water, and the epidemic raged among them with fatal violence.

Cholera having appeared in Baku (June 6th) and in Astrakhan (June 18th) further government measures were directed to the two great lines of communication which start from these ports. To the Transcaucasian railway, which connects Baku with Batoum and Poti on the Black Sea, M. Gratcheff the senior Inspector of Railways was sent early in June by the Minister of Ways and Communications. To the Volga M. Fadëef the Director of the Department of roads and waterways was dispatched by the same authority.

The instructions to M. Gratcheff, dated June 10th (3) directed him on arriving at Tiflis the capital of the Caucasus to form a commission of certain specified local representatives. The duties of the commission were, to organise a sanitary service on the railway, to see that the numerous government orders for preventing the spread of cholera were carried out, and to concert with the local authorities all measures that seemed to be called for to check the epidemic.

Unfortunately the Transcaucasian railway, though a main, was not the sole channel by which the infection was carried. When cholera declared itself in Baku an uncontrollable panic seized the inhabitants; the authorities were paralysed and the epidemic raged unchecked by the most

elementary measures of precaution. Flight presented itself as the most likely means of evading infection. It has been stated on official authority that as many as 75,000 people fled from Baku during the first few weeks of the epidemic. The accommodation in the trains was insufficient to carry such immense numbers, and those who could not escape by rail did so by road or by sea. In this way the disease was carried in all directions at once from Baku as a centre, and many of the earliest cases occurred in places far distant from the railway.

The efforts of the commission were consequently directed, not to the hopeless task of confining the disease to Baku, but to the localisation and destruction of the infection wherever it appeared along the line.

The measures adopted were the same as those embodied in an order of the Ministry of Ways and Communications, issued on June 27th (4.b.). In compliance with this order similar commissions were formed on every line of railway throughout the country. The measures entrusted to them for execution group themselves into two divisions.

The first group were precautionary, and referred to the provision of disinfectants, the cleansing and disinfection of carriages and stations, particularly of the *retirades*; the provision of boiled water and cheap tea at all stations; the improvement of the sanitary condition of waiting-rooms, workshops, dwellings of railway-servants, and all other buildings under the control of the line.

The second group were directed to dealing with the disease when it had appeared in any district on the railway. Observation and reception points were established at junctions and at other stations appointed by the commissioners. The reception points were in no case more than 100 versts (67 miles) apart. For the immediate aid of persons taken ill on the train the order provided that a hospital wagon should be attached to the rear of every train. The condi-

tions that such a wagon should fulfil were fully described and may be briefly summarised as follows.

A third class carriage or a luggage van may be adapted to the purpose. It should contain three compartments, two for male and female patients and the third for the attendants; it should be provided with steps for the easy admission and removal of patients; it should possess means for boiling water and should be well lighted and warmed; the exterior should be painted white; the roof should be covered with canvas and in no case be made of iron, and finally there should be a through passage from end to end of the carriage. Each such wagon was under the charge of a *feldscher*¹⁾ and other attendants; and was provided with ice, disinfectants and all the means needed for „first aid“ treatment. The patients were placed in hammocks and were removed at the first reception point at which the train stopped.

In addition to railways it is necessary to remember that a very important part is played in Russia by waterways as one great means of communication. The Volga in summer, with its fleet of 600 steamers, carries all the traffic of the immense district through which it flows. There are no railways running parallel with it to connect the large towns on its banks. Certain lines run at right angles with the river, but south of Tsaritsyn (480 versts from the mouth) even these cease, and the town of Astrakhan is accessible only by water or by postroad. The traffic on the other large rivers is only less considerable than that on the Volga; and a large number of canals connecting the rivers with each other has covered the land with an elaborate network of waterways, forming a complete system of

1) A *feldscher* is a male attendant, who has undergone a course of hospital training, extending over four years. In many outlying parts of Russia they are in sole medical charge of considerable districts.

communication almost from one end of the country to the other.

The necessity for controlling this internal navigation during the epidemic was provided for by three orders, one already in existence since 1890 (5), and two others issued on June 3rd and June 10th of last year (6 and 7). As already stated the main reliance was placed on the construction of observation and reception points, at the most frequented landing stages. The lazarets at the reception points were either adapted from some suitable building already existing or were specially constructed for the purpose. They were ordered to provide the following accommodation; one male ward with ten beds and one with six, one female ward with four beds; two rooms for the medical staff; one for the Sister of Mercy; rooms for the *feldschers* and other attendants; a room for carrying out disinfection; bathroom, kitchen and offices. The staff of such a lazaret consisted of two physicians, two *feldschers*, a sister of mercy, five nurses and servants, a cook and laundress.

The opening of so many small hospitals along the railways and rivers naturally created a large demand for the services of medical men, *feldschers* and nurses. In order to meet this demand the Medical Department of the Ministry of the Interior offered sufficiently liberal rewards to army-surgeons, senior students and *feldschers* who were willing to proceed to the infected districts, to induce a large number to offer their services ¹⁾. The students were all such as

1) The payment offered was at the following rates:

	On appointment.	Monthly stipend.	Travelling expenses per 1000 versts.
Surgeons of rank of Staff-officer	Roubles. 450	Roubles. 115	Roubles. 75
Surgeons of lower rank	200	100	50
Students	200	60	25
<i>Feldschers</i>	60	43.75	25

A rouble is equivalent to (about) two shillings.

had entered their fifth year; they were sent principally from the Academy of Medicine in St. Petersburg to the country of the Don Cossacks and from the University of Kharkof to the Caucasus. The supply of Sisters of Mercy was derived from the Red Cross Society.

It may be noted in passing that this Society recently celebrated the 25th anniversary of its existence, having been founded by the late emperor Alexander II; it has been most active throughout the epidemic, not only in St. Petersburg, but in every part of the country.

The remaining provisions of the orders relating to inland navigation may be briefly summarised. An infected boat or landing stage was enjoined to carry a yellow flag by day, and at night two lights at the mast-head, a green above a red. Additional instructions related to the provision of adequate shelter in the form of barracks or tents for the labourers employed in loading and unloading boats; to the supervision of buffets and the provision of cheap tea and other refreshments on boats and at landing stages; and to the accommodation and early treatment of persons sickening with cholera in the course of the journey. For the last named purpose each boat carrying passengers was instructed to set aside a cabin under the charge of a *feldscher*, and furnished with all the means necessary for „first aid“ treatment. Another cabin was appropriated for the reception of the bodies of persons who died on the journey. Full instructions were further given for the preservation of cleanliness in every part of the vessel, „beginning at the hold“, and for its disinfection when necessary.

A body of Inspectors of the river boats is always in existence and with them lay the responsibility of seeing that these measures were carried out. Any captain or other person in authority who failed to comply with the instructions was liable to one month's imprisonment, or a fine not exceeding 100 roubles.

The powers of the river authorities, to whom the three orders just considered were addressed, are limited to the rivers and the narrow strip of land on each side of them, technically known as the „tow-path“. Beyond this the management of affairs is in the hands of the representative bodies of the governments, *uyezds* (districts), towns and rural communes into which the country is divided.

To these authorities an order, in some respects the most important, and certainly the most far-reaching, of any issued, was addressed by the Ministry of the Interior on June 9th. (8.). By this order each town forming the centre of a government or *uyezd* (district) was instructed to form a Sanitary Commission, consisting of medical men, to whom was entrusted the carrying out of all measures directed against the importation or spread of cholera in that particular district. The provision of accommodation in hospitals, the construction of additional lazarets, the arrangements for moving patients to hospital, the provision of immediate medical aid, particularly to the poorer classes, the organisation of means for disinfection were all matters under the immediate and sole control of the Commissions.

But in addition to this they were instructed to undertake, in conjunction with the police, a series of measures to improve the sanitary condition of the town and district under their charge, and were empowered to punish any person who refused to carry out the improvements which they recommended. Space will not allow of a repetition here of the excellent measures suggested or rather enjoined by the order. They may be summed up in the one expression „general sanitation“, with special attention to certain points as of paramount importance on the approach of cholera.

Nor was the fact forgotten that many of the peasant population, illiterate and superstitious, might, in their ignorance of the necessity of many of the measures adopted,

be aroused to dissatisfaction, or even active antagonism against the ruling authorities. In the light of the unfortunate riots which occurred later in so many parts of the country, the following paragraph of the order is of interest. „In carrying out all the measures here laid down, it is necessary as far as possible to avoid anything that may arouse excitement and dissatisfaction among the people; and it is particularly important to instil into all classes the conviction that the authorities are labouring to fulfil their task with the utmost consideration and zeal, and that their endeavours are directed solely to the common weal“.

How far the instructions relating to sanitation were carried out, and what effect they had in lessening the severity of the epidemic, it is difficult to say. The sanitary deficiencies, to the removal of which the efforts of the commissioners were directed, are undoubtedly very great in many parts of the country. To take one question alone, the water supply is declared by the Annual Report of the Medical Department to be of unsatisfactory quality in a majority of governments throughout the empire. The water is derived from rivers, springs or shallow wells, and in the country districts these sources are but too frequently contaminated. In some places Artesian wells have been bored, and in many of the larger towns a regulated system of water supply with processes of filtration is in use. But these are the exception.

It was of course impossible that the Sanitary Commissioners could remove in a few weeks the many insanitary conditions of which the bad water supply is a sample. But that they could do much is proved by the successful efforts of a similar commission formed in St. Petersburg. The thorough inspection and cleansing of every building, the removal and destruction of accumulations of rubbish, improvement even if only temporary in the water supply, in a word the removal as far as possible of all hygienic defi-

encies were measures of undoubted benefit in the capital, and there is no reason to suppose that they were not equally so in the provinces, wherever they were equally thoroughly carried out.

Apart from these general sanitary improvements, the measures insisted upon on the approach of cholera were principally: (1) Notification to the local authorities of all suspicious cases, (2) Thorough investigation and diagnosis of each case, (3) Isolation and disinfection.

For the purpose of notification an official form was provided, but with the object of gaining full statistical information on all points bearing on the nature and mode of spread of cholera, a second form was widely distributed to all medical men in the districts affected by the disease. Not only are the name, age, sex, address, occupation, condition of life, probable source of infection, date of sickening and result furnished by this form, but the wish is expressed in it that information be given, under the heading „remarks“, on the water supply, the soil, the habitations, the density of the population and the prevailing occupation of the inhabitants, the state of the medical service, and the measures taken for dealing with the epidemic in the town or district in question.

The filling in of this form was not compulsory, but the request of the Medical Department to supply these details in addition to those in the notification form has been largely responded to, and the result will be an immense quantity of valuable statistical material. Some time must yet elapse before these statistics can be arranged and published in an available form, but their appearance in the government report on the epidemic will be looked forward to as an event of considerable interest and importance.

The remaining orders must be briefly dismissed. An important circular appeared on July 2nd. „On the personal

measures of precaution to be observed in view of the epidemic“ (9). Beginning with the recommendation to change the general routine of life as little as possible, the circular points out what articles of diet should be avoided, insists on the necessity for cleanliness, and gives advice on a score of other important measures of personal hygiene. The early symptoms of the disease are described in clear popular language, and simple instructions given for early treatment, and for the disinfection of *dejecta*, linen and any other object soiled by the patient.

Five other orders relate to disinfection. The first issued on June 2nd (10), contained detailed instructions as to the disinfection of houses, linen, clothes, bedding and *dejecta* of patients suffering from cholera or other infectious disease. The order covers seven pages of close print, and its instructions not only express the best accepted views on the subject of disinfection, but are given in a thoroughly practical and useful form.

Two orders relate to the disinfection of goods in transit. The first (11) issued June 5th contained instructions as to the disinfection of all goods from an infected district passing through an „observation point“. The second (12) issued June 29th related more particularly to the treatment of Central Asiatic goods. With most articles the process of disinfection consisted in washing the wrappers or outer surfaces of the package with an antiseptic solution, milk of lime being most recommended. Certain packages, particularly such as contained wearing apparel, rags and bedding were ordered to be unpacked and the contents submitted to the action of steam in cameras specially constructed for the purpose.

Finally two orders relating to the supply of disinfectants were published on June 10th and July 3rd. The first (13) instructed all chemists to lay in a sufficient stock of disinfectants, and to sell them to the public at certain fixed

prices, the cost of the materials without charge for dispensing (*taxa laborum*).

The last (14) removed the import tax on all disinfectants brought from abroad.

This completes the long list of orders issued by the authorities in St. Petersburg to grapple with the cholera epidemic of last summer. Nothing has been said of the many Army orders, nor of the numerous measures already in force from previous years to guard the coasts and the internal lines of communication from an invasion of the disease. But enough has been said to justify the remarks with which this chapter opened: namely, that the Russian government was fully alive to the danger which threatened the country as soon as cholera was announced from Persia, and that on its part no effort was spread to minimise the effects of the epidemic in every possible way when once it had passed the frontier.

NOTE TO CHAPTER IX.

It has seemed more convenient to append in the form of a note a list of the orders published by the Russian government, rather than to insert their frequently long titles in the body of the chapter.

The measures are not given in chronological order but in the order in which they have been referred to:

- (1) Short instructions on the investigation of the dejecta of suspicious cases for the presence of the comma bacillus of Koch. (Army Medical Scientific Committee. 8th May 1892.).
- (2) Measures for guarding the Empire from the introduction of cholera from the Caspian littoral (Ministry of the Interior. 27th May 1892.).
- (3) Instructions to the Senior Inspector for taking measures on the Transcaucasian Railway. (Ministry of Ways and Communications. June 10th 1892.).
- (4) a. Measures for dealing with the cholera epidemic.
b. Sanitary measures upon railways in view of the appearance of cholera.
c. Instructions on the precautions to be observed and on the measures to be taken in a case of cholera. (Ministry of Ways and Communications. June 27th 1892.).

- (5) Rules for the sanitary supervision of river navigation during an epidemic of cholera. (Ministry of the Interior. July 13th 1870.).
- (6) Instructions confirming and amplifying the laws for the sanitary supervision of river navigation. (Ministry of the Interior. June 3rd 1892.).
- (7) On providing boats and landing stages with copies of these laws (5 and 6); and on the sanitary supervision of such boats. (Ministry of Ways and Communications. June 6th 1892.).
- (8) On the formation of Sanitary Commissions in towns forming the centres of governments and *uyezds* (districts), in order to prevent the introduction and spread of the cholera epidemic. (Ministry of the Interior. June 9th 1892.).
- (9) Personal measures of precaution against cholera. (Ministry of the Interior. July 2nd 1892.).
- (10) On the disinfection of houses, linen in infectious diseases. (Ministry of the Interior. June 2nd 1892.).
- (11) On the disinfection of goods carried through an „observation point“. (Ministry of the Interior. June 5th 1892.).
- (12) On the conditions of the admission of Central Asiatic goods within the limits of the Empire. (Ministry of the Interior. June 29th 1892.).
- (13) On the means of providing the public with disinfectants in infected districts at cheap rates. (Ministry of the Interior. June 10th 1892.).
- (14) On the free importation of disinfectants for government and public institutions. (Ministry of Finance. July 3rd 1892.).

CHAPTER X.

NOTES ON THE TREATMENT OF CHOLERA IN ST. PETERSBURG.

Introductory. Hot baths. Hot air baths. Copious hypodermic injections of salt solution, and copious rectal injections (Cantani's Hypodermoclysis and Enteroclysis). Internal treatment. Purgatives, not astringents, employed. Calomel. Internal antiseptics or microbicides. Stimulants, cardiac and nervine. Treatment of symptoms; vomiting, diarrhœa, cramps, uraemic symptoms.

In the foregoing chapters cholera in Russia has been discussed solely from the epidemiological standpoint. The clinical aspects of the disease have not been touched upon.

It was not part of my original intention to enter upon this branch of the subject.

Should the propriety be questioned of describing the treatment of a disease without first discussing the symptoms, pathology and aetiology, my reply must be twofold.

Firstly, even a brief clinical account of cholera, and of the conflicting views held as to its causation and pathology, would have demanded considerable space. The chapters devoted to this purpose must have exceeded in bulk those devoted to the general course of the epidemic. This would

have altered the character of the present treatise, which is intended mainly as an epidemiological study.

Secondly, while the experiences of last years epidemic in Russia have not greatly added to the general knowledge of, or greatly altered the views held upon, the symptoms, pathology and aetiology of cholera, they have afforded, as every fresh epidemic must afford, new material whereon to form conclusions as to the value of different methods of treatment.

It appeared to me that it would be useful to collate the methods of treatment adopted, and the conclusions arrived at as to their merits, by the distinguished physicians who were in charge of the hospitals devoted last summer to cholera patients in St. Petersburg and Cronstadt.

These notes are the result of frequent visits paid during the epidemic to the hospitals in question. In many of these visits it was my good fortune to be accompanied by Dr. Richard Sisley, and some of the following appeared in an article communicated jointly with him to the Medical Magazine¹⁾.

The hospitals which admitted the largest number of cholera patients were the Alexander Hospital in memory of Professor Botkin²⁾, the Obuchovski Hospital, the Alexander Hospital in memory of the 19th of February 1861³⁾ (the date of the Emancipation of the Serfs), the Mary Magdalene Hospital, and the Petropavlovski Hospital, in St. Petersburg, and the large Naval and Military Hospital in Cronstadt.

There is perhaps no disease for which so large a number of remedies have been proposed and tried and (many of them) abandoned, as for cholera. Methods of treatment

1) November 1892.

2) This hospital is henceforth referred to as the Alexander (Botkin) Hospital.

3) This hospital will be referred to as the Alexander (Serf) Hospital.

diametrically opposed to one another have been loudly praised and as loudly decried. A remedial measure which has met with almost universal approval may therefore not inappropriately be considered first.

The use of hot baths, though it has not the claims of a remedy aimed at the cause of the disease, has been found to be of undoubted value in practice. Not a little may be said for it in theory, for it at least fulfils a number of indications for a symptomatic treatment.

The method of giving hot baths varied in St. Petersburg. The temperature of the bath was usually about 32° Réaumur (104° Fahrenheit). At the Alexander (Serf) Hospital the patient was kept in the bath for twenty minutes at a time, and the bath was repeated from three to five times in the day. At the Obuchovski Hospital the patient was kept in the bath for from one to two hours.

It was found that the effect of these baths was very grateful to the patient in all stages of the disease. Dr. Levin at the last-named hospital and other observers agreed that the symptoms were also greatly relieved while the patient was in the bath and for some time after. The pulse was notably improved; an imperceptible radial pulse became perceptible, and a weak pulse became much stronger. Vomiting and diarrhoea were diminished; cramps were relieved or arrested; the cold extremities were warmed. It was also noted that the dilatation of the superficial vessels relieved the circulation, and that the action of the bath upon the skin tended to ward off the uraemic coma, which almost always supervened in severe cases.

Some modifications of the simple hot water bath were employed. With the object of increasing the action of the bath upon the skin turpentine was in some instances added, in the proportion of from one to three teaspoonfuls in the bath. Mustard was also sometimes added. At some of the hospitals in St. Petersburg a bath

of progressively increasing temperature was used, it was thought with success. It was commenced at a temperature of 29° Réaumur (97.25° F.), and this temperature was gradually raised to 34° Réaumur (108° F.), or even higher if the patient could bear it. The patient was kept in the bath for from one hour to one hour and a half. In every case after the hot bath the patient was immediately placed in bed between hot blankets. He was usually also encouraged to drink hot fluids (such as tea) in order to promote perspiration. In some cases pilocarpine was administered with the same object.

With the view of maintaining the warmth of the patient after the bath the following method was used at the Alexander (Serf) Hospital and at some other hospitals. A large sack of linen was stitched lengthwise in three or four places, so as to make, as it were, four or five narrow, parallel, adjacent sacks. A quantity of oats, heated in a stove till it could scarcely be touched by the hand, was then put into the sacks and distributed evenly in them. The patient being laid on this bed of oats, with or without an intervening blanket, according to the temperature, the sides of the sack were turned up over him. Such a sack retained its heat for two or three hours. Freshly heated oats were then substituted. This method was thought to possess the advantages that the heat was more evenly distributed than when blankets and hot bottles were employed and that the heat was retained for a longer period.

Hot air baths were applied in some cases. They appeared to possess the advantage that they could be given with less disturbance to the patient, and that a higher temperature could be borne by him than in the case of a water-bath. They also allowed of a freer action of the sweat glands. The apparatus in use for the hot air bath was of a simple character. An ordinary lamp was placed on the floor underneath one end of a metal chimney. The

other end of the chimney, which was bent at a right angle, projected into a „cage“ on which the bed-clothes were raised. The chimney conducted the hot air from the lamp to the space thus formed around the patients body. A very high temperature could in this way be produced and was well tolerated by the patient.

Of as frequent use, if not so universally approved, as hot baths were the injections, hypodermic and rectal, associated with the name of Cantani. They may be appropriately considered before passing to the internal treatment of the disease.

It will be remembered that subcutaneous and intra-rectal injections of warm fluid in large quantities were used by Professor Cantani of Naples in the severe epidemic of cholera in that city in 1884, and were highly praised by him under the names, more expressive than euphonious, of hypodermoclysis and enteroclysis¹⁾.

For the subcutaneous injections the solution originally employed by Cantani consisted of four grammes of chloride of sodium and three grammes of carbonate of soda to the litre of water. In St. Petersburg this was found to cause considerable pain, and consequently the composition of the fluid injected was modified. A solution containing seven grammes per litre of chloride of sodium was found to be equally efficient and less painful.

As a rule, from 700 to 800 cubic centimetres were received by the patient at one time, one-third of this quantity being injected into each of three punctures, the site chosen being usually the abdominal wall. The rate at which this large quantity of fluid was introduced into the subcutaneous tissue varied. In the Naval Hospital at Cronstadt the solution was allowed to flow in slowly by its own weight from a vessel held some five feet above the patient, the opera-

1) Vide «Lancet» 1885. Vol. II, pages 589, 637 and 728.

tion taking some twenty minutes. In the Obuchovski Hospital in St. Petersburg the solution was (sometimes at anyrate) rapidly injected by an ordinary piston syringe, all the three injections being completed in about one minute.

This method was modified at the Rojdestvenski Lazaret in St. Petersburg, by Dr. Puritz, who detailed his experiences at the Russian Conference on Cholera, held last December. His argument may be briefly stated as follows. The most salient symptom of cholera is the profound disturbance of the circulatory system. The heart's action is depressed; the blood-pressure is much below normal; the specific gravity of the blood is greatly increased. If subcutaneous injections of fluid are to be used to remove these morbid conditions they must be used in much larger quantities than those recommended by Cantani. Mainly through the loss of its watery constituents, 40 per cent. of the whole quantity of blood may be lost in cholera. This is equal to about 4 per cent. of the whole body weight. Two or three times this amount must be injected subcutaneously in order to make up the loss. On this argument the following method of treatment was founded. From 7 to 12 litres (7000 to 12000 cubic centimetres) were injected in the course of from two to five hours. The fluid was heated to a temperature of 44° or 45° Celsius (111° or 113° F.), experiments having shewn that after passing through the tubing the temperature of the fluid fell to 38° Celsius. One and a half litres were injected simultaneously at each of two punctures; that is to say, three litres were introduced at each operation. The operation occupied twenty minutes. It was repeated as the condition of the patient indicated, the blood-pressure being taken as the main guide. Good results were claimed for this rather heroic method of treatment. It was tried in twelve very severe cases of cholera and all but one recovered. In all the blood pressure is

stated to have risen, and the specific gravity of the blood to have fallen, to normal. The small number of cases in which this method was used are obviously insufficient to form grounds for any conclusion as to its value.

In a very large number of instances the hypodermic injections were taken advantage of as a means of administering alcohol. To each litre of the salt solution ten grammes of absolute alcohol were usually added. There is a very general consensus of opinion as to the value of this procedure. In cholera patients alcohol is but too often rejected if given either by the mouth or by rectal injection. Given hypodermically a large quantity can be introduced into the system, and is rapidly and easily absorbed.

Antiseptic precautions were always observed in inserting the needle for these injections, and any inconvenience from local inflammation or abscess formation was of the very rarest occurrence.

The pain caused by copious hypodermic injections is occasionally considerable. It appears however to be less than might have been anticipated; and in the apathetic state into which many cholera cases fall, the inconvenience is inappreciable. It was noted in many cases that a local tolerance was produced, the site of a previous injection being less painful than a new site. The swelling caused by the introduction of a large quantity of fluid rapidly disappears, and in less than one hour no trace is as a rule left. Its absorption may be hastened by massage during the period of injection.

High rectal injections were very generally employed in all the St. Petersburg hospitals. The fluid used was generally a solution of tannic acid, of a strength of one or two per cent., and at a temperature between 38° and 40° Celsius (100° and 104° F.). It was injected either by an enema syringe, or more frequently by the aid of gravity. The vessel containing the fluid was, in the latter case, held

at a height of $1\frac{1}{2}$ or 2 metres above the patient, and the fluid was allowed to flow by its own weight through caoutchouc tubing connecting the vessel with the rectal tube. Two or three litres, and sometimes even a larger quantity were thus injected at a time. The injections were repeated from three to five times daily.

The grounds upon which this form of treatment was adopted were principally the following. The contents of the lower bowel were removed; the bactericidal action of the tannic acid was of value; and its astringent powers were thought to have a beneficial action on the mucous membrane with which it came into contact. The injections also appeared to stimulate the heart's action, mechanically and by the raised temperature at which they were used. That such injections tend to raise the blood-pressure by absorption of the fluid, as has been suggested, does not appear probable. The mucous membrane of both small and large intestine are probably incapable of absorption in cholera, while it may be questioned whether the fluid passes the ileo-caecal valve and reaches the small bowel, at least in the majority of cases. That it may in some be proved by the instances on record where clysters have been vomited. The recent epidemic has furnished additional instances; rectal injection of a fluid containing creasote having been followed shortly after by vomiting of a fluid smelling strongly of creasote.

The use of such creasote injections was not general in St. Petersburg. They were highly recommended by at least one speaker at the Conference on cholera. Dr. Fedchenko (of Piatigorsk in the Caucasus) employed water containing as much creasote as it would hold in solution. It appeared to act favourably on the vomiting and on the diarrhoea.

Naphthalene was in some instances added to the rectal injections, in the proportion of from ʒi to ʒi in each injection.

Internal treatment of cholera was in St. Petersburg mainly directed to an endeavour to remove or to destroy the reputed cause of the disease.

Cholera was almost universally regarded as due to the invasion of the gastro-intestinal canal by living organisms, probably the comma bacilli of Koch. The symptoms of the disease were ascribed to the action of a poison produced by the bacilli and absorbed into the system. Slightly differing views were held as to the exact part played by this poison in producing the various symptoms, but they need not be repeated here.

The diarrhœa, being looked upon as a safety-valve, whereby the system got rid of large quantities of the poison that would otherwise be absorbed, was, within certain limits, encouraged. No attempt was, as a rule, made to check it by opium or astringents. Opium was, it is true, given in many cases, but with the object of relieving distressing vomiting and alleviating pain, and not on account of its action in checking the intestinal secretions.

Calomel was the remedy most frequently employed to promote the removal of the offensive contents of the intestine. In most cases a large initial dose of from 5 to 10 grains was given. In some instances this was repeated two or three times at half hour intervals. In all instances, if the first dose was vomited, it was repeated. Persistent vomiting, which is one of the greatest obstacles to internal medication in cholera, was checked by remedies which will be referred to later, when speaking of the treatment of symptoms. By the aid of these remedies the stomach was frequently enabled to retain a dose of calomel or other medicament which had at first been rejected.

Castor oil was given in some cases as the initial purgative, but it was thought to be of less value than calomel.

The large doses of calomel were repeated, at least in some cases, until the re-appearance of bile in the stools.

The drug was, in almost all cases, continued in small doses, one or two grains being given every two hours. These small doses were given, not as purgatives, but with a view to employing the microbicidal powers of the calomel.

With the same object, that of killing the bacilli in the intestine, many other agents possessing this power were also administered. Acids, from their known inhibitory action on the growth of cholera bacilli, were largely used. Salol and salicylate of bismuth, each of which splits up in the intestine into salicylic acid and another body, must be classed in this category of remedies. They were both in very general use in St. Petersburg last year. Salol in particular was stated by some observers to be of decided value. It was given in doses of 8 to 10 grains every two hours. The salicylate of bismuth was sometimes combined with the salol, and sometimes given alone, in doses of 5 grains every two hours.

Naphthalene was exhibited in some cases, and success was claimed for this drug in doses of $1\frac{1}{2}$ grains every two hours.

Other germicidal remedies which were tried were iodoform, resorcin, thymol, creolin, β naphthol and camphor. Little, however, can be said as to their value, and more than one of them was abandoned as utterly useless. Iodoform was found to be worse than useless, as it increased the vomiting.

The value of this class of drug remains a moot question. Supposing them to attain their end and destroy all the bacilli in the alimentary canal (a somewhat large supposition), they cannot of course touch the poison already absorbed into the system.

Another large group of remedies employed consisted of cardiac and nervine stimulants. They are clearly indicated in cholera and appear to have been of undoubted benefit in the cases seen last summer.

Ether, given by the mouth or subcutaneously, camphor, strychnine, digitalis, caffeine, musk, and alcohol are all of value. Alcohol was given in varying quantities. At the Alexander (Botkin) Hospital not more than one ounce of brandy was administered in the day. At all the other hospitals much larger doses were thought to be necessary, 6, 8, or 10 ounces being given in the twenty-four hours. As already stated a useful method of exhibiting alcohol was found in the addition of 10 grammes of absolute alcohol to each litre of the fluid used in the Cantani injections.

Oxygen, by inhalation or by hypodermic injection (the production of an artificial emphysema by injection of the gas) was not found to be of great service; its administration was difficult, and its use was for these reasons abandoned.

Finally a treatment of individual symptoms and complications was very largely resorted to, and not without considerable success in relieving the patient's sufferings, if not in curing his disease.

Diarrhoea, usually the most prominent symptom, was, as already stated, not as a rule checked. By some observers, however, if the diarrhoea was extremely profuse and appeared to threaten the patient's life from the immense and rapid loss of fluid by the bowel, it was considered advisable to attack this symptom directly and endeavour to arrest it. For this purpose opium and astringents were given internally and rectal injections containing opium, tannin or both combined were employed.

Vomiting was checked if at all severe. Any action it might have in removing poisonous matter from the alimentary canal was thought to be outweighed by its deeply depressing action on the heart and nervous system, while, if unchecked, it prevented the administration of medicine and nourishment. It was thought to be either of gastric or of cerebral origin. The first form could to some extent

be checked by remedies; the second appeared almost uncontrollable.

The remedies given for this distressing symptom were principally the following: ice, sucked and swallowed; acid drinks, such as a solution of citric acid (10 or 20 grammes to the litre of water, say ʒii to the pint); sinapisms to the epigastrium, which relieved both vomiting and pain; hydrochlorate of cocaine ($\frac{1}{6}$ to $\frac{1}{3}$ of a grain) by hypodermic injection in the same region; and morphia given by the same method.

Cramps were relieved by hot baths; by wrapping the limbs in hot flannels; by friction, either with the bare hand or with the hand encased in a glove moistened with spirits of camphor; and by the administration of opium or morphia.

The uraemic symptoms, which so frequently complicate severe cases of cholera, were combated by special treatment. This was mainly directed to an endeavour to relieve the kidneys by acting upon the skin. The hot baths (water and air) and the hot rectal injections were found to be of great service in this connection. Pilocarpine was given to increase the action of the sweatglands. Diuretics were also frequently administered. Of these may be mentioned digitalis, caffeine and diuretin. Diuretin (the sodio-salicylate of theobromin) in 15 grain doses proved at the Obuchovski Hospital to be of great value in re-establishing the renal functions, even after these had been in complete abeyance for two days. Warm diluent drinks, such as tea, coffee, barley-water, were also of use.

Other complications were treated on general principles, according to their nature.

With regard to diet the following may be noted. During the acute period little nourishment could be given on account of the vomiting. Milk and bouillon were the articles of diet most generally given; whey, eggs, meat-juice and peptones were also allowed. The amount of fluid was not

limited, and to relieve the intense thirst large quantities were frequently drunk. Cold effervescing, and acid drinks were recommended by some physicians, while others preferred very hot liquids, such as tea, coffee and hot soup.

It has been remarked with regard to the treatment of cholera that there are two classes of cases, the slight and the severe, and that, irrespective of treatment, cases belonging to the first group will recover and those belonging to the second will die. This may be true. On the other hand it may not be true. *A priori*, if not on the grounds of experience, much might be said against such a view. In other diseases a certain proportion of cases fall into a third group, — a class of cases which will recover if properly treated, but which will die if left alone or if improperly treated. There appears to be no reason why cholera should be an exception to this general rule.

It must be universally admitted that no specific is as yet known for cholera. Until the pathology and aetiology of the disease are fully known all treatment must be hesitating and empirical. But this need not prevent the continued use of remedies which in theory fulfil many of the indications of the disease, and in practice have been found to be of real value in its alleviation.

In the foregoing notes I have tried to present the opinions of many Russian physicians as to the value of the forms of treatment adopted by them; and to state which of them, in their opinion, conformed to the conditions just mentioned and which did not.

In the preface I have thanked these gentlemen for their kindness in freely communicating to me the results of their experiences. I would here ask their forgiveness if I have misrepresented or not adequately represented the views they expressed upon cholera and its treatment.

CHAPTER XI.

CHOLERA AND DISINFECTION IN ST. PETERSBURG.

Disinfection of dejecta. Description of the apparatus for boiling dejecta. Disinfection of wearing apparel; of bed-linen; of rooms or wards; of furniture; of closets, cess-pools, dustbins, drains and sinks. Volunteer disinfectors in St. Petersburg.

The importance of thorough disinfection in the presence of cholera is so universally recognised that no apology is needed for the following notes on the methods advocated and employed in St. Petersburg during the recent epidemic.

In the large hospitals of this city, where as many as two or three hundred cholera patients were under treatment at the same time in one institution alone, the question of disinfection was one of the first importance, not diminished by the facts that all the liquid portion of the excreta passes directly into the drains, the drains open into the canals which intersect every part of the city, and the canals communicate directly with the river Neva.

Various methods were used for the disinfection of the dejecta, of wearing apparel, of bed linen, of the walls and floors of rooms or wards, of furniture, and finally of closets, dustbins and drains. In the following notes each of these objects is considered in the order named.

The dejecta naturally claim the first place. The most usual method employed was to add to them a solution of carbolic and sulphuric acids. This solution is prepared as follows: To three parts by weight of impure carbolic acid (50 per cent.) add one part of sulphuric acid; this must be done slowly, with sufficiently long intervals to prevent the development of heat, and with constant stirring. It is advisable to surround the vessel containing the mixture with ice or cold water. The mixture is allowed to stand for two or three days. When required for use it is diluted by adding $1\frac{1}{2}$ lb. to $1\frac{3}{4}$ lb. ¹⁾ (615 to 682 grammes) of the mixture to a *vedro* ($21\frac{1}{2}$ pints or 12·3 litres) of water, with energetic stirring. In this way is produced a from 5 to 6 per cent. sulpho-carbolic solution. The dejecta having been collected in wooden barrels, well tarred on the inner surface, an equal amount of the sulpho-carbolic solution is added and the mixture stirred. This was found by experiments made by Dr. Levin at the Obuchovski Hospital to be efficient, attempts at cultivations from the dejecta thus treated having proved abortive.

But as heat is considered the most absolutely certain method of sterilising fluids, the further process of boiling the dejecta was adopted. The Alexander Hospital, founded in memory of Professor Botkin, (the large city hospital for infectious diseases, devoted last summer entirely to cholera cases), was the first to put this radical method of disinfection into practice. The apparatus employed there is shewn in the accompanying drawing, and may be briefly described.

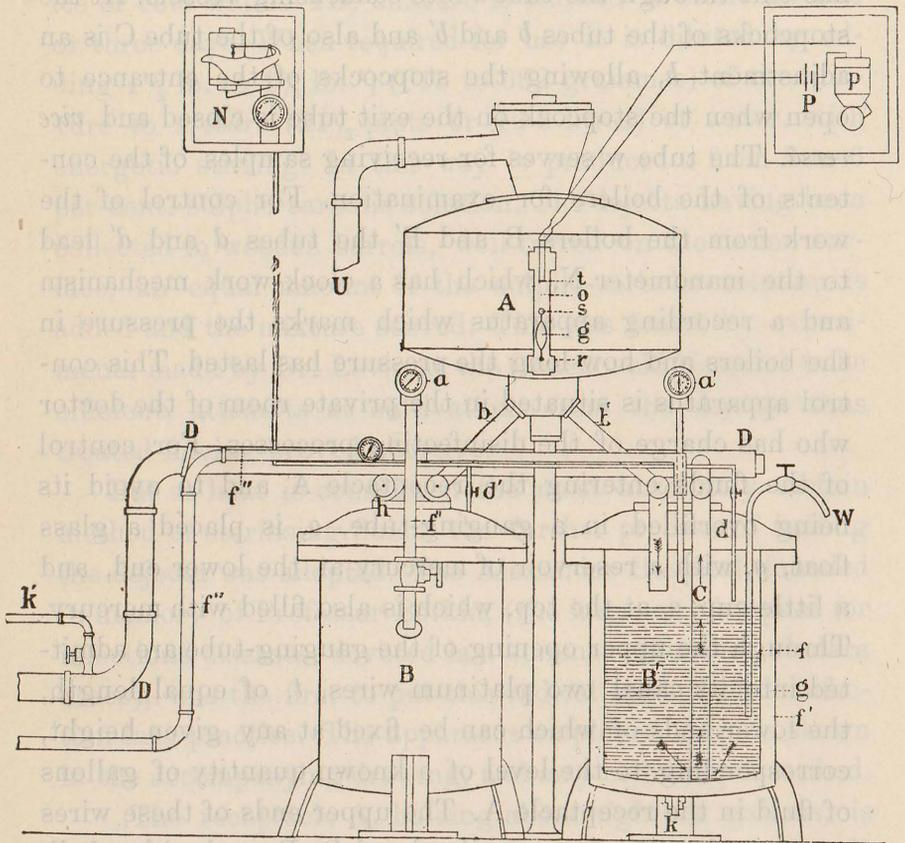
„The receptacle A, holding about eighteen gallons, is joined by means of tubes *b* and *b'*, with the two boilers B and B', having double walls *f* and *f'*, capable of supporting a pressure up to seven atmospheres. The pipes *b* and *b'* open within the boilers in such a manner that the end of

¹⁾ In the Russian Pharmacopœia one pound (fluid or solid) equals 12 oz. Throughout this chapter the Russian pound alone is spoken of.

each stands out a little from under the lid of the boiler. Into each of the boilers is led another tube, C, going almost to the bottom, which unites with the tube D for the purpose of passing the contents of the boilers into the drain. Each boiler is provided with a manometer *a* and *a'*, showing the pressure within the boilers. The steam from the general steam boiler is led by the tube *f'* into the interval, *g*, between the walls of the boilers, and having done its work has exit through the tube *k* into condensing vessels. At the stopcocks of the tubes *b* and *b'* and also of the tube C is an adjustment, *h*, allowing the stopcocks of the entrance to open when the stopcock on the exit tube is closed and *vice versa*. The tube *w* serves for receiving samples of the contents of the boilers for examination. For control of the work from the boilers B and B' the tubes *d* and *d'* lead to the manometer N, which has a clock-work mechanism and a recording apparatus which marks the pressure in the boilers and how long the pressure has lasted. This control apparatus is situated in the private room of the doctor who has charge of the disinfecting processes. For control of the fluids entering the receptacle A, and to avoid its being overfilled, in a gauging-tube, *o*, is placed a glass float, *g*, with a reservoir of mercury at the lower end, and a little cup, *s*, at the top, which is also filled with mercury. Through the upper opening of the gauging-tube are admitted into its canal two platinum wires, *t*, of equal length, the lower ends of which can be fixed at any given height, corresponding to the level of a known quantity of gallons of fluid in the receptacle A. The upper ends of these wires are united with elements (Laclanché), P, and with a bell, P, placed in the building of the general boilers of the hospital, and therefore near to the firemen and machinists.

„The whole process of disinfection is carried out thus: — From the receptacle A the fluid flows through the tubes *b* and *b'* into the boilers B and B'. Into the now empty re-

ceptacle fresh quantities of fluid are introduced while that is being disinfected in both boilers, so that the one process does not prevent the other. When the boilers are filled steam is admitted through the tube f' into the interval g between the walls of the boilers. The degree to which the fluid is heated is shown by the manometers acting on the recording apparatus N. When the process is finished the stopcocks of the tubes C open and let out the contents of



the boilers into the drainage-pipe by the tube D, cold water being previously admitted into this last through the tube k' , for mixing with and cooling the disinfected fluid.

„The whole process, counting from the moment of filling the boilers and entrance of steam till the exit of fluid into

the drain, takes about an hour, during which the pressure as shown by the manometers attains that of three atmospheres, with a pressure of four atmospheres in the great general steam-boiler. This time is shorter if the boilers work constantly — i. e., their walls being warmed by the previous boiling are not cooled by the new portion of fluid entering them. This apparatus was invented by MM. Vassilief and Krel, and the diagram is taken from Dr. Krupin's book¹⁾. I have to thank Dr. Krupin for permission to reproduce the drawing of the apparatus.

Another means used for sterilising dejecta was to add a 20 per cent. milk of lime, prepared as follows: To 20 parts by weight of lime, which should preferably be newly burnt, are added 80 parts of water in a wooden or earthenware vessel, slowly and with constant stirring. After this solution is added to the dejecta the mixture should be allowed to stand for three or four hours. A solution of chloride of lime may also be employed of a strength of from 2 to 4 per cent.

Wearing apparel was treated according to the material of which it was made. All linen garments (to which may be added sheets, towels etc.) were on removal from the patient rolled up in a sheet or put into a bag moistened with a 4 per cent. solution of chloride of lime and removed to the disinfector. They were immediately placed in a hot solution of carbolic acid and soap and allowed to soak for one hour. This solution is prepared thus: Pure carbolic acid (100 per cent., if of less pure quality some of it remains undissolved and may stain linen) is added to a solution of soap in water in the following proportions: To one vedro (21½ pints or 12·3 litres) of water, in which are dissolved 1½ lb. (615 grammes) of soap, are added 200 grammes of

1) Quoted from a description of the apparatus communicated by Dr. Richard Sisley to the *Lancet*, December 31st 1892.

the acid. The solution should be clear and of a yellowish colour; it is used at a temperature of from 50° to 80° C.

Woollen clothes, and indeed all articles that are not spoilt by moist heat, were disinfected by the action of steam at a temperature of 100° C. This question received the most detailed consideration at the hands of Dr. Krupin, who is in charge of the large disinfecting camera at the above-mentioned Alexander Hospital. Here the chamber into which the steam is admitted is rectangular; at each end of the chamber is a door opening into separate rooms, the one for receiving infected articles, the other for removing them after disinfection. A thermometer is inserted in the centre of the articles with an automatic arrangement for ringing an electric bell as soon as the temperature at the point where the thermometer lies reaches 100° C. From the time that the bell rings the articles are left in the apparatus for from half an hour to one hour. From the designs of Dr. Krupin a firm of engineers in St. Petersburg has supplied a number of smaller disinfecting chambers of cylindrical form to many of the other hospitals of the city.

A simple and inexpensive method of improvising a steam disinfector is described in a circular of the Medical Department of the Ministry of the Interior issued last year. I have not seen one in use. It is described as follows: On the top of an ordinary kitchen or washing boiler is placed a simply made cask or barrel, which should closely fit by its lower edge to the upper edge of the boiler. In the bottom of the cask are pierced a large number of holes; in its lid, which should fit tightly, are two small holes, in one of which is fitted a cork transmitting a thermometer, the other being a very small one for the exit of steam. Inside the barrel are screwed hooks on which to hang the articles to be disinfected. The boiler being heated, steam enters the cask by the holes in the bottom, passes over the articles and

escapes by the hole in the lid. The process is continued for an hour after the thermometer marks 100° C.

Certain substances, such as leather and furs, are spoilt by steam, but objects made of wool, hair, down, feathers, linen, hemp, cotton, silk, cloth of all sorts, velvet or plush, such things as books if unbound, mattresses, blankets and carpets may all be disinfected in this way without injury. Objects which are injured by steam were submitted to the action of chlorine gas in a specially prepared chamber.

The disinfection of wards which had been occupied by cholera patients was effected at the Alexander Hospital by thoroughly syringing the walls, ceiling and floor with a solution containing one part of corrosive sublimate and one part of chloride of sodium in 1000 of water, followed by thorough ventilation for some days. The use of a 10 per cent. milk of lime was also recommended for ceilings and walls; and for floors a 4 per cent. solution of chloride of lime or a hot solution of carbolic acid and soap, as described above. In papered rooms the paper must of course be removed before using the milk of lime to the walls.

For pouring down closets, cesspools, dustbins, drains and sinks lime was chiefly used. The quantity requisite for disinfection was calculated thus: For every 100 persons in health not less than one pound of pure lime should be used — i. e., of a 20 per cent. milk of lime at least 5 lb., of a 10 per cent. at least 10 lb.; while for every 100 cholera patients ten times these quantities should be allowed. This calculation is based on the units of 1 lb. of excreta per day per head in health, and of 10 lb. per head among cholera patients, and allows of one part of lime by weight to every hundred parts of dejecta.

Among the many excellent measures adopted by the St. Petersburg authorities none seems to have been more thoroughly useful than the institution of a corps of volunteer disinfectors. These men, 130 in number, were enrolled

under the control of the municipal medical officers. Having first received a short course of lectures from Dr. Lipski, a prominent member of the Sanitary Commission¹⁾, and having been shown practical illustrations of the method of disinfection at the Alexander Hospital, the members of the corps were provided with detailed printed instructions as to their duties. These were principally to carry out disinfection of the rooms in the house to which they were sent, and to remove from the house to the disinfecting camera at the Alexander Hospital all clothes, bed linen, mattresses, pillows and any other movable objects that had been in contact with or soiled by the patient. The objects themselves were not disinfected before removal, but the box, basket or sheet in which they were packed was ordered to be well moistened with either a 1 in 2000 sublimate solution or a 5 per cent. carbolic solution, from a pulverisator provided for each man. The floors and walls and all furniture were ordered to be washed with a 1 in 1000 sublimate solution, and finally with a 1 per cent. solution of soda. With the permission of the owners, any articles of small value were ordered to be burnt. It should be added that each member of the corps of disinfectors received a payment of 30 roubles (£ 3) per month.

1) The Sanitary Commission has been in existence for some years in the Russian capital. It has entire control of all sanitary measures, and shares with the Hospital Commission the medical administration of the city. Special Commissions were formed on the approach of cholera to examine the sanitary condition of every building in the city and to investigate the nature of the first cases that occurred.

CHAPTER XII.

THE RUSSIAN CONFERENCE ON CHOLERA.

The origin, nature and object of the Conference. The Conclusions of the Conference under six headings. I. Sanitary Organisation. II. Measures for improving the health of inhabited localities. III. Precautionary measures against the introduction of an epidemic. Quarantine. New regulations based on the conclusions of the Conference. The holding of fairs, bazaars etc. The experience of Nijni Novgorod. IV. Organisation of medical aid. Notification. The position of bacteriological investigation. V. Disinfection. VI. Treatment.

Frequent mention has been made in the foregoing pages of the Conference of Russian physicians, held in St. Petersburg last December to discuss a number of questions relating to the cholera epidemic. It may be useful to explain in this closing chapter the nature and object of that Conference, and to present briefly the conclusions at which it arrived, and, where possible, the practical results to which these conclusions have led.

The Conference was due to the initiative of the Minister of the Interior. His circular letter summoning the Conference was signed on October 30th of last year, and

this early date, as indicating promptitude, is worthy of note. In accordance with this letter the Governor of each province or government throughout the country was requested to select one or two physicians, who had had close personal experience of the epidemic in the summer, to represent the particular governmental division at the Congress.

The total number of members, of whom, in addition to the local representatives, many were present *ex officio*, was 312. They met on December 13th (25th) and on each of the seven succeeding days. General meetings were held daily in the Michael Palace, kindly lent for the occasion by the Grand Duchess Catharine Michaelovna; and the sub-committees met in the Medical Department of the Ministry of the Interior.

Such, briefly, was the origin and nature of the Conference. Its object was a purely practical one, namely to mutually communicate individual experiences of the epidemic, to discuss the lessons which they had taught, and to base upon them a course of action to be taken in the winter and spring in order to meet a revival of the epidemic in the following, that is, this present, summer.

The transactions of the Conference fill a large volume, and the experiences of the members, who, it must be remembered, came from North and South and East and West, from the snows of Siberia and the tropical heats of Central Asia, from the mountains of the Caucasus and the plains of the Volga, and all fresh from a life - and - death struggle with the ravages of cholera, afford material of no little interest to any one who is able to read them in the language in which they were communicated. In earlier chapters I have availed myself of that material to some extent, and more particularly as affording evidence of the mode by which cholera was generally disseminated in the country districts

of Russia. But evidence, such as that quoted, was for the most part elicited incidentally in the course of the discussions, which, it may be repeated, were directed to strictly practical ends.

The decisions at which the Conference arrived have since been printed separately from the detailed transactions, and even in this condensed form they cover nearly ten pages of foolscap paper. A number of them, dealing with domestic internal organisation, are of purely national rather than international interest, and therefore do not demand more than passing mention.

Of this nature were the conclusions arrived at under the first main heading of the report, namely that of *Sanitary Organisation*. Under this heading are a number of decisions with regard to the constitution and functions of the local sanitary commissions, which, as already stated, were formed in every town of any size throughout the country. The report declares that they proved most valuable and necessary institutions, and advises that they should remain permanently in force, although the danger for which they were called into existence should have passed.

Under the second heading, *Measures for improving the sanitary condition of inhabited localities*, the chief sources of danger to health, to which the attention of local authorities is particularly directed, are briefly enumerated, and the corresponding measures for removing such sanitary deficiencies are indicated. The chief sources of pollution of soil and of water and their remedies, to which this section is mainly devoted, need not here be repeated, as they form the very alphabet of sanitary science; and I may be permitted to pass over this second group of conclusions with a single citation. Speaking of the removal and disposal of refuse, both domestic and of trade-products, the report recommends that in each town these matters should be

entrusted to some one central responsible body, and not left, as has hitherto been the case, in the hands of private individuals who have no interest whatever in the sanitary condition of the town.

In the third group of decisions, relating to *Precautionary measures against the introduction of an epidemic*, the question of quarantine claims the first place. The principle and practice of quarantine were condemned unanimously and in no halting terms by the Conference. The report declares that quarantine has no scientific basis, that it leads to great annoyance and loss, that it demands an immense expenditure for its proper carrying out, and that it does not attain its end, as evasion of quarantine is always possible. The report therefore recommends that quarantine should be replaced by a system of inspection, isolation of sick and disinfection.

Supervision upon lines of communication is declared to be useful and necessary where large bodies of passengers are concerned, such as labourers, troops, emigrants and convicts; and where such large bodies of persons are concerned the report points out the necessity for providing them, in times of cholera, with cheap or free refreshments, with shelter, and with cheap baths and wash-house accommodation, but the inspection of all passengers by ordinary passenger trains is recognised as irksome and useless; and the compulsory disinfection of the luggage of healthy passengers, whether by train or boat, is in like manner condemned.

In strict accordance with these conclusions an order has been recently issued by the Minister of the Interior, relating to „Measures for guarding the marine frontiers of the Empire against the introduction of epidemic disease“. The Order was published in the Government Gazette of May 23rd (June 4th). Its chief enactments may be briefly quoted.

The measures relied upon are the four following: — (1) Examination of documents (bills of health, sanitary visas etc.) relating to the health, of all ships coming from foreign ports; (2) Questioning concerning, and, if necessary inspection of, the crew and passengers; (3) Removal of any persons suffering from an infectious disease; (4) Improvement of sanitarily defective arrangements, and, if necessary, disinfection, of the ship.

Ships will be of two classes. Those which have come from a healthy port and can shew a clean bill of health, will be immediately allowed free *pratique*. Ships, on the other hand, which have come from an „infected“ port or country, and any ship which has a case of infectious disease on board, or which is clearly in an insanitary state, will submit to the following measures. The crew and passengers will be inspected by the medical officer appointed for the purpose; if any sick are found on board they will be removed to the local quarantine hospital; and the ship will be disinfected. The ship will be detained only so long as the process of disinfection requires.

The Minister of the Interior will announce from time to time what foreign countries, or parts of them, are affected by dangerous infectious diseases, or, technically, „infected“.

The import and export of certain goods, from and to countries affected with epidemic disease are forbidden. The nature of the proscribed goods will be defined in a note issued annually by the Ministries of the Interior and Finance. All other goods will be allowed free transit without any process of disinfection, unless there are good grounds for believing that the goods in question have been in immediate contact with persons suffering from infectious disease. In that case their wrappers or outer surface will be disinfected.

A ship arriving with a clean bill of health will for the future carry a yellow flag at the fore-mast; while a ship that

has come from an „infected“ port or has illness on board, will carry a black flag.

A number of other paragraphs in this Order refer to ships going from one Russian port to another and to coasting vessels, but the regulations concerning these, do not call for more than this passing mention.

I have referred thus at some length to this Order as it indicates the views held by the Russian authorities at the present time upon the uselessness of quarantine, and as it shews the methods in force at Russian ports for preventing the introduction of infectious diseases; whilst at the same time, its regulations so closely correspond with the conclusions of the St. Petersburg Conference as to appear to have been founded directly upon them.

To return to the deliberations of that Conference, it has to be noted that the report states clearly that, in the opinion of the Conference, it is quite unnecessary to forbid the holding of fairs, pilgrimages and bazaars, or to close places of entertainment during an epidemic of cholera; provided, of course, that such concourses of people are under sanitary supervision. This conclusion cannot but have been influenced by the experience of the great fair at Nijni Novgorod, which was held last summer, notwithstanding the epidemic. The most elaborate precautions were taken, and the results must be held to have justified the decision to hold the fair.

Nijni Novgorod is in winter little more than a small country town, if the number of inhabitants be taken as the standard; while in summer the fair attracts literally hundreds of thousands of visitors from all parts of Russia and from neighbouring countries. It was no light responsibility that lay with the authorities, to decide whether the fair should be held as usual, although cholera was raging already in the districts whence a large number of the visitors to the fair must come and through which still more

must pass: or whether the fair should be postponed or, rather, not held for one year, a decision which must have entailed enormous and far-reaching results in the way of trade dislocation and economic losses. It was ultimately decided that the fair should be held as usual, and it was opened as in previous years on July 15th (27th). Extraordinary precautions were taken to meet and control the epidemic, as already observed, and we must again appeal to figures for the result of this, so to say, gigantic experiment. There were in all 1,953 cases of cholera in Nijni last summer, and of these 891 proved fatal. It is unfortunately impossible, in the absence of statistics as to the number of persons who attended the fair, to state what proportion these figures bore to the population of the town for the time being; but they cannot but be held to indicate a distinctly, and considering the circumstances, a strikingly mild visitation of the epidemic.

Returning from this digression, the fourth group of conclusions arrived at by the Conference must next be mentioned. They refer to the *Organisation of Medical aid* in districts affected by cholera; to the training of Sisters of Mercy (whose services proved invaluable last summer); to the methods of notification of cases of cholera and to some other matters. These must be passed over without detailed notice, with the exception of two clauses, which appear to be of sufficient interest to quote in full. The first runs as follows.

„The medical officer should immediately [on the appearance of a case of cholera in his district], without awaiting the confirmation of the diagnosis by bacteriological investigation, or any formal recognition of the existence of an epidemic in his district, undertake all the measures laid down for the localisation of an epidemic..... Bacteriological investigation, although desirable, is not necessary for the diagnosis of cholera; the disease may be

recognised quite sufficiently clearly by the sum of the clinical and pathological phenomena“.

The second clause to be quoted provides for the return of doubtful cases. „On the form [of notification] the cases should be returned in three groups, viz: cholera, choleric and choleraic diarrhoea. N.B. So far as concerns the measures for localising the disease, all three forms have the same significance“.

In order to ensure uniformity in the returns, it was recommended that they should be made weekly, and that the week should count from Sunday to Sunday.

The fifth group of conclusions relates to *Disinfection*. The necessity for laying in supplies of disinfectants before the spring is pointed out. The use of crude carbolic acid is condemned, unless it is proved by analysis to contain a sufficient percentage of the pure acid. In general the crystalline acid is recommended as preferable to the crude. The methods of disinfection detailed in the Order relating to that subject ¹⁾ are stated to have proved quite satisfactory and to call for no amendment.

The disinfection of travellers by the high-roads is declared to be useless. „The disinfection of passengers on railways and boats should be carried out only under exceptional circumstances, as for instance in temporary, local outbreaks of the disease“.

Finally the question of the *Treatment* of cholera was discussed by the Conference and matter of much interest was communicated, including some curious revelations as to certain popular modes of treatment resorted to by the peasants in certain country districts. The members of the Conference were unanimously of opinion that there is no specific means of curing cholera or of cutting short an attack; and that therefore an *ex cathedra* statement approv-

1) See page 78.

ing of any one drug or line of treatment appeared unadvisable. The report adds that, in adopting a rational symptomatic treatment, care should be taken that the form of treatment is not wrongly interpreted by the peasantry, and does not rouse their antipathy.

The Conference also approved, but not without the expression from some members of a contrary opinion, of the so-called „cholera medicine-cases“, in the hands of priests and others living among the peasants, as being of use for „first aid“ treatment, provided that they do not contain any very powerful drug.

APPENDIX I.



ing of any one drug or line of treatment appeared undesirable. The report adds that, in adopting a rational system of treatment, care should be taken that the patient's treatment is not wrongly interpreted by the physician and does not cause their antagonism in favour of blood-letting. The Conference also approved, but without the expression from some members of a contrary opinion, of the so-called "cholera medicine-cases", in the hands of priests and others living among the peasants, as being of use for "first aid" treatment provided that they do not contain any very powerful drug, about most cases blood-letting is not necessary.

The distinction of cholera is related to the necessity for giving in general to patients a certain amount of saline in the form of gastric and intestinal fluids. The use of crude carbolic acid is not advised, and it is preferred to employ a solution of salicylic acid by means of a suitable apparatus. In general it is recommended that the use of salicylic acid is preferable to the crude. The methods of disinfection detailed in the Order relating to the disinfection of cholera are to be followed, but it is stated that they have proved quite satisfactory in the treatment of cholera.

The distinction of cholera is related to the necessity for giving in general to patients a certain amount of saline in the form of gastric and intestinal fluids. The use of crude carbolic acid is not advised, and it is preferred to employ a solution of salicylic acid by means of a suitable apparatus. In general it is recommended that the use of salicylic acid is preferable to the crude. The methods of disinfection detailed in the Order relating to the disinfection of cholera are to be followed, but it is stated that they have proved quite satisfactory in the treatment of cholera.

Finally the question of the treatment of cholera was discussed by the Conference and matter of much interest resulted from the discussion, particularly in connection with the communication received from the Government of the Punjab, in which it was stated that the Government of that Province had resorted to certain popular methods of treatment in order to relieve the suffering of the peasants in certain districts. The members of the Conference were unanimously of opinion that there is no specific means of curing cholera, and that therefore an appropriate

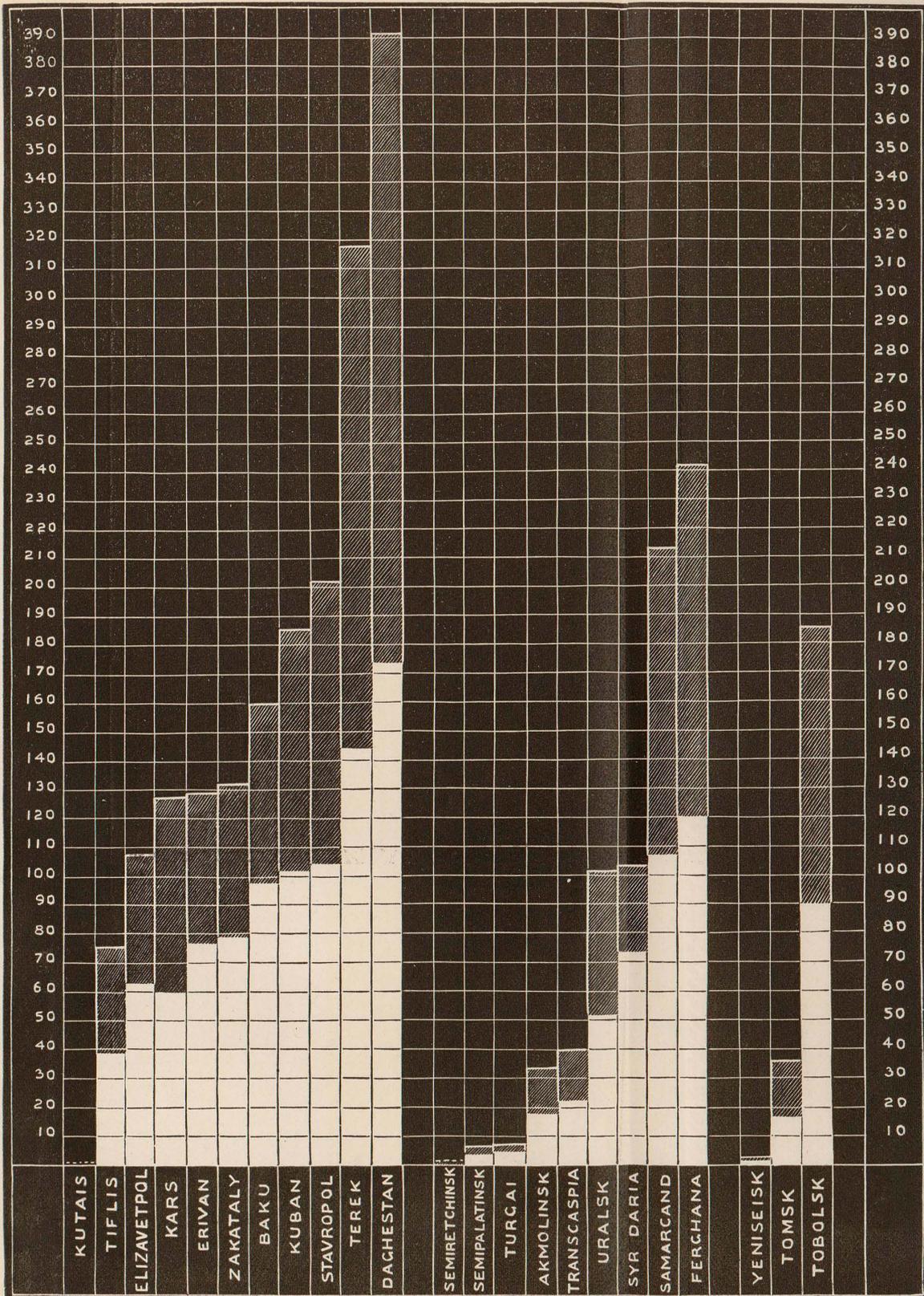
APPENDIX I.

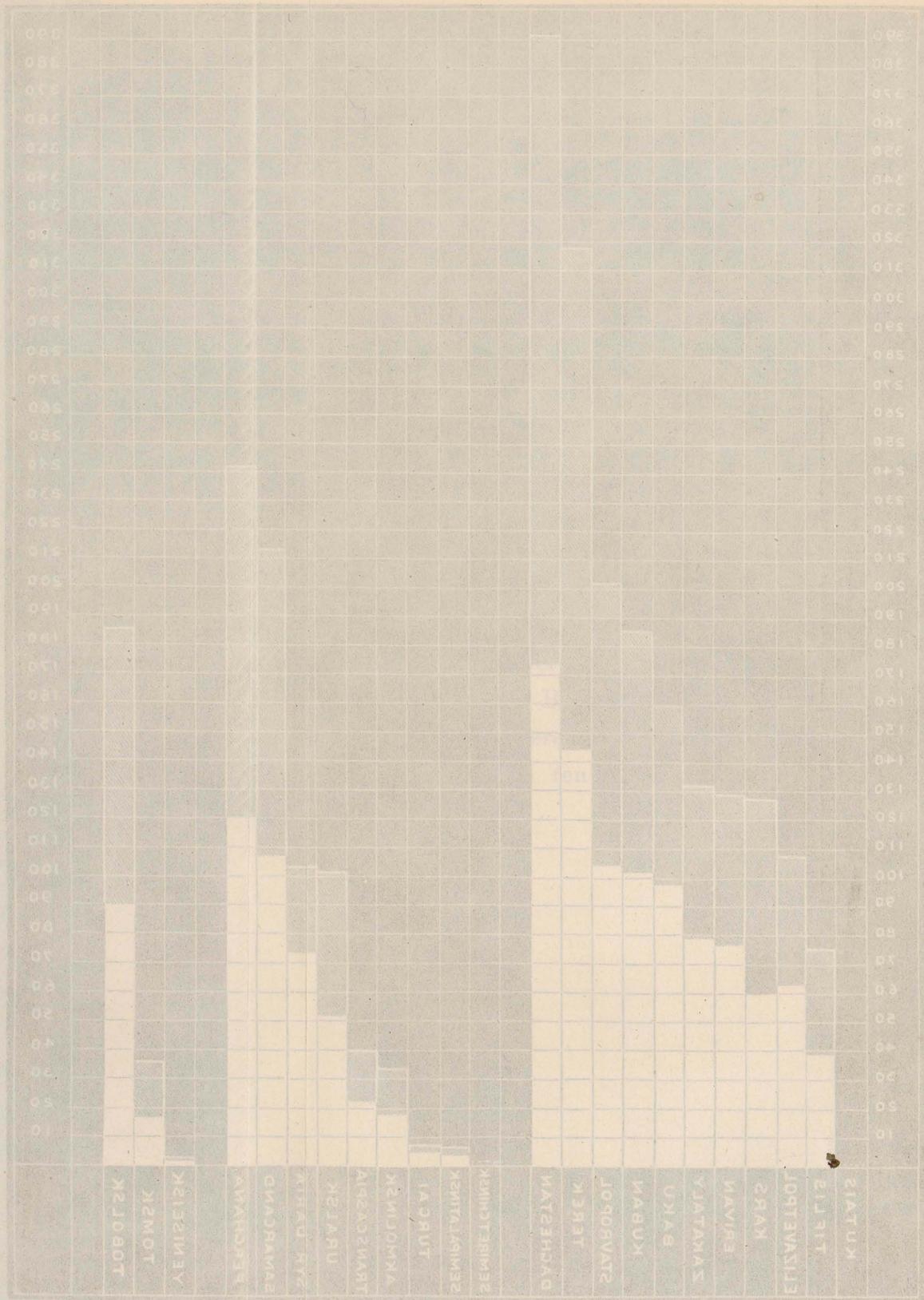
The Diagram on the opposite page shows the relative severity attained by the Cholera Epidemic in each of the divisions of India. The shaded spaces indicate the number of cases, the white spaces the number of deaths from cholera per 10,000 inhabitants (N. B. In the text of the book the proportions are everywhere expressed per 100,000 and therefore appear to be ten times as high as in the diagram).

APPENDIX I.

The Diagram on the opposite page shews the relative severity attained by the Cholera Epidemic in each of the divisions of Asiatic Russia.

The shaded spaces indicate the number of cases, the white spaces the number of deaths from cholera per 10,000 inhabitants (N. B. In the text of the book the proportions are everywhere expressed per 100,000, and therefore appear to be ten times as high as in the diagram).





APPENDIX II

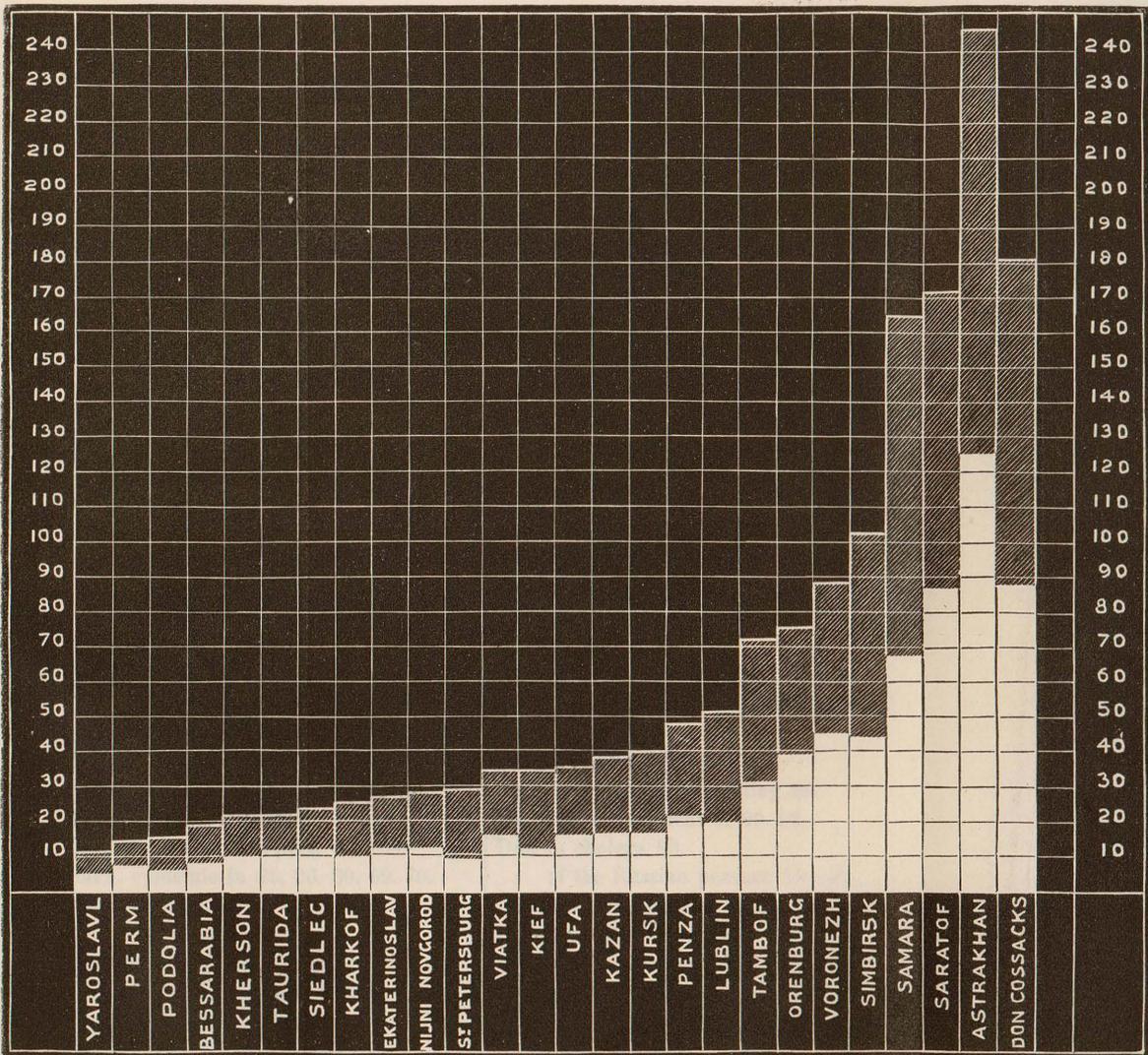
APPENDIX II.

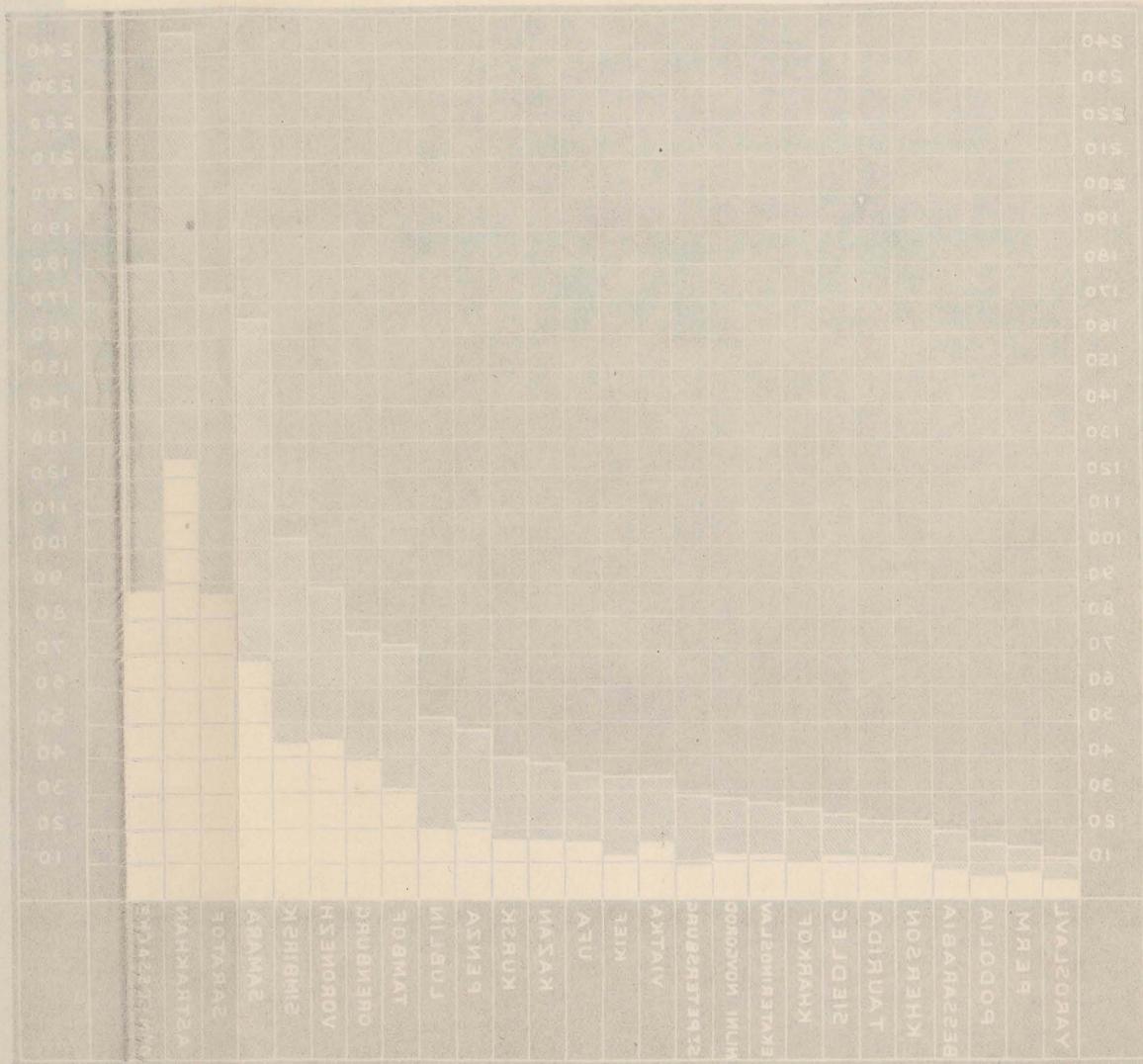
The Diagram on the opposite page shows the relative severity attained by the various countries of Europe in the epidemic of 1849-50. It is drawn to the same scale as the preceding figures, and represents in like manner the proportions of cases (shaded spaces) and deaths (white spaces) per 10,000 inhabitants.

APPENDIX II.

The Diagram on the opposite page shews the relative severity attained by the Epidemic in each of the governments of European Russia.

It is drawn to the same scale as the preceding figure, and represents in like manner the proportions of cases (shaded spaces) and deaths (white spaces) per 10,000 inhabitants.



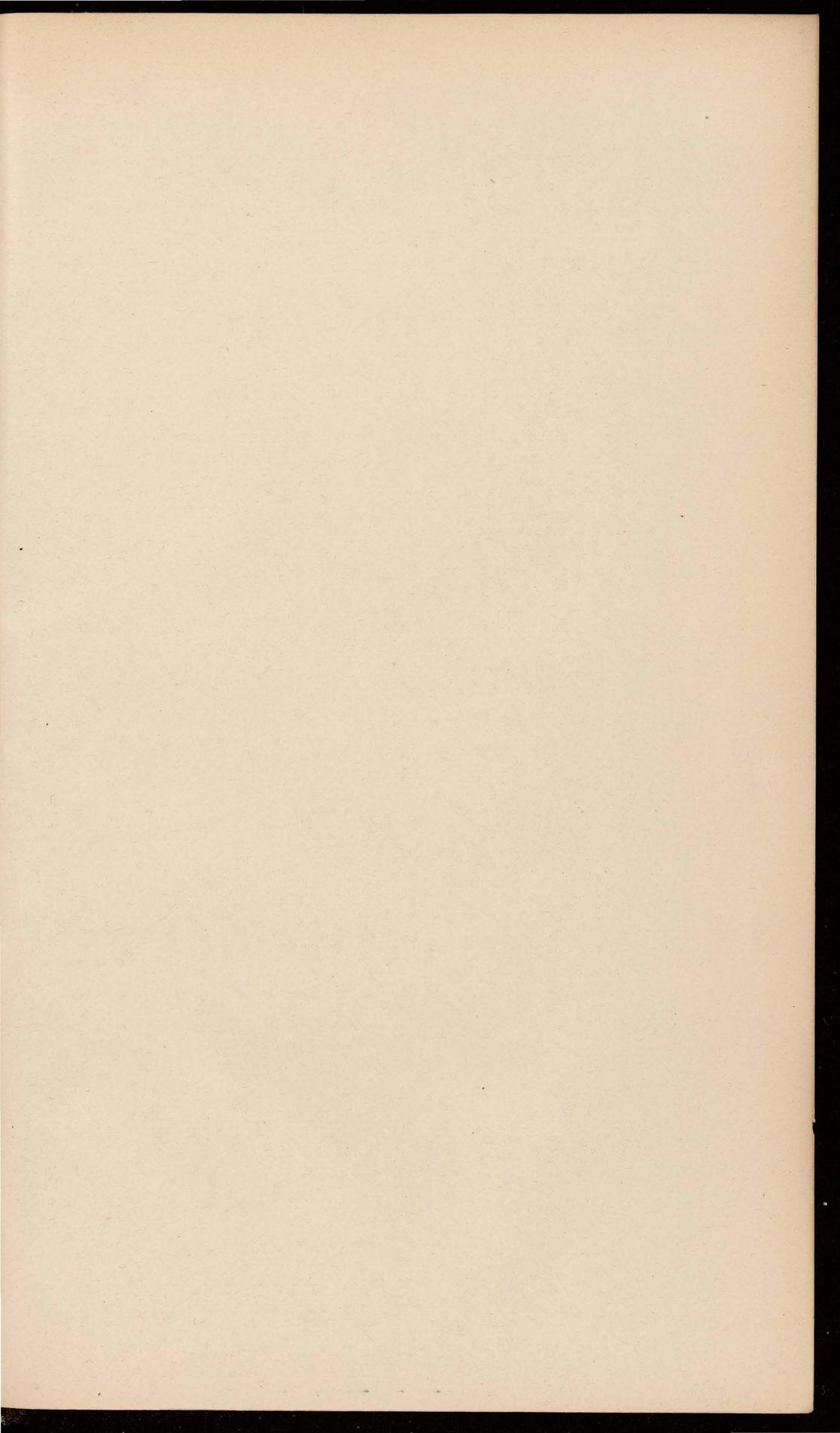


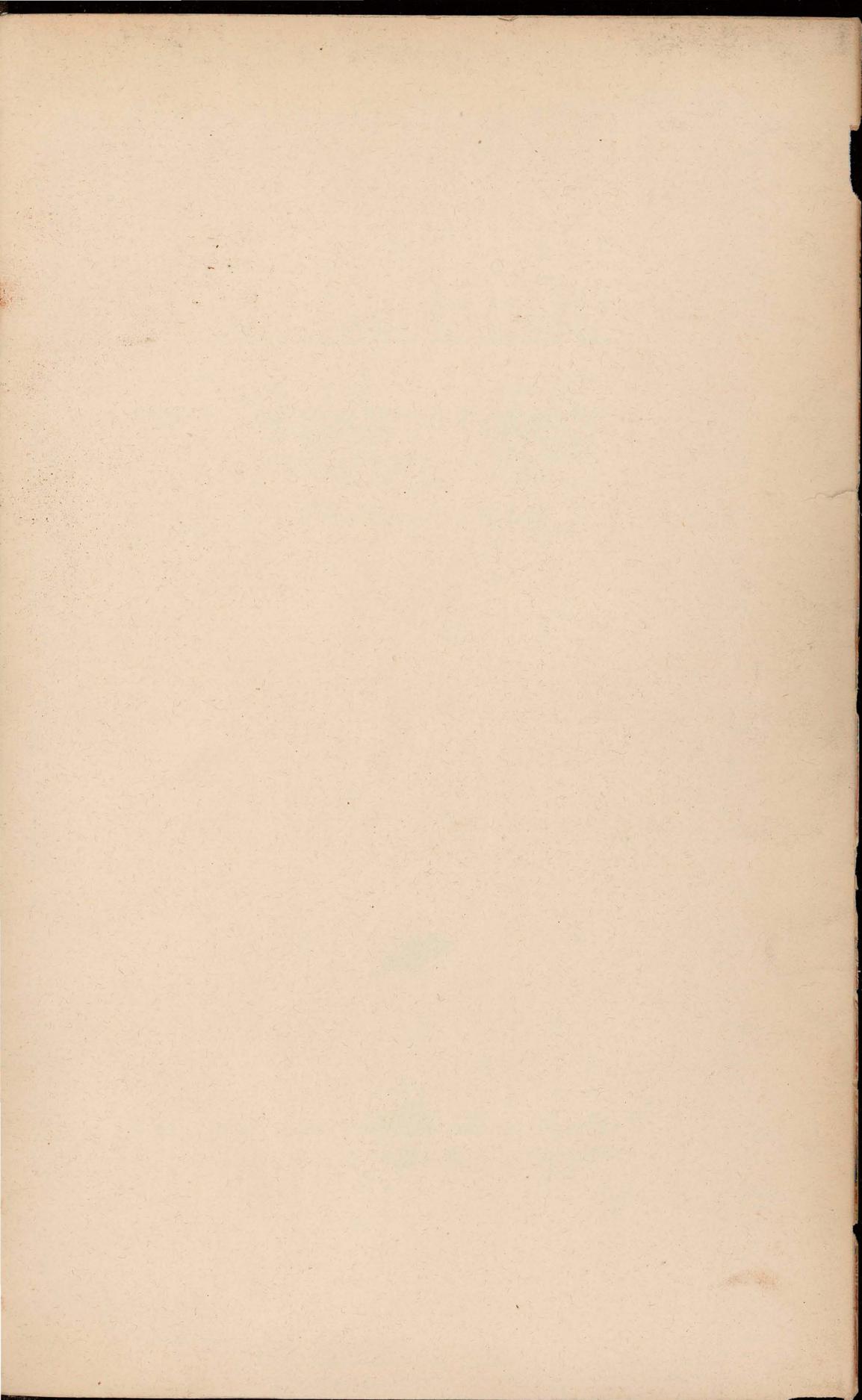
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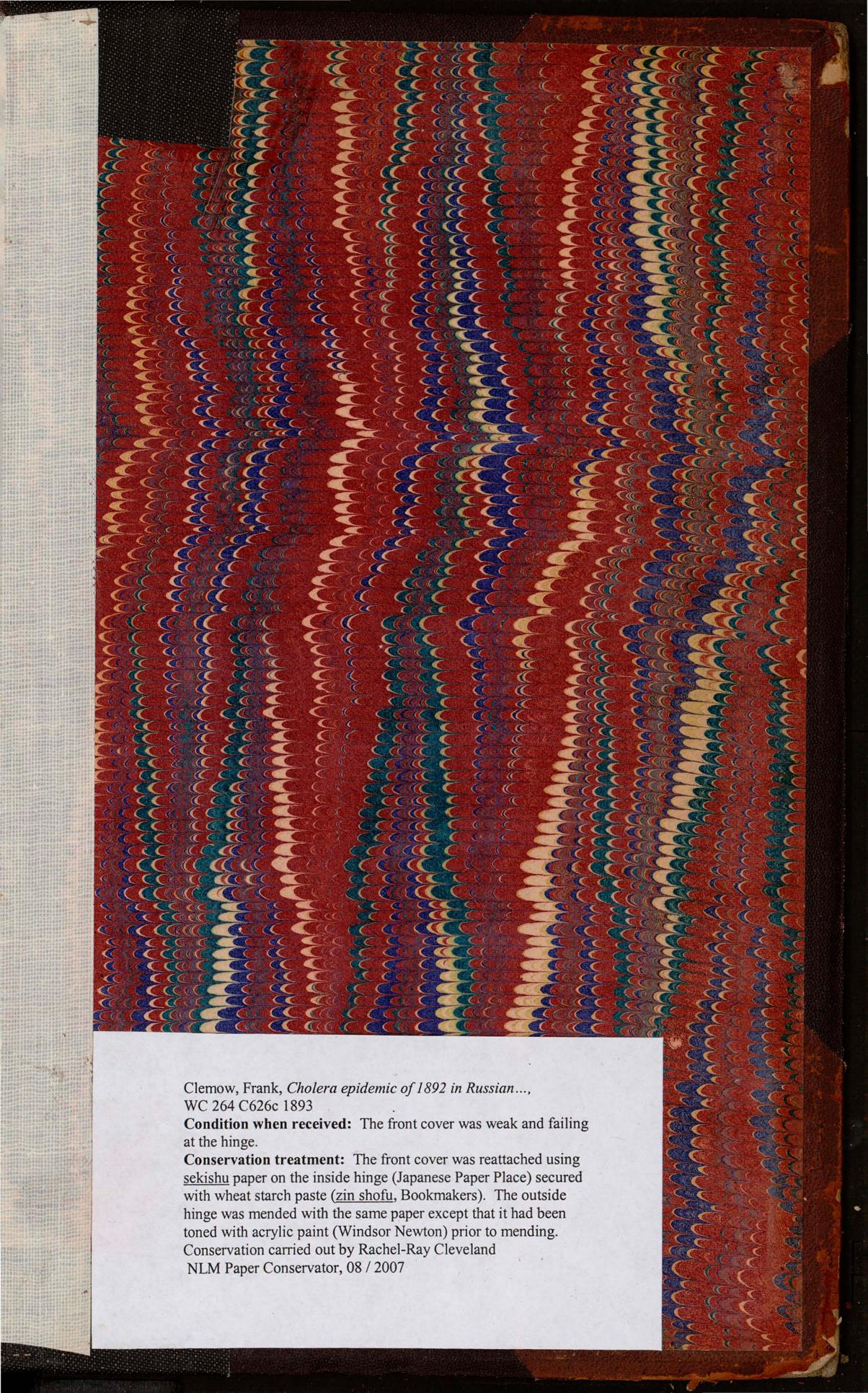
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