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SMALL-POX HOSPITAL.

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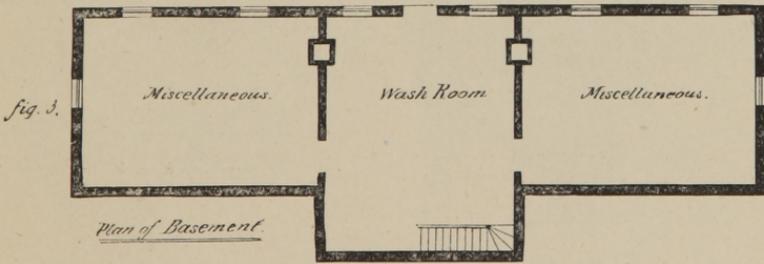
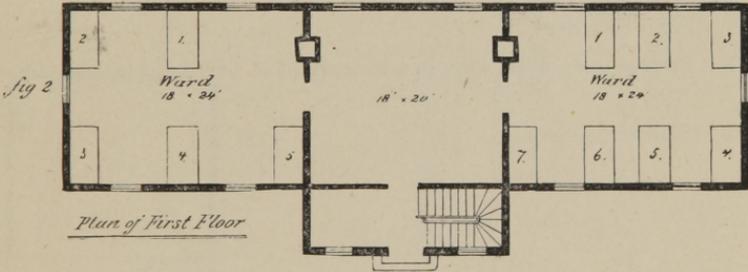
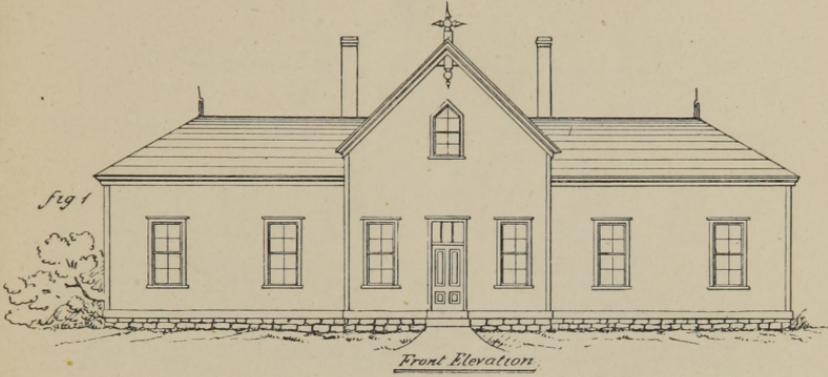
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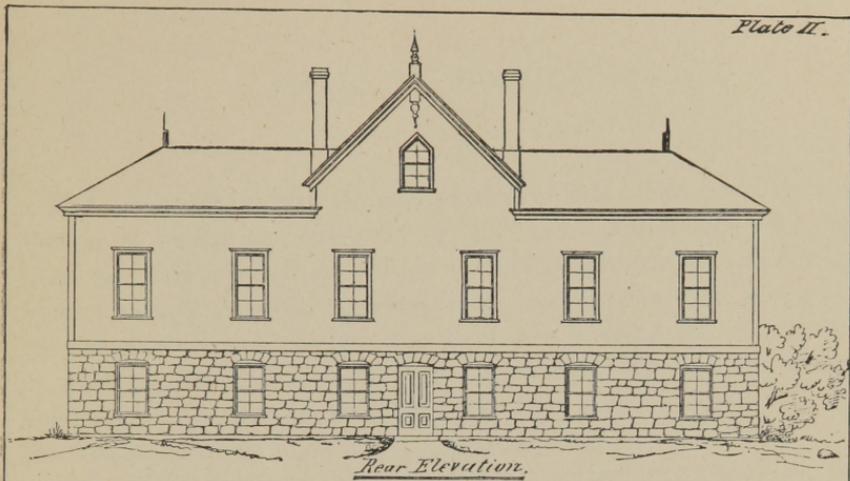
Proposed Plan for a Small-pox Hospital.



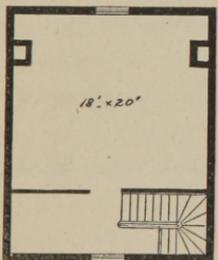
DESCRIPTION OF PLATES.

PLATE I.

- Fig. 1. Front elevation.
- Fig. 2. Plan of main floor, with an arrangement of five or seven beds for each ward.
- Fig. 3. Plan of basement.



Rear Elevation.



Plan of Allic-room.

Proposed Plan for a
Small-pox Hospital,

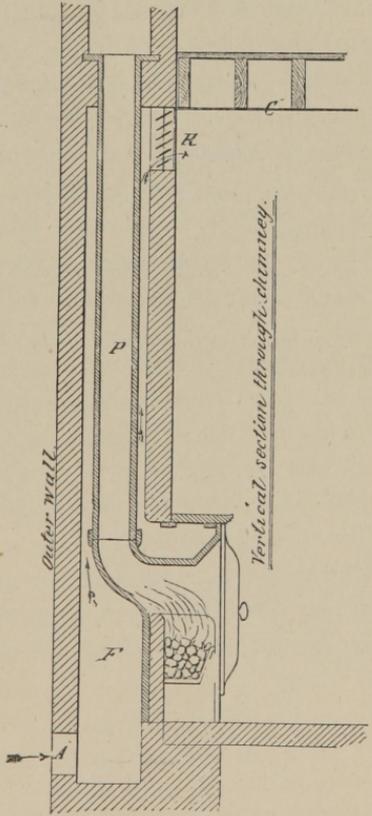


PLATE II.

Fig. 1. Rear elevation.

Fig. 2. Plan of attic room.

Fig. 3. Section (diagram) of a Galton fire-place (with blower applied), and chimney, (from Putnam's, "The open fire-place in all Ages.")

A. Duct for entrance of fresh air.

P. Iron pipe, leading from the throat of the grate to the flue above.

C. Ceiling.

F. Space behind grate, where, and at the sides of the grate, and around the iron pipe, the air in its ascent is heated.

R. Register or opening, just beneath the ceiling, through which the heated air enters the ward.

SMALL-POX HOSPITALS.*

The construction and equipment of hospitals is the province of a branch of sanitary science, and of this branch I have selected a portion; viz., that of small, or as they are now commonly termed, cottage hospitals, having special reference in the treatment of the subject, to the use of these small hospitals as small-pox hospitals or pest-houses, or, avoiding those old-fashioned and apparently objectionable names, and adopting a recently recommended euphemism, hospitals for the treatment of contagious and infectious diseases.

The origin and growth of small hospitals are exceptions to the general rule of the development of the great from the small, for the large hospitals came first and have existed for many centuries, whereas small or cottage hospitals are the product of the last three or four decades.

The great hospitals sprang from the church, and were at first and for a long time afterward devoted to the care of the old and helpless, as we would now say, asylums, and were, some of them, at least, devoted to the care of sick and wounded in comparatively modern times. Some of those enormous establishments still exist, being found in Rome, Naples and other cities of Italy.

The year 1859 saw in England, at Cranleigh, the birth of the first cottage hospital, a lapse of fifteen centuries since St. Jerome used the word "nosocomian" for an institution which must have then existed.

I will not waste the valuable time of the society by attempting to describe the various forms of cottage hospital which have been erected in Great Britain and America; nor is it deemed necessary to dwell upon the important items of site, material, etc. A few remarks may, however, be permitted on the advantages of small hospitals, and more especially of that variety of them peculiarly devoted to the treatment of contagious and infectious diseases.

The general advantages of small hospitals, beside the great one of being comparatively, if not entirely, free from the vice of hospitalism,

*From a paper read before the State Medical Society at its annual meeting January 25, 1882, by R. J. Farquharson, M. D.

so graphically and eloquently *described by Sir J. Y. Simpson, are the following:

Affording as they do a home-like refuge for the poor, in cases of sickness and accident, they are not regarded with that superstitious dread, amounting almost to horror, with which all great hospitals are generally invested by the imagination of their intended inmates.

Persons treated in a well-conducted small hospital are actually surrounded with more comforts, more care and more cleanliness than are to be found in the homes of most people, for it is a lamentable fact that most private dwellings, even those of the better class, abound in unsanitary surroundings. But it is when a small hospital is used as a pest-house, *i. e.*, for the seclusion of those sick with infectious or contagious disorders, that its great excellence becomes apparent.

If every person over the age of one month was properly protected by vaccination, as they should be in every civilized community, and as they would be in the Utopian city of Hygeia, there would not be a particle of use or necessity in isolating a single case of small-pox; however this place might be advantageous in regard to scarlatina, measles, diphtheria, and perhaps other diseases.

Unfortunately, however, there are in all communities in this country a number of unprotected, or improperly protected persons for whose safety isolation of small-pox cases is necessary.

What great assistance in stamping out small-pox and kindred diseases the complete isolation afforded by a small hospital lends, is shown by the following quotations :

No sane person doubts that the provision of adequate hospital accommodation for such cases is, in the end, by far the cheapest and most effectual course for the local authorities to adopt. Experience abundantly proves this.

Dr. Buchanan has shown the value of this ready-made provision for infectious cases by recording the results of establishing a small-pox hospital at Cheltenham with fourteen beds.

During six months of the year 1875, small-pox was brought into Cheltenham, no less than six times, from Gloucester, Birmingham, Liverpool and elsewhere. Seven persons ill of the imported disease were taken without delay to the hospital, and, except one individual (who was also removed to the hospital), nobody in the town caught the disease from these centers of contagion.

Dr. Wilson says:—At Hastings small-pox epidemics have been twice stamped out. At Bristol, on many occasions, epidemics from various infectious diseases have been averted, and probably one of typhus in 1877.

At Newcastle on-Tyne typhoid fever (once epidemic) has several times been completely stopped.

At Leet, in Staffordshire, no case of small-pox occurred after removing the first to the hospital.

At Coventry small-pox has been stopped twice, and scarlet fever on many occasions. At Ipswich, in 1877, small-pox was imported into the borough no less than twenty (20) separate times without once getting a foothold.—*Burdett, Cottage Hospitals, 2nd ed., Phila., 1881, pp. 265 et seq.*

All this evidence comes from England, but had we such carefully prepared statistics of small hospitals in America, which unfortunately is not the case, there is little or no doubt but that it might be duplicated here.

Another and a great advantage of a ready-made small hospital for contagious diseases, is on the score of economy, and from experience, I am fully satisfied that no outlay of public money will yield a greater return in the long run. As an illustration, I may be allowed to quote the following brief chapter of my personal experience.

In 1873, the city of Davenport and Scott county were without a proper hospital for infectious and contagious diseases; upon the outbreak of the cholera, the usual senseless panic occurred, and though the epidemic only lasted a very short time, over \$2,000 of public money was expended (the most of it wasted), an amount, as will be seen further on, almost sufficient to build the efficient hospital now in existence.

This brings me now to the proper subject of this paper, which is to demonstrate by example how a small hospital, especially adapted to the treatment of small-pox, cholera, scarlet fever, measles, diphtheria, or any other contagious or infectious disease (and which may be, and is, used for other purposes), may be erected upon a safe and suitable site, and for a comparatively small sum of money.

The use of the word safe, in reference to the situation of the hospital, does not refer, as it might seem at first sight, to the isolation of the building, for, in my opinion, a very slight separation from other houses is necessary, but to the protection of the hospital from destruction by fire; for, strange to say, pest-houses, although isolated from all other buildings, and not in any way peculiarly exposed to the action of the elements, are of all others, in my experience, the most liable to destruction by fire. The neighbors, not near ones, of almost every building used as a pest-house, think it no crime to apply the torch of the incendiary to the humble structure.

This had been the constant experience in Scott county, each suc-

ceeding year bringing its quota of detached cases of small-pox, the advent of each creating the ever-recurring panic, with its search for a new pest-house, and the inevitable big bill of expenditure for nurse-hire, provisions, transportation, etc., amounting in some cases to hundreds of dollars.

Tired of this state of affairs, the supervisors of Scott county and the Mayor and council of the city of Davenport, entered into a contract with the Mother Superior of the Sisters of Mercy, at Mercy Hospital, for the care and treatment of all such cases of small-pox, and other contagious diseases, as might in the future be admitted into that hospital. The agreement in brief, striking some details, was as follows; viz.,

Lease of ground for twenty-one years; city and county may renew the lease, or may remove the building, having twenty days to do so.

Compensation : Three (\$3.00) dollars per day of twenty-four hours, *provided*, that when any patient shall be provided with medical attendance by second party (the Sisters), then the sum of five (\$5.00) dollars per day [in addition to the said three (\$3.00) dollars] shall be paid for said medical attendance. That said five (\$5.00) dollars additional shall at no time be paid for more than two (2) patients at a time; but such additional sum of ———, not to exceed in any one case more than four (\$4.00) dollars per day, shall cover all charges for medical attendance; and in case there is one or more such patients in said hospital, then a male nurse is to be furnished by the first party (city and county), as above stated.

Bedding, etc., to be cleaned for future use, if practicable, to be furnished by the city.

A joint appropriation of \$2,500, by the supervisors of Scott county and the Mayor and council of Davenport, was then made for the building and equipment of the said hospital.

I drew the plans of the building needed, and these, after their approval by the Medical Board of Mercy Hospital, were followed in the construction.

A fine site was found, sufficiently near the main hospital for convenience of attendance and administration, and for the protection of the building against incendiarism; and sufficiently remote to afford ample protection to all parties. This site was on the declivity of a hill, but near the summit, thus affording excellent drainage, both surface and otherwise, and, as will be seen from the accompanying plates,

having all the well-known advantages of a hill-side barn. After making the excavation, it was tile-drained, and a drain of broken stone put just outside of the foundation wall, on three sides; this wall is of stone (ashler), but the division walls of the basement and the chimneys are of brick.

The upper structure is of wood (frame, with tarred paper under the weather-boards), and the whole building has a total length of 70 feet, with a width of 20 feet in the wings and of 26 feet in the central portion, this projecting six feet, thus affording a hall or vestibule, which contains the stairs ascending to the attic, and those descending to the basement. These are all inside measurements.

The wings have a height to the eaves, in front of 12 feet, in the rear of 20 feet, and to the ridge (from the top of the basement wall), of 20 feet; the central part has a height to the eaves of 18 feet, and to the ridge of 29 feet (from top of basement wall). There are twenty-four windows, fourteen of which have eight (8) 14x20 panes of glass; eight (in the basement) have eight (8) 14x14 panes, and the remaining two, those of the attic, smaller ones. The fourteen windows of the main floor are all provided with weights and pulleys, and, also, with inside shutters, which are not painted, but varnished.

The whole wood-work had two coats of paint, and the floors of the wards and of the central room, after being oiled, had three coats of paint.

The ground floor, which is entered from the rear by a door one or two steps above the ground, contains three rooms, two end ones of 18x24 feet, and a central one of 20x24 feet; the two former are not floored or otherwise finished, but it was intended, at some future time, to erect a bin at the end of one for the storage of dry earth, to be used in the earth-closets, with which the wards are provided; and, also, in a convenient corner, near one of the chimneys, a chamber for the disinfection of clothing by dry heat.

The central room is intended for kitchen and laundry, being supplied with water from a cistern, a pump, a sink, cooking-stove and appliances. It was floored over, but this was a mistake, the flooring should have been of concrete, which laid over a drained surface makes the best floor for such a room.

In the lower corner of the hospital lot, which is enclosed by a board fence, a small privy is built, over a vault provided with an over-flow pipe leading further down the hill, and into cultivated ground; into this vault or cesspool all the waste water is led.

As there is no other water supply than that afforded by the cistern, water-closets were out of the question; however, a very cheap and efficient substitute was found in the Wakefield earth-closet, one of which was placed in each ward.

In the attic is a room of 18x20 feet, separated from the head of the stairs by a landing. There is here sufficient lodging room for two or three attendants. On the main floor is the main room, reached by a small flight of steps from the ground level in front, through a hall or vestibule 6x20 feet. This room needs no particular description, being furnished with a table and a few chairs, and may be used as a dining, sitting or convalescent room.

Coming now to the essential part of the structure, we have two wards of 18x24x10 feet; each ward has a door leading from the central room, and five windows, with one so situated that either five or seven beds (see Plate I, Fig. 2), may be conveniently arranged. This would seem at first sight to limit the maximum capacity of the hospital to fourteen beds, but when we treat of the peculiar mode of ventilation used, it will be readily seen that at any emergency this number of beds may be safely increased.

The walls of the wards, after having been plastered and hard-finished in the usual manner, were tinted of a delicate shade of color, pleasant to the eye.

Before applying the last coat, I made a most diligent search for something to produce an impervious and glass-like surface, visiting several newly built hospitals for the purpose, but in vain. The best that can be done with such walls is to frequently scrape and white-wash them; but I am satisfied that the proper wall, especially for a small-pox ward, is one with a surface impervious as glass, which should be kept constantly moistened with a dilute solution of glycerine, thus catching all germs, debris, epithelial scales, pus corpuscles, indeed all solid particles, and preventing their rebound into the air-space of the room; at intervals, the crop of contagious particles thus gathered might be wiped off with sponges and destroyed.

The wards are heated by Galton fire-places or grates, one of which is placed at the rear end of each ward, in the division wall. Now, these fire-places will not heat the incoming air more than 30° or 40° Fahrenheit, and are, therefore, in very cold weather, to be supplemented by stoves, holes and thimbles for the pipes of which are placed in the chimneys; but for eight months of the year the heat afforded by the Galton grates would be sufficient.

Now, I may here pause to remark, one of the great beauties of this system of ventilation, which is that, no matter how close, on a cold winter night, the nurse may make every crack or crevice, where fresh air might enter, as is their wont, or how red-hot he may make the stove, the proper ventilation of the ward will proceed as long as any fire is kept up in the grate, which the attendant is always likely to have for his own greater comfort, and the increased convenience of boiling water, making tea and other drinks over an open fire. Finding (in 1876) no Galton fire-places were to be had in this country; I procured two made in Cincinnati, which answered the purpose very well; I may here remark, in passing, that Galton grates and an excellent American modification of them may now be had in New York. These grates are built into the chimney (see Plate II, Fig. 3)—this is a very delicate job and requires an expert in the building of fire-places and chimneys—and are of iron, but have a lining of fire-clay. From the throat of this grate an iron pipe (see Plate II, Fig. 2 P.) rises some ten (10) feet, (just above the ceiling C), terminating in a flue, which runs the remainder of the chimney, and should terminate in a cap (but does not in the present instance).

The air, admitted from the outside at the base of structure A, is warmed by contact with the heated sides and back F of the grate, then after being still further heated by surrounding the iron pipe in its ascent, is delivered into the ward from a lowered opening or register R, placed just beneath the ceiling C. The end rooms of the ground floor being vacant and unused, the air is taken at present from them, but in case of their occupation, it would be necessary to lead a pipe outside (see Plate II, Fig. 3 A).

I have purposely left the subject of ventilation to the last, as the most important, the most essential feature, the *sine qua non* of good hospital construction.

On this subject Dr. Elisha Harris says (Public Health Reports, volume 1, page 114):

At his side stand the masters in hygiene and surgery, and in the words of John Simon, all unite in the statement that, "So thoroughly does a hospital depend for its usefulness on the capacity of its wards for the most exquisitely perfect ventilation, that in all plans of hospital construction this is the one cardinal virtue to be insisted on. The ventilation must be such as shall leave no corner unsearched by its current."

Surgeon Billings, U. S. A., in his "Notes on Hospital Construction" (Public Health Reports, volume 2, page 386,) says of the Galton fire-place :

If carefully made and adjusted, such a fire-place (a double one) has been found by experiment to satisfactorily heat a room of 48x25x12 feet, and to ventilate it at the rate of 40,000 cubic feet of air per hour (*i. e.*, to renew the air of such a room every twenty minutes), the external temperature being at the freezing point.

Another author says :

The open fire-place (he is speaking of the common open fire-place, and his remarks apply with double force to the Galton, which not only removes the foul, but brings in fresh air,) sweeps the air of the room by removing 12,000 cubic feet per hour (he is speaking of a small room), every portion of which is charged with organic debris of every kind, from the inert particles of the floor, bedding and clothes, to the epithelial scales, and pus corpuscles, the carriers, it may be, of actual contagion.

It is customary to speak of allowing 1,000 cubic feet of space to each patient, but if the air is renewed as contaminated by respiration and transpiration, 300 cubic feet per hour would suffice.—*Billings' Notes on Hospital Construction, Public Health Reports, vol. 2, p. 387.*

Our ward of 18x24x10 feet would give a cubic space of about 4,000 cubic feet (4,320), which, for five persons would give a cubic space of 800 cubic feet of air, and a square surface of 86 square feet to each; but, as will be seen below, the air would be renewed five (5) times per hour, or every twelve (12) minutes.

Captain Galton's estimates are as follows :

Size of the room being	6,357 cubic feet.
Air changed per hour	31,784 cubic feet.
Requiring sectional area of smoke-pipe	140 solid inches.
Requiring sectional area of cap-pipe	70 solid inches.
Requiring sectional area of fresh-air flue	400 solid inches.

Now, if these elements are preserved in the construction of the ward (and they are, excepting the chimney-cap), it would give just 20,000 cubic feet of air renewed per hour, and the cubic contents being 4,000 cubic feet, would make five times per hour, or every twelve minute, as stated.

Ridge ventilation of the wards was not attempted, and for the following reasons : In our climate it is impracticable in winter; it is always under the control of the nurse, who invariably closes it when

most needed, *i. e.*, at night; and, finally, in summer it is not needed, for the end and side windows would give ample ventilation, if there was any wind blowing, and, if the air was calm, a small fire burning in the grate (with the air-duct closed) would soon renew the air.

Not having the bills at hand, I cannot state exactly what each item cost, but the total expenditure was \$2,500. This included the whole outlay for the building, painting, plastering, plumbing, the purchase of a cooking stove with the necessary kitchen utensils (including a large boiler), tables, chairs, twelve iron bedsteads with beds and bedding, and, finally, the erection of two lightning-rods made of three-fourths-inch iron rods welded together (planted each in a small well reaching to the wet subsoil and filled with powdered coke) and reaching some distance above the top of each chimney.

I have thus attempted to show how a small hospital in every way adapted to the treatment of cases of small-pox, or of any other contagious or infectious disease, may be constructed at a comparatively small cost.

This plan of a small hospital is not presented as a model or typical one, but merely as a suggestion, in the hope that it may stimulate and in some degree assist in the erection of some such hospitals in various quarters of the State, where, as every one must admit, they are very greatly needed.

The accompanying plates will be soon published in the small-pox circular of the State Board of Health, and can be procured by any one on application.



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