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TREASURY DEPARTMENT
UNITED STATES PUBLIC HEALTH SERVICE

PUBLIC HEALTH BULLETIN No. 68
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SAFE DISPOSAL OF HUMAN EXCRETA AT UNSEWERED HOMES.

By L. L. LUMSDEN, *Surgeon;* C. W. STILES, *Professor of Zoology;* and A. W. FREEMAN, *Epidemiologist,* United States Public Health Service.

Good health depends largely upon the exercise of good sense.

Climates are often referred to as "healthful" or "unhealthful," but, as a matter of fact, the health of any community is influenced directly much less by climate than by conditions which we, ourselves, can regulate.

In all places and under all conditions of human existence, the disposal of the waste or refuse products of the human body has a most important bearing on health.

The excretions from our bowels and kidneys, though coming from within our bodies, are generally regarded after they have left our bodies as being filthy, and we instinctively shun them. This instinct should be followed, not blindly, but intelligently. Otherwise, in attempting to avoid human filth we may be brought into most intimate contact with it.

Although the filthiness of human refuse is an important consideration, the danger of this matter to health and to life is of still greater importance. To soil the hands and feet with it is filthy. To swallow water or food that is contaminated with it is filthy and dangerous. If, therefore, we are to dispose of human filth intelligently, we must do so in a manner that will prevent it from gaining access either to the inside or to the outside of our bodies.

In cities sewer systems carry the matter at once far away from the home. In rural districts safe and cleanly disposal can be effected with less expensive machinery, provided we act with an understanding of the ways in which this filth may be spread about the home, and of the methods for preventing such spread.

Why and How Human Filth is Dangerous.

The excreta (stools and urine) from persons are dangerous because they often contain the living poisons (or germs) of disease. These germs may come not only from persons sick with disease, but also from persons in apparently good health (the so-called "carriers" of infection). Therefore, our great safeguard against certain diseases is a cleanly disposal of all human excreta at all times.

If not disposed of in a sanitary (cleanly) manner, human excreta may in various ways get into the water we drink, the food we eat,

and on the skin of our bodies, and so convey to us the germs which have come from the bodies of infected persons.

Among the most important diseases caused by living poisons, or germs, contained in and spread by human excreta are typhoid fever, dysentery, Asiatic cholera, tuberculosis, hookworm disease, and roundworm, eelworm, and tapeworm diseases.

Typhoid fever.—This disease is caused by germs which come from human filth. Typhoid germs, like seeds, as those of wheat and corn, do not originate spontaneously but they come by natural descent from others of their kind. Their continued existence in nature depends upon their getting into and multiplying in the bodies of human beings. They come from persons and only from persons. From the bodies of the infected persons they are discharged in the stools and urine. They enter the bodies of other persons by being swallowed. Unless we get something which is contaminated with human filth into our mouths and swallow it we can not have typhoid fever. Persons sick with typhoid fever discharge in their stools and urine tremendous numbers of these germs. Some persons who are apparently in good health carry in and discharge from their bodies typhoid germs just as do persons ill with the disease. These persons are called "typhoid carriers." Typhoid germs are very small; 12,000 of them placed end-to-end, or 36,000 of them placed side-by-side, measure only about an inch. Like molds and yeasts they are plants; and under favorable conditions (as in milk, for instance) they multiply rapidly, so that in a few hours a single germ may give rise to thousands of its kind. Hundreds of them may be contained in a small particle of feces or in a small drop of urine. They are colorless and cause no disagreeable odor or taste in water or milk. Therefore, water which is clear or milk which is sweet, if contaminated with very small quantities of human filth—such as may be conveyed on a fairly clean looking finger or by a fly—may be teeming with the living germs of typhoid fever.

Dysentery and Asiatic cholera.—These diseases result from the swallowing of germs which have their source only in human excrement and are spread for the same reasons and in the same ways as are the germs of typhoid fever.

Tuberculosis.—While most of the infective discharges from the lungs of consumptives are given off by the mouth, it should be kept in mind that some of this matter is swallowed and also that some persons have tuberculosis of the bowels or of the kidneys. Therefore, human excreta often contain the germs of tuberculosis.

Hookworm disease.—This disease is caused by worms that live in the small bowel. The parasites, when full grown, are about half an inch in length. They attach themselves to the wall of the bowel, which they wound. The worms lay eggs in large numbers which are passed in the stools and which escape from the body in no other

way. Under favorable conditions of climate and soil on ground polluted by human excrement containing these eggs, tiny worms hatch out within a few hours from the eggs. These young worms grow, and when about 1 to 2 weeks old, but still only about one-fortieth of an inch long, and therefore scarcely visible to the naked eye, they may be swallowed, or they may burrow through the skin—especially of barefooted children—and in so doing cause that condition known as "ground itch," "dew itch," "dew sores," "toe itch," etc. From the skin these minute worms get into the blood and gradually make their way to the bowels, where they grow to adult worms, which in their turn lay eggs.

There are in the United States at least 2,000,000 people who suffer from hookworm disease. This serious disease results solely from contact with soil polluted with human excrement containing hookworm eggs.

Round worms and pin worms.—These worms live in the bowels of persons. They lay numerous eggs that are discharged from persons only in the excrement. The eggs and young worms are scattered around with the excrement, and upon being swallowed by persons they develop, in the bowels, into grown worms which in turn lay eggs. The presence of any of these common worms in a person means that that person has swallowed the discharges from human intestines.

Tapeworm disease.—Tapeworms live in the bowel. They lay eggs by thousands. These eggs escape from persons in the stools. If such stools are scattered around, the eggs may be swallowed by live stock. The eggs from the beef tapeworm, if swallowed by cattle, produce "beef measles." The eggs of the pork tapeworm, if swallowed by swine, produce "pork measles. Thus pollution of the soil with human excrement may lessen the value and wholesomeness of meat. If meat containing live tapeworm cysts ("measles") is eaten by persons, the young worms grow into adult tapeworms. Some kinds of tapeworm eggs passed in the stools can, if swallowed by man, be the direct cause of disease. Thus, tapeworm disease in persons results either directly or indirectly from uncleanly distribution of human excreta about the premises.

From the foregoing discussion of some of the serious diseases affecting the human race, it is clear that human excreta, if not prevented from reaching human bodies, constitute the most dangerous of all matter with which we are liable to come into contact in the the course of our daily lives.

The Ways Human Filth is Spread.

It is easy to understand that human filth is dangerously spread under the conditions generally found at unsewered homes (figs. 1 and 2). Upon leaving the body, human excreta may be spread

around by various means, of which the following are the most important:

By water, through surface washing or subsoil seepage.

By the hands or feet of persons or by animals.

By flies and other insects.

Water.—Rain or other water can carry filth into drinking water, either by washing over the ground or by seeping through the ground into a well, spring, stream, or lake (fig. 3). Tubes left by decayed tree-roots and the burrows of insects or of cray-fish or of worms may act as channels to carry the filth considerable distances underground.

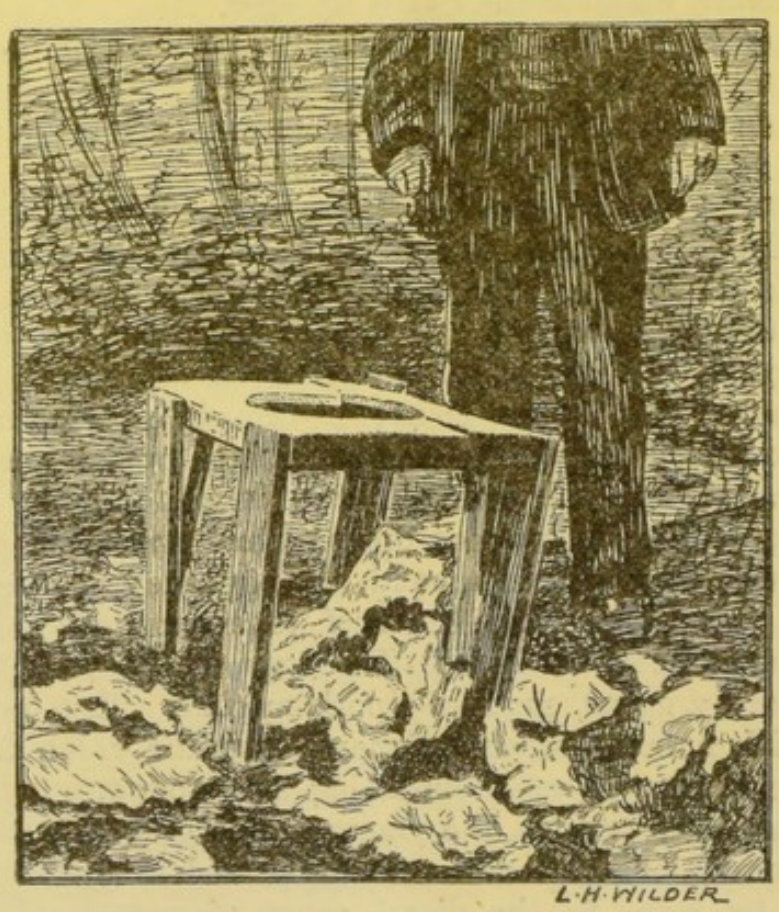

FIG. 1.—An insanitary privy of primitive type permitting extensive soil pollution. Reproduced from a photograph. (Original.)

Water supplies can become contaminated by excreta conveyed on the hands or feet of persons, on the feet and bodies of poultry and of other animals, and by worms and insects. Water contaminated with human excreta if used for washing certain foods or for washing vessels used for storing or handling foods—milk vessels being particularly important in this connection—will spread filth to foods. Thus water can serve both directly and indirectly as an agent in the spread of human excreta—with the various disease germs which such matter may contain—from person to person.

Persons and animals.—Persons and animals, such as poultry, dogs, cats, rats, etc., walking over soil polluted with human excreta get

some of the filth on their feet, and then "track" this filth to the well top, the spring bank, the yard where children play, or into the kitchen, dining room, and other parts of the house. Hands soiled with filth either from accident or carelessness while a person is meeting the calls of nature, or from handling objects contaminated in any way with

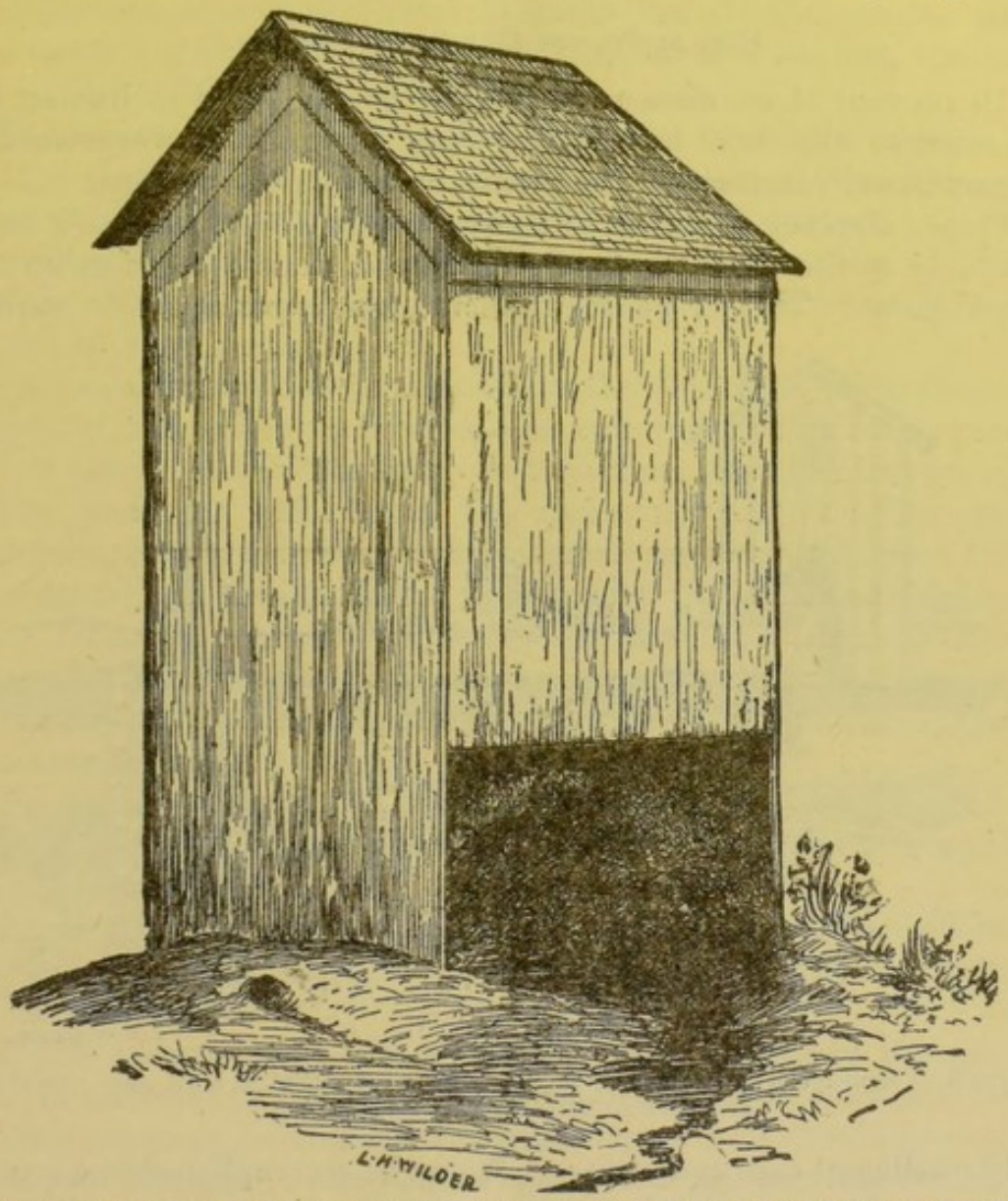

FIG. 2.—An insanitary privy open-in-back. Filth, with any disease germs which may be contained in it, is spread from a privy of this kind by flies, by the feet of persons, by animals, by surface washing and drainage, and by subsoil seepage. Such exposure of human excreta is a menace to the household and the community. (Stiles, 1910.)

human excreta, carry excreta directly into human mouths or to food and drink which reach human mouths.

Flies and other house insects.—Flies breed in and feed on human filth. These same flies frequent the kitchen and dining room, crawl over foods, fall into the milk, walk on the lips of sleeping children, and smear the filth from their feet and their bowels on everything they touch. Of all household insects the fly appears to be most important in spreading human filth.

Considering the many ways in which human filth may be spread, the frequency with which germs of disease are found in it, the minute size and large numbers of these germs, there is no mystery about the widespread and frequent occurrence of certain diseases in our unsewered (rural) districts.

How to Prevent Filth-Borne Diseases.

To prevent those diseases caused by germs found in human filth we must so dispose of human filth that none of it, however small in amount, may reach either the mouth or the skin of persons.

Proper disposal of human filth requires that from the time it leaves the body to the time it is finally destroyed, none escapes to be scattered about. This is neither difficult nor expensive. It requires

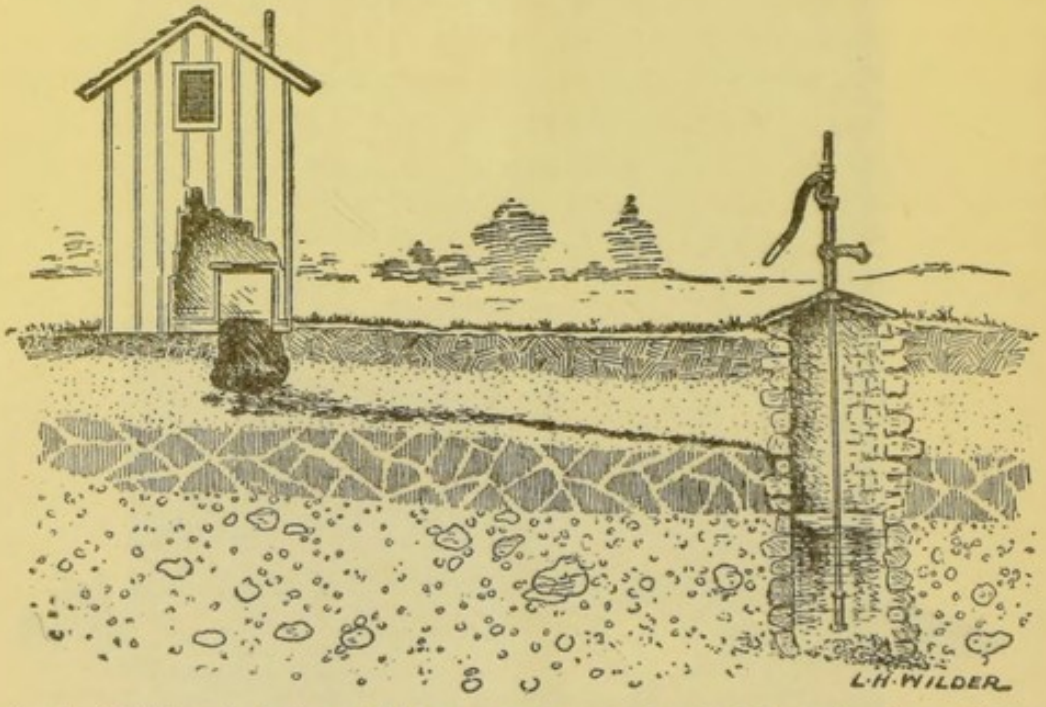

FIG. 3.—Pollution of a shallow well by seepage of excreta deposited in a pit privy. (Slightly modified from Minnesota State Board of Health.)

only intelligent care and energy. It can be accomplished in a number of ways. It is absolutely necessary to the preservation of human health.

How to Dispose of Human Filth.

In nature agents exist which tend to render human excreta free from danger.

By understanding the principles involved, and by applying this knowledge practically and intelligently, man can subject human filth effectively and safely to the natural agents of purification; he can also, for purposes of immediate convenience and additional safety, hasten the natural purification by employing artificial agents.

But for the action of the purifying agents in Nature, even before they were recognized and before artificial agents were discovered,

mankind could have existed on earth only in very small and isolated groups of individuals or only in constantly roving tribes. Permanent settlements of numbers of people in any one place would soon have rendered the locality so filthy and dangerous that the existence of the people would have become intolerable or impossible.

Important among the natural agents are (1) the minute plants and animals with which the upper (2-foot) layer of the soil is teeming, (2) sunlight, (3) air, (4) soil and water.

The minute plants and animals attack and "rot" the excreta, just as they destroy a dead tree or other dead organic matter, and reduce them to simple earthy substances suitable for plant food.

Sunlight, if direct and prolonged, dries human excreta and has a surface action in the destruction of disease germs which may be contained in such matter.

Air has a drying action and furnishes the elements used by the living agents of the soil in their work of destroying dead or refuse matter.

Soil and water hold the filth so as to prolong the time of action of the active purifying agents and also dilute the matter. The greater the volume of water into which a given amount of human filth is introduced, the greater is the opportunity for time and dilution to effect its purification. The greater the amount of earth between a deposit of human filth and a water supply, the greater is the operation of the factors of time, dilution, and filtration, in preventing dangerous contamination of the water supply.

In disposing of human filth, we should take advantage of the natural purifying agencies and, so far as practicable, work in harmony with them.

From what has been said above, the principles to be considered in the selection of a place in which to deposit the excreta from our bodies are obvious.

If the excreta are to be deposited on the surface of the ground, the place should be far (the farther the better) away from, and downhill from, human habitations and water supplies; it should be exposed to direct sunlight; it should be protected against flies which are likely to go from the deposits of filth to foods for human consumption; and it should be so safeguarded that the soil for considerable areas about and liable to be polluted with the excreta will not, within 12 months after the deposit of the excreta, get on the skin of persons. The precautions to make disposal of human excreta on the surface of the ground a reasonably safe procedure evidently are highly inconvenient, and even under the best of circumstances may fail of their purpose. Therefore, this method is not to be recommended.

If the excreta are to be voided directly into the ground for immediate and final burial, the place should be as far as practicable and downhill from human habitations and water supplies; it should not be exposed to animals likely to uncover the matter; the trench or hole

should be from 6 to 12 inches deep and the deposits immediately after being voided should be covered with from 6 to 12 inches of earth. This method is similar to that prescribed by Moses to the children of Israel.[1] It embodies excellent sanitary principles in the disposal of excreta, but under usual conditions of modern life it is inconvenient.

If, for convenience and as an intermediate step to final disposal, the excreta are to be deposited temporarily within the immediate surroundings of the home, the place should be so equipped that the excreta will not, either directly or indirectly, dangerously pollute the soil, contaminate water supplies, or furnish a breeding or feeding place for flies.

Important among the artificial agencies for use in the sanitary disposal of human excreta are water-tight receptacles, fly screening, disinfectants, and fire for burning or boiling.

The Sanitary Privy.

A privy is a device for furnishing privacy to persons while voiding their excretions. A sanitary privy is a labor-saving device for convenient and comfortable use in the safe and cleanly disposal of human excreta.

In the minds of most persons modesty and privacy are the chief considerations which lead to the construction of a privy. As such privacy may be secured by a clump of bushes or a grove of trees (fig. 1), some persons consider a privy unnecessary. The protection of modesty and the securing of privacy while responding to the calls of nature are laudable objects, but all must agree that they are of much less importance than the great object of preventing disease. A privy which is so constructed as to be sanitary and so used as to be kept sanitary, accomplishes all three of these objects.

Furthermore, the convenience of a sheltered and comfortable place, nearby the dwelling, in which to void the excreta, the regular habits which such a place encourages, and the saving of labor in the disposal of the excreta, which is accomplished in removing considerable amounts at one time instead of having to dispose separately of each deposit, constitute additional advantages of the sanitary privy.

The essentials of a sanitary privy are:

(1) Proper construction.
(2) Proper use.
(3) Proper upkeep.
(4) Proper disposal of contents.

Construction.—A sanitary privy should be so constructed that it will afford privacy and comfort to the user. It must have a water-

[1] Deuteronomy XXIII, 12 and 13.

tight receptacle (pail, can, tub, barrel, tank, or vault) to receive the excreta. This receptacle must be so protected as to prevent access of flies or domesticated animals to its contents. The receptacle must be so arranged that it may readily be removed for cleaning or easily cleaned in place.

Use.—The sanitary privy in order to give the benefits for which it is intended must be used intelligently. If some members of the household use the privy and others repair to the woods or barn to void their excreta in an insanitary manner, the sanitary privy will, in large part, fail of its purpose. If two or more privies are needed at a home, two or more should be constructed. The sanitary privy must be used in a cleanly way. If the seat of the privy becomes soiled with excreta or if any of the excreta gets anywhere about the privy except into the receptacle, the place ceases to be sanitary. If the contents of the receptacle are not continually safeguarded from flies by keeping down the cover over the hole in the seat when the seat is not occupied, or by other means, the privy is not sanitary. Thus to use a sanitary privy properly all members of the household must exercise or be made to exercise a "privy sense."

Upkeep.—A privy so constructed as to be sanitary must be kept in proper repair and condition. Otherwise it will not remain sanitary. Screens over air vents, the boarding of the receptacle box, and the receptacle itself will, sooner or later, need repair or replacement with new material. The receptacle must not be allowed to overflow. Its contents should be prevented either by ventilation or by the use of drying powders or disinfectants, or by both, from becoming markedly offensive.

Disposal of contents.—The sanitary privy is, as has already been emphasized, a place for the temporary, safe, and convenient storage of human excreta from the time the matter leaves the body until it can be removed and disposed of finally in a safe and cleanly way.

The removal and final disposal of the contents of a privy is necessary to keep a privy sanitary. This requires more work than does either the construction or the up-keep of the privy itself. It must be done systematically. People generally—and particularly those who do not understand the importance of the work—do not like to "handle" the material. Privies may be so constructed that final disposal occurs automatically through pipes which carry the overflow to the subsoil in such a way as to be safe or relatively so; or the receptacle can be made large enough (as a vault) so that it need not be emptied more than once a year; or it may be made large enough (as a barrel) so that it need not be emptied more than once a month, if the family is not too large; or it may be of a size (as a pail) that requires emptying every week or every day according to the circumstances.

The important point to be held in mind is that the contents must be disposed of intelligently and that the greater the care, the greater is the protection against disease.

TYPES OF SANITARY PRIVY.

A privy to be sanitary must conform to the principles of construction, use, up-keep, and care outlined in the preceding section. A privy which does not do so, no matter how elaborate or costly, is insanitary, unclean and unsafe.

An ordinary water-tight pail, or can, and a gunny sack—all told costing about 30 cents—if used with sufficient care, may be operated successfully as a sanitary privy. Such a simple arrangement is, however, inconvient for practical use.

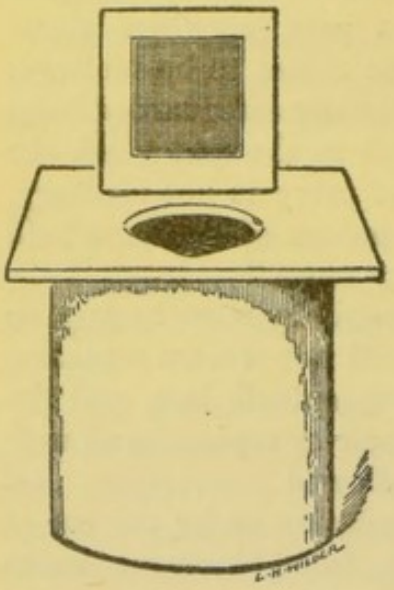

FIG. 4.—Covered can. The simplest type of sanitary receptacle privy. Used with a suitable drying powder, or disinfectant solution, it may be kept sanitary and practically odorless. The seat should be provided with cleats on the under surface to hold it in place on the can. (Original.)

Money and labor intelligently expended in the building of a privy will render the up-keep of the privy easier and cheaper and in the long run will be an economy.

The following types of privies conform to the principles of sanitation and have been proved in actual use to be practical:

I. Removable-Receptacle Privies.

(A) *Covered can.*—This type (fig. 4) consists of a stout water-tight can fitted with a wooden top having a suitable hole in it to serve as the seat. The hole in the seat is covered by a hinged lid. The seat board is closely fitted to the top of the can and the lid fits closely over the hole. To provide ventilation the lid may be a framed screen. This simple type of sanitary privy, which can be set up for about one dollar, if operated with care can be kept sanitary.

(B) *The boxed can.*—This type (fig. 5) consists of a suitable water-tight receptacle, incased in a box which serves as the seat. The receptacle may be a can, pot, or other water-tight vessel. The box must be large enough to hold the receptacle. For purposes of ventilation and easy removal, it is advantageous to have a space of about 2 inches between the top of the receptacle and the under surface of the seat and between the sides of the receptacle and the box. The box must be fly-tight and substantially built. The lid should be hinged at the back or to one side of the hole. To have it on the left side is more convenient. It should be arranged to drop into place of its own weight when the privy is not in use. The top or front of

the box should be hinged to permit removal of the receptacle for cleaning. It should, of course, be closed except during removal or replacement of the receptacle. Such a commode, including one galvanized iron can, may be set up for about two dollars. It may be placed in a privy house or in any other suitable building, such as a barn or woodshed, and is thoroughly practicable for use. It should be protected from the weather to prevent warping and cracking. If placed in some structure already screened, it is much easier to keep all flies from the excreta.

A water-tight receptacle protected against invasion from flies is the essential part of any receptacle privy. The boxed receptacle may be made a part of the structure of the privy house, the back and sides of the house serving as parts of the box (figs. 6 and 7).

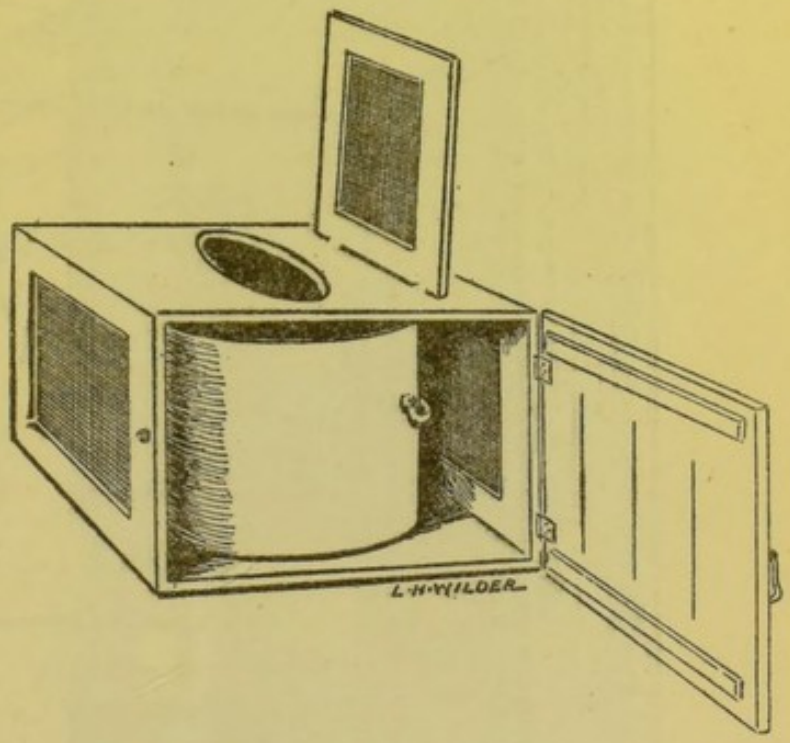

FIG. 5.—The boxed receptacle. Flies are excluded by the fly-tight box. Ventilation is provided by screened openings in the sides of the box and in the lid. The hinge d front permits ready removal of the can for cleaning. Such a device is safe, sanitary, and convenient, and may be placed in an existing privy house or in any suitable outbuilding. (Original.)

If the privy is installed on an alley in a village or town, and is to be cleaned by a public scavenger, the box should be arranged to open in the back of the privy, so that it may be cleaned from the alley (fig. 7). Under other conditions it is usually better to have the top or front of the box inside the house made adjustable for the removal of the receptacle, because the box will be much easier to keep fly proof if completely protected from the weather.

A separate privy house is in many instances more advantageous than the utilization of some other outbuilding used principally for other purposes. The privy house is built primarily and solely for use as a privy and its location and construction should tend to make its use convenient and safe.

Further, where a privy house already exists, or when one is to be constructed, there are certain advantages in having the receptacle box built entirely separate from the privy house and kept in it.

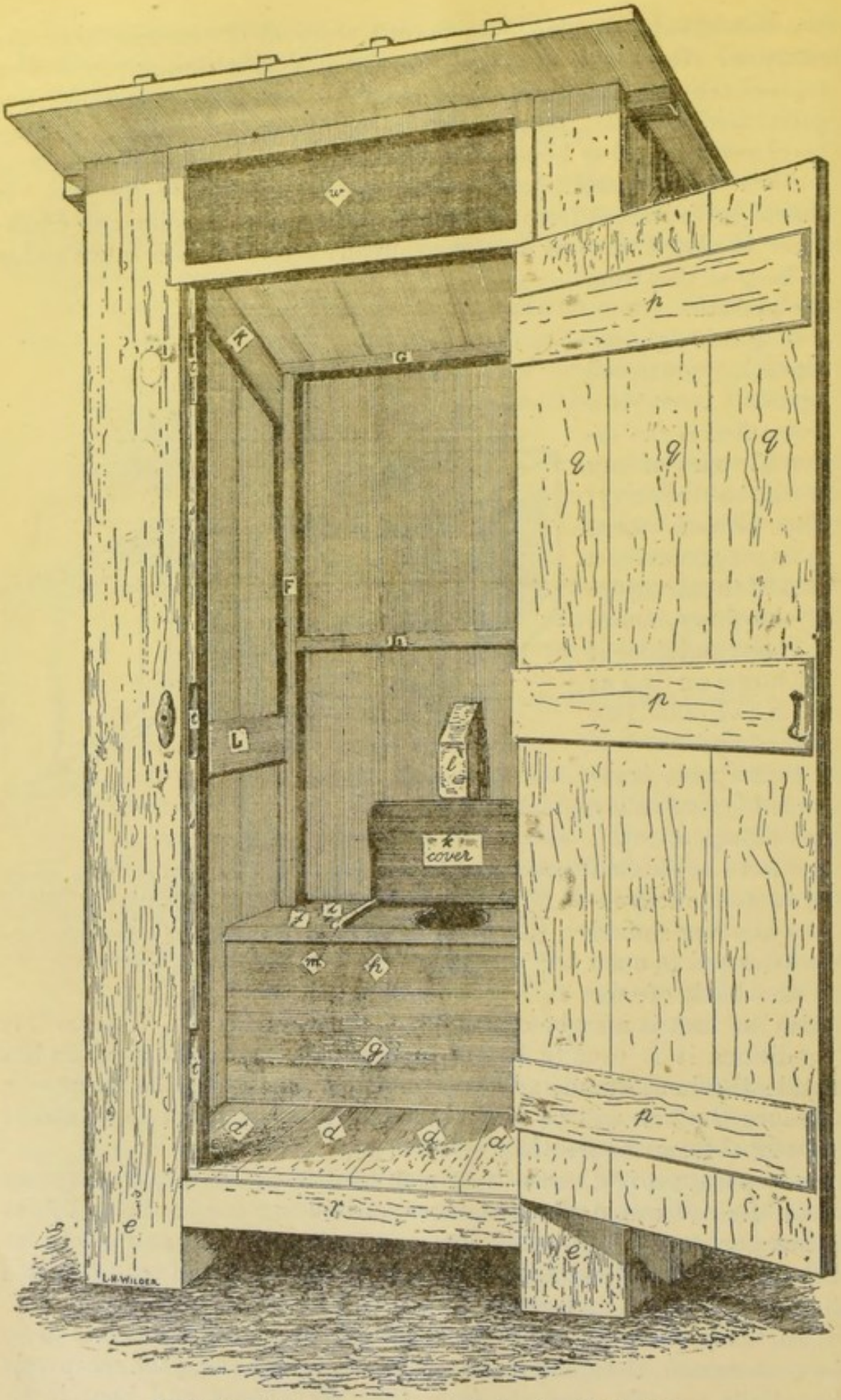

FIG. 6.—Front view of a removable-receptacle privy. (Stiles, 1910.)

Almost any existing privy house can, with only minor alterations, be fitted to hold such a receptacle box. Almost any insanitary privy can thus be made sanitary at a cost of not over $2 to $3. A similar result can be obtained by building a fly-tight box, provided with a receptacle, under the seat of any ordinary open-in-back privy (fig. 8).

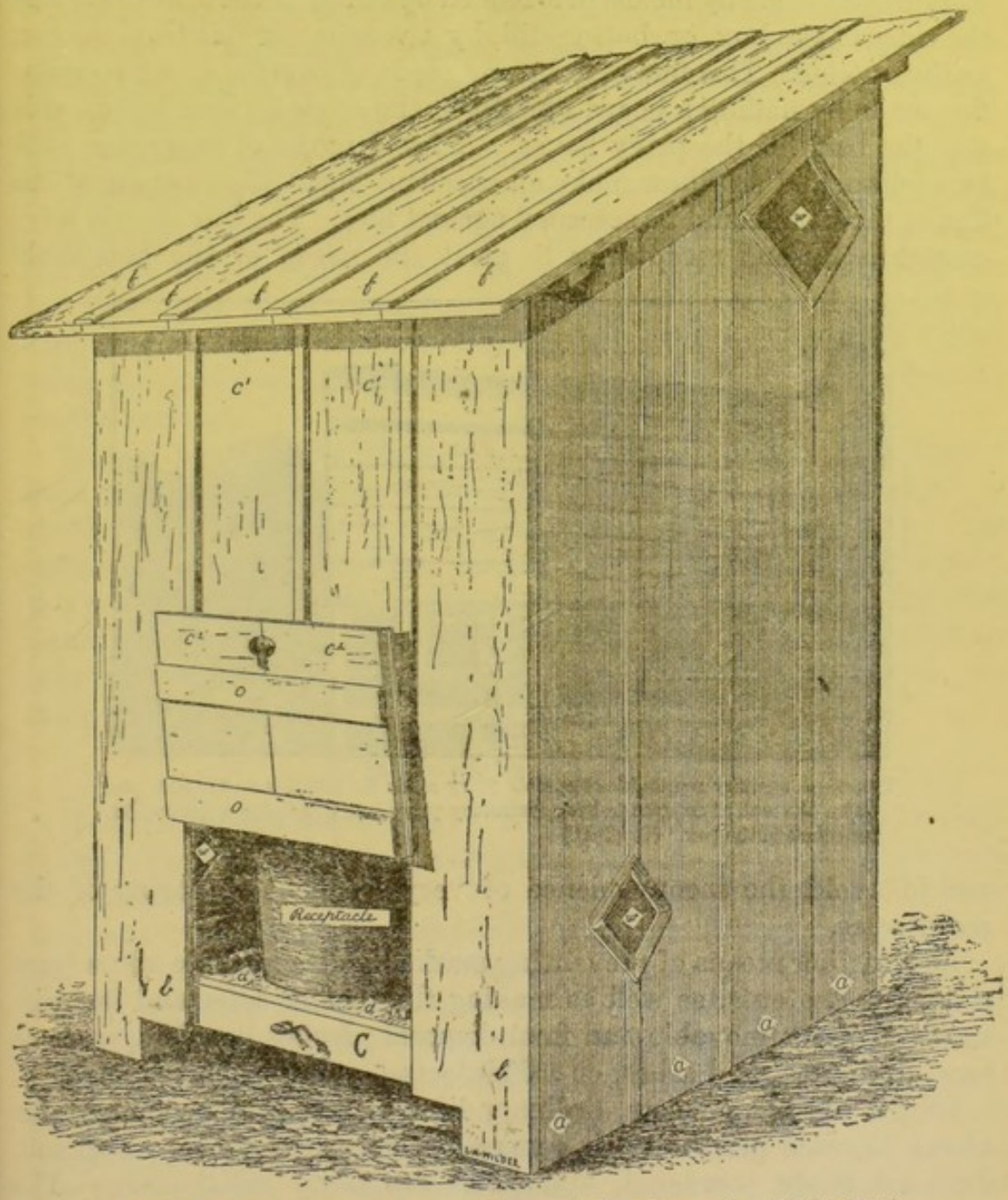

FIG. 7.—Rear and side view of a removable-receptacle sanitary privy. (Stiles, 1910.)

Any water-tight receptacle of suitable size may be used in a sanitary privy. Experience has shown that wooden receptacles soon warp, become leaky, and are therefore unsafe, and in the long run expensive. Cylindrical cans made of strong galvanized iron are generally most suitable. A can about 15 inches in height and holding about a bushel is a convenient size. This type of can costs about 60 cents

and is obtainable at most any store where hardware is sold. The painting of the inside of the receptacle with coal tar increases durability and makes cleaning easier. Whenever emptied, the cans should be inspected to see if they leak.

The box should be well ventilated to remove objectionable odors. This may be done by means of screened openings in the seat cover and the sides of the box, or, better still, by a ventilating flue from the box to the outside. This flue may be one made of boards, or a triangular flue made by nailing a board upright in the angle formed by one side and the back of the privy house. A few lengths of stovepipe with two collars and an elbow make an excellent flue. The opening of the flue in the box should be screened against flies. The box should have enough holes and receptacles to meet the needs of the household

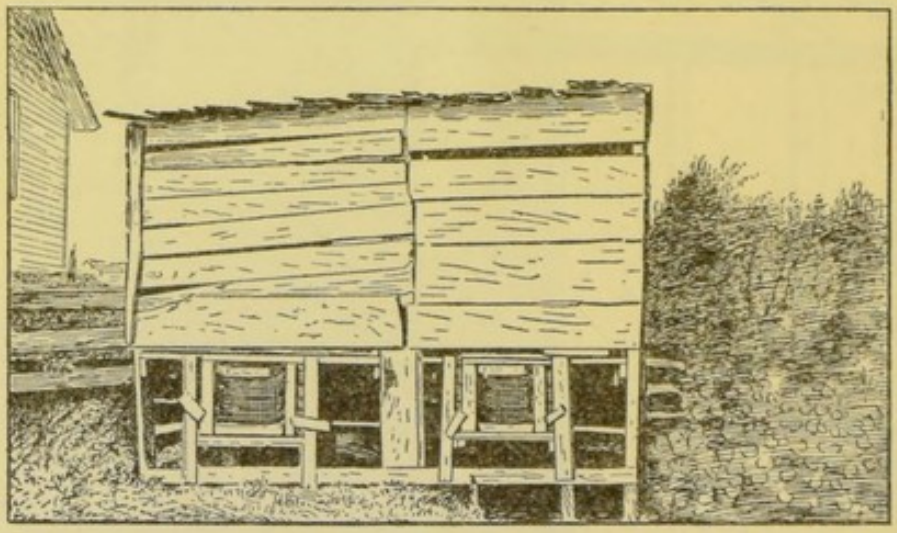

FIG. 8.—A sanitary removable-receptacle privy made by building a fly-tight box under the seat of an open-in-back insanitary privy and by placing a water-tight receptacle in the box. (Original.)

and to avoid the inconvenience of very frequent emptying of the receptacles.

As a further means of preventing markedly disagreeable odors from the privy contents, as well as making the matter safer and less disagreeable for removable and final disposal, drying powders, such as lime, dry earth, and ashes, or a disinfectant solution may be used.

Of the drying powders, ordinary lime (which can be bought for about 75 cents per barrel) is generally most satisfactory. Top soil, dry and finely powdered, and ashes are fairly satisfactory. The drying powder should be kept in a box or barrel in the privy and about a teacupful of the powder sprinkled on each stool immediately after it is deposited. By using enough drying powder, odor can be controlled even where ventilation is only fairly good.

Disinfectant solutions also keep down odors, and are much more effective than drying powders in destroying disease germs in the excreta. For this purpose the so-called coal-tar disinfectants are

very efficient. A sufficient amount of a strong solution of the disinfectant to disinfect the contents of the can when full is placed in the empty can. For a receptacle of 1-bushel capacity a gallon of the solution is required.

Chloride of lime solution (1 pound to 8 gallons of water) is an excellent and cheap disinfectant for excreta and is safe to have about the home. This solution should be used regularly in the receptacle in the proportion of about one teacupful to each deposit of excreta. The solution should be kept in a well-stoppered vessel.

A disadvantage attending the use of a disinfectant solution is that it increases the tendency of the contents of the can to splash on the person or clothing when the privy is used. This is also the case when the night urine is emptied into the can, and the use of a separate can for this urine is advantageous. Splashing may be prevented by dropping a piece of thick paper on the surface of the liquid just before using the privy or by keeping small pieces of wood or chips floating on the surface.

In cold weather the contents of the can may freeze. The matter does not, however, freeze so readily or so solidly as does water. If stout cans are used it is very rare for one of them to burst. The thicker the matter is, the less danger there is from freezing; therefore, the use of drying powders has in this respect some advantage over liquid disinfectants. When the contents of a can are frozen, emptying may be facilitated by applying heat to the outside of the can; the mass will then slide out in a solid block.

II. Stationary-Receptacle Privies.

If the receptacle does not have to be removed from the privy for emptying, it may be of large capacity, and thus the frequency of disposal of contents may be lessened. The receptacle may be of wood, iron, or concrete. Concrete is the most durable and, in the long run, the cheapest. It is advantageous to have the receptacle of this kind of privy wholly or partly below the surface of the ground to prevent freezing.

(A) *Simple vault privy.*—This type of privy (fig. 9) is fairly satisfactory. The same principles of fly-proofing, ventilation, and use of drying powders and disinfectants apply to this as to the removable receptacle privy. The construction should be such that the excreta will be accessible for safe and cleanly removal. The difficulty of properly cleaning a privy of this kind constitutes the main objection to its use.

(B) *The L. R. S. privy.*[1]—If human excreta are permitted to undergo natural fermentation, the solid matter becomes liquefied and a con-

[1] Lumsden, Roberts, and Stiles: "Preliminary note on a simple and inexpensive apparatus for use in the safe disposal of night soil." Public Health Reports 1910, Nov. 11, v. 25 (45), pp. 1623-1629. Stiles and Lumsden: The Sanitary Privy. Farmers' Bulletin 463 (U. S. Department of Agriculture), pp. 17-21. Lumsden: Public Health Bulletin No. 51, pp. 46-49.

siderable proportion of the excrement and urine is carried away by evaporation and gas formation. Thus the labor and cost of disposing of the matter may be lessened. These principles are applied in the L. R. S. privy. (Figs. 10 and 11.)

This apparatus consists of the following parts:

(1) A water-tight tank, barrel, or other container, to receive and liquefy the excreta.

(2) A covered water-tight can, pot, barrel, or other vessel, to receive the effluent or outflow.

(3) A connecting pipe about 2½ inches in diameter, about 12 inches long, and provided with an open T at one end, both openings of the T being covered with wire screens.

(4) A tight box, preferably zinc lined, which fits tightly on the top of the liquefying barrel. It is provided with an opening on top for the seat which has an automatically closing lid.

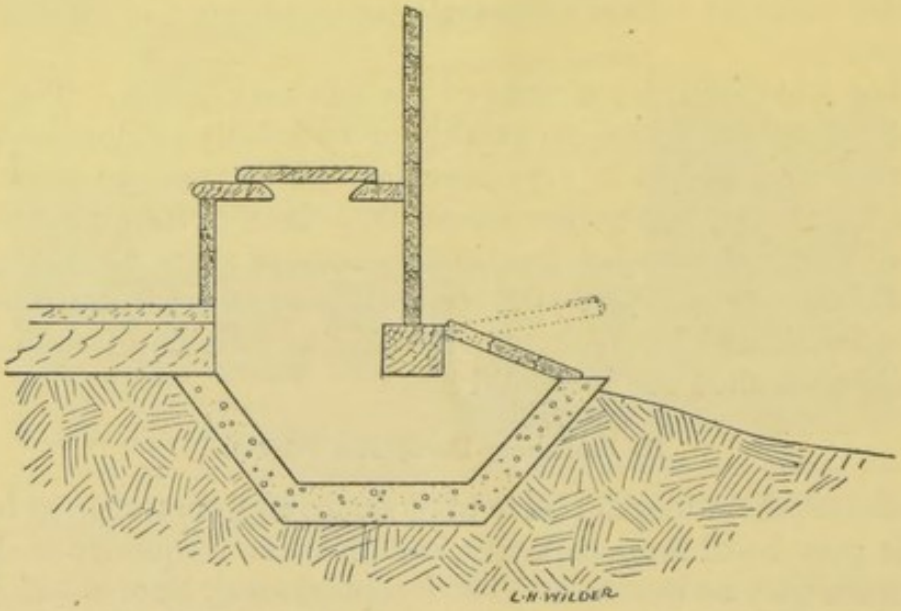

FIG. 9.—A stationary-receptacle sanitary privy with a cement vault arranged for convenient cleaning. (Original.)

(5) An antisplashing device, consisting of a small board placed horizontally under the seat about an inch below the level of the transverse connecting pipe. It is held in place by a rod, which passes through a hole in the side of the seat and by which the board is raised and lowered. A layer of chips floated in the tank may be used instead of this antisplashing device.

(6) A ventilating pipe, such as a stovepipe or wooden flue, connecting the space under the seat with the open air.

The liquefying tank is filled with water up to the point where it begins to trickle into the effluent tank. A pound or two of old manure should be added to the water to start fermentation. As an insect repellent a film of some form of petroleum may be poured on the surface of the liquid in each container.

When the privy is to be used, the rod is pulled up so that the antisplashing board rises to within about 1 inch of the surface of the water. The fecal material falls into the water, but this board prevents splashing. Before leaving the privy the person should sink the antisplashing board by pushing down the rod so that the fecal matter and the toilet paper will float free into the water.

Although some of the fecal matter floats, it is protected both from fly breeding and fly feeding in the following ways: First, by the automatically closing lid; second, by the water; third, by the film of oil;

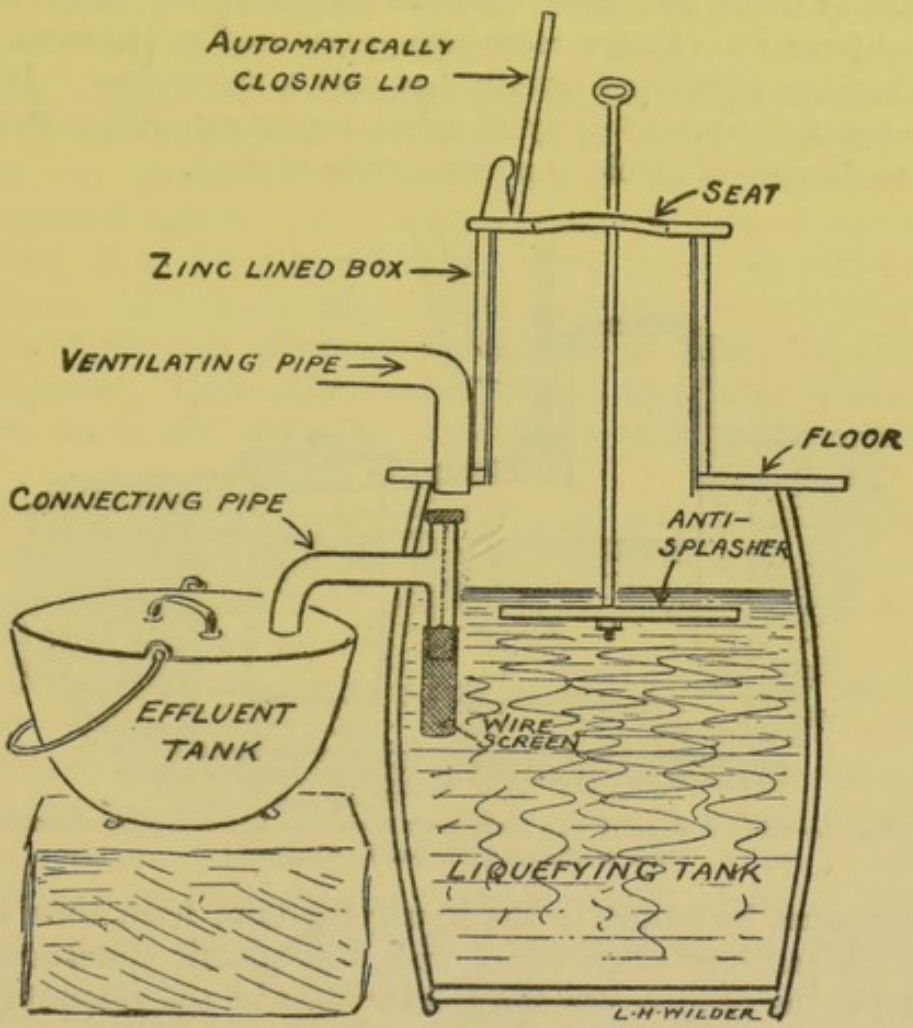

FIG. 10.—An L. R. S. privy with an ordinary vinegar barrel used as a liquefying tank and an iron pot for effluent tank. (Original.)

and fourth, by having the apparatus located in a screened place, which should be done for additional safety. The film of oil prevents the breeding of mosquitoes in the tank.

The fecal material ferments in the water and gradually liquefies. The level of the liquid is raised and the excess flows into the effluent tank, where it is protected from insects by the cover and a film of oil. This effluent may be allowed to collect in the tank until it reaches the level of the connecting pipe, when it may safely be disposed of in any one of several ways. (See page 26.)

Among the advantages of the L. R. S. privy are (1) it prevents flies and mosquitoes from having access to the excreta; (2) it liquefies the fecal material and reduces its volume so that this material may be safely disposed of much more easily and cheaply than the contents of other types of privies; (3) it reduces odor and thus makes the work of privy cleaning less disagreeable, and (4) it is of simple and inexpensive construction.

The volume of the effluent from an L. R. S. privy is less than half the volume of the excreta and paper deposited in the liquefying tank and thus is much less than the amount of matter which must be removed from an ordinary receptacle privy used to the same extent. The effluent is liquid and usually has only a slight odor. It is easy also to disinfect by heat or by chemical treatment, and is thus much easier to dispose of safely than are crude excreta.

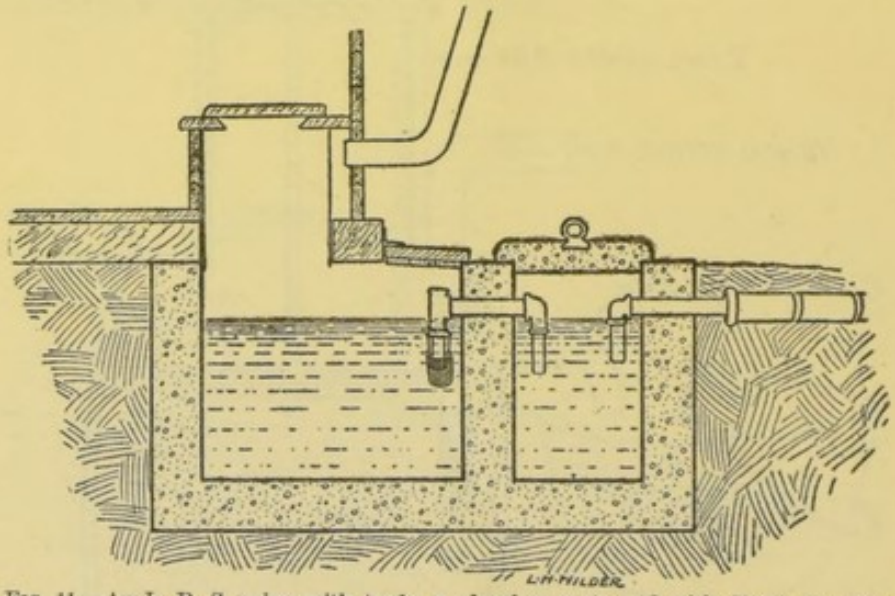

FIG. 11.—An L. R. S. privy with tanks made of concrete and with direct distribution of effluent into top soil. (Original.)

Water must be added to the liquefying tank from time to time; how much and how often varies with atmospheric conditions. The more rapid the evaporation the greater must be the amount of water added. Under average conditions about two gallons of water added once a week will be sufficient for a tank of 50 gallons capacity used by 4 or 5 persons. If the matter in the liquefying tank is allowed to become too much thickened proper fermentation will cease and offensive gases will be formed.

Disinfectants must not be used in the liquefying tank because they stop the fermentation.

As an effluent tank various receptacles can be utilized. A galvanized iron garbage can is quite satisfactory. If an iron pot is used, a fire can be built under it and the effluent thus can be easily and cheaply disinfected by heat.

As a liquefying tank, a barrel, an iron tank, or a concrete vault may be used. Whatever is used for this purpose must be strictly water-tight. Iron or concrete will cost more than wood, but on account of greater durability will be more economical in the long run.

The larger the number of persons to use the privy the larger the liquefying tank must be. A 40-gallon barrel, such as a whisky or oil barrel, is sufficient for three adults. For a larger number of persons the capacity should be increased by using two or more barrels or one larger receptacle, in the proportion of about 40 gallons capacity to every three or four adults. If two or more barrels are used in the same privy they should be connected by piping. A complete device, as shown in figure 10, can be placed in any suitable outhouse, such as a barn or woodshed, and thus expense of building for this special purpose may be saved. To have the place in which the device is kept screened against flies is an important additional safeguard.

In the L. R. S. privy regular toilet paper breaks up with sufficient promptness. If heavier paper (such as newspapers) is used it will rot more slowly and allowance for this should be made in increased tank capacity. Corn cobs, cotton waste and similar objects would interfere materially with the successful working of the liquefying tank.

Experiments and extensive practical operations have shown that the principles of the L. R. S. privy are good. Any intelligent man should be able to work out the details of construction and operation best suited to his own locality.

If operated fairly intelligently, the liquefying tank will seldom need cleaning—not more than once a year. Provision should be made in the construction of this privy so that when it becomes necessary to clean the liquefying tank this can be done in a cleanly manner.

The device is better adapted for localities with warm or moderate climates than for those with long and very cold winters. But if the apparatus is kept in a room with a temperature maintained above the freezing point, or if the liquefying tank is sunk in the ground below the freezing line, or embedded in stable manure, or otherwise protected against freezing, it can be operated successfully even in cold climates. Since the same outhouse may be operated either as a pail-system privy or as an L. R. S. privy, it may be convenient in some localities to alternate the systems with the season, the L. R. S. being used during the warm weather months, which are the months of greatest danger from excreta-borne infections, and the pail system during the cold winter months.

The effluent from an L. R. S. privy should be regarded as potentially dangerous, just as are crude excreta, and it should be disposed of accordingly. Since the excreta in an L. R. S. privy are reduced in

amount and liquefied, the matter may be subjected to the natural purification agencies more effectively than the crude excreta can be. On some premises the effluent may with safety be discharged through drain-tile piping directly into the top soil. (Fig. 11.) In disposing of the effluent directly into the ground, great care should be taken to prevent the contamination of water supplies. This is particularly important in limestone localities. Chemical disinfectants may be

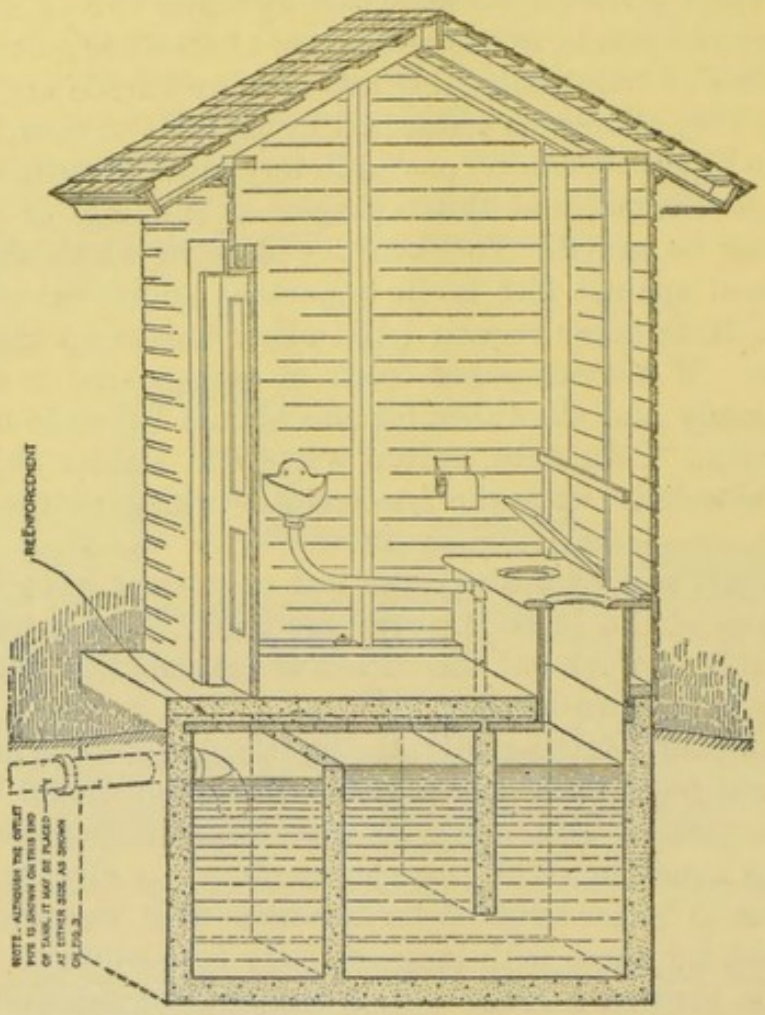

FIG. 12.—The Kentucky Sanitary Privy. (Kentucky State Board of Health, 1913.)

added to the effluent tank and the effluent may be discharged into the soil automatically and periodically.

A somewhat elaborate modification of the L. R. S. privy has been designed by the Kentucky State Board of Health, which is known as the Kentucky sanitary privy. (Fig. 12.) In this privy there are three tanks, and the effluent from the final tank is discharged into a system of drain tile arranged to distribute the effluent under the surface of the soil. In the construction of this privy it would be well to make provision for cleaning the tanks.

Makeshifts and Compromises.

While a privy of the receptacle type, rigidly screened against flies and properly operated, represents the only really sanitary privy and the only one which can be recommended, conditions are sometimes such that it is not practicable to secure the installation of such a privy at a given home. To meet such conditions, but with full recognition of the fact that any departure from the established principles of proper privy construction is made at the expense of health and cleanliness, certain types of privies, all more or less makeshifts or compromises, are here described. These types are not recommended. They are presented here solely as suggestions toward some improvement of privies used by persons who will not install a proper type of privy.

Pit privy.—A type of privy in use in certain localities, and offering as its great advantage freedom from the necessity of having to move human filth, is known as the "pit privy."

The pit privy is essentially a hole in the ground, over which the privy house is built and into which the excreta are deposited. When the pit is filled nearly to the surface of the ground, the house is moved and placed over a new pit and the excreta in the old pit are covered with earth. Well constructed and properly used, the pit privy protects against flies and domesticated animals, but it does not protect against pollution of underground water. (Fig. 3.) The labor of digging new pits and of repeatedly moving the house to them is at least equal to that required for the regular cleaning of a receptacle privy.

The pit privy is particularly dangerous in limestone localities and in marshy soils. It should never be located within 100 yards of a well or on the slope over a spring. The deeper the pit, the greater is the danger of pollution of water supplies. Where water stands in the pit the breeding of mosquitoes should be guarded against by frequent oiling.

To withstand the frequent moving, the privy house should be built more substantially than that of an ordinary privy. The back should come to the surface of the ground. When the house is in place over the pit, dirt should be heaped up around the base of the house to exclude flies. The covers for the holes in the seats should be tight fitting and all cracks which might admit flies to the excreta should be carefully closed. In loose soils the four sides of the pit should be braced with boards to prevent caving. The use of drying powders or disinfectants in the pit privy will to some extent lessen its dangers.

Unprotected receptacle privy.—A suitable water-tight receptacle under the seat to receive the excreta, even if the contents are not protected against fly invasion, makes a very considerable improvement over the open-in-back surface privy (fig. 2). The retention of the matter in such a receptacle prevents it from polluting the soil and from endangering water supplies. By the use of disinfectants or of oil in the receptacle, fly feeding and fly breeding can be lessened.

Closed-in-back surface privy.—The owner of the ordinary surface privy, if he is unwilling to make the changes necessary to convert it into a strictly sanitary privy, should at least close in the back of his privy by boards or screens and provide a cover for the hole in the seat, in order to keep flies and animals away from the excreta. This does not render the privy sanitary, but if carefully done it reduces very much the danger of the spread of disease by flies and animals. It does not prevent the pollution of the soil about the privy or of water supplies. The use of lime to cover the excreta in such a privy will render cleaning easier and will add to the sanitary value of the device.

Sunshine privy.—If the back of the privy is turned to the south, and the contents thoroughly protected against flies by screens, the sunshine adds to the sanitary value of the privy. Even this privy is a considerable improvement over the common open-in-back surface privy.

Final Disposal of Privy Contents.

The method of removal and disposal of privy contents varies with the type and method of operation of the privy. If the receptacle is removable it may be taken out and emptied into another water-tight vessel or, better still, it may be carried to the place for final disposal of the excreta and there emptied and cleaned. From stationary receptacle privies, the matter may be pumped, dipped, or shoveled into another water-tight container which can be hauled away. In moving the privy contents the work can and should be done in a cleanly and inoffensive way. None of the matter should be spilt about the premises. Even if the matter is quite solid a shovel (and not a pitchfork) should be used for handling it.

By the use of a disinfectant the matter may be rendered free from objectionable odor and made safer to handle. One of the most suitable disinfectants for this purpose is chloride of lime—one pound dissolved in water for each 5 gallons of excreta.

If the matter is to be hauled over public streets or roads, it should be carried in tightly covered containers so that it will not be exposed to flies nor be objectionable to smell or sight while in transit.

In cities, towns, villages, and thickly settled country districts, it is highly advantageous to have the work done by public scavenger service. By such a service the work can be done more systematically, more safely, and more economically than if done by individual effort or employment. The scavenger service may be operated by the municipal authorities or by some voluntary cooperative arrangement. It is always best, when feasible, to have some official supervision exercised over the scavenger work. In towns or villages, public scavenger service for removal of privy contents can usually be obtained under contract at the rate of about 35 cents per month for the average household of 5 persons.

At a country home, the removal and disposal of 1 or 2 bushels of privy contents each month is very little work, but is most important work. If a drying powder or disinfectant, or just common sense, is used, it is not disagreeable work. It is certainly no more degrading to "handle" this matter than it is to "handle" stable manure. The amount of labor involved in the proper disposal of privy contents is much less than that required to carry daily a pail full of household slops to the pigs.

Privy contents may be disposed of finally (1) by burning, (2) by discharge into a sewer, (3) by burial, either with or without disinfection by heat or chemicals.

Burning.—In cities, towns, and villages, privy contents may be disposed of most conveniently, most safely, and most economically by burning with other refuse in an incinerator. At country homes also, disposal by burning is the safest method; but because of lack of facilities at such homes it is usually not feasible.

Discharge into a sewer.—If a sewer is available, privy contents may be dumped through a manhole directly into it and the sewer flushed with water from a fire hose. In doing this, precautions (grit chambers or gratings) should be used to prevent choking of the sewer with coarse insoluble matter. From a sanitary standpoint, the diluted privy contents are as safe for discharge through the sewer as is the sewage of the community.

Burial.—In small villages and country communities the disposal of privy contents by burial is usually the most available method that is practicable. The place selected for burial should be at least 100 yards away from any water supply and should not drain toward it.

To take advantage of the natural agencies of purification in the soil and to protect underground sources of water supply as much as possible, the burial should be in the upper 2 feet of the soil. Furrows (such as are made by an ordinary plow) or narrow trenches should be used rather than large pits, so that the purifying agents of the soil will not be overworked. As an additional safeguard, disinfection of the excreta by heat or chemicals may be employed before such burial.

The effluent from the L. R. S. privy is particularly adapted to disinfection. If human excreta are disinfected by boiling the matter is safe for use as a fertilizer, even near the dwelling.

The field used for the burial of untreated excreta should be one which is not to be cultivated for at least 6 months; and in sections where hookworm disease prevails a minimum of 12 months should be allowed. In cold climates trenches should be dug before the ground freezes. They should be ample to take care of privy contents during the winter and should be marked with stakes, so that they may be found even when covered with snow. The matter put into these trenches should be covered as soon as the ground thaws.

Trenches for winter use should be about 2 feet deep. In open weather, the matter should always be covered immediately; the furrows should be from 6 to 12 inches deep; and the excreta scattered along the furrow, in a layer not more than 2 inches in thickness, and covered with 6 to 12 inches of earth.

The use of a field for the burial of human excreta in this manner increases the fertility of the soil. This is particularly the case if the matter is given as much as 12 months to undergo thorough rotting.

The effluent from an L. R. S. privy is more readily purified by the natural agents of the soil than are crude excreta. It is liquid, and its volume is relatively small. It is therefore well adapted for direct disposal into the active subsurface soil (fig. 13). The place selected for such disposal should be well away from (at least 50 yards) and not draining toward any water supply. The effluent

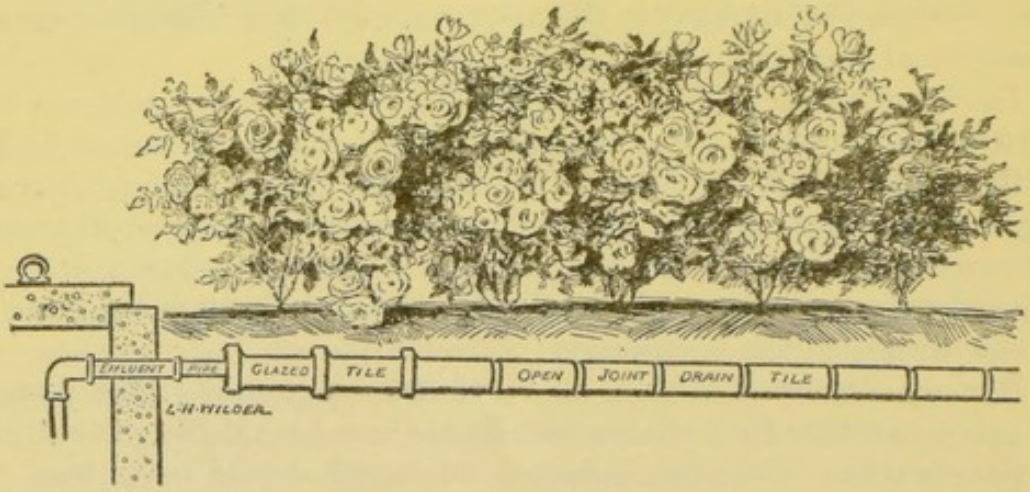

FIG. 13.—Distribution of effluent from an L. R. S. privy into top soil. The effluent pipe is cemented into a glazed (water-tight) terra cotta pipe which extends to the disposal ground. The effluent is distributed into the soil by means of open-joint drain tile. (Original.)

may be conveyed under ground through a water-tight pipe for the necessary distance and then distributed into the soil by means of drain tile. The tile should be laid about 12 inches below the surface of the ground. If the soil is not porous, the distributing pipe may be laid in a trench filled with sand or gravel. The increased fertility of the soil along the track of the distributing pipe may be used advantageously to cultivate an attractive hedge of rose bushes (fig. 13) or other shrubs or to cultivate a row of corn or other plants, the edible parts of which are produced well above the surface of the ground.

Conclusion.

The proper disposal of human excreta can not be accomplished without some labor and expense, but the returns in cleanliness, comfort, and health make an intelligent expenditure of labor and money for such a purpose one of the best possible investments.

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