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Water And Sewage Disposal for Farm Homes

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An abundant supply of good, pure water conveniently furnished, and a safe, sanitary method of disposing of household wastes are two of the most valuable conveniences that can be installed in any home. No type of equipment will return so much satisfaction for the money expended as a good water and sewage disposal system.

It is the purpose of this circular to give fundamental information concerning simple water and sewage disposal systems which the average farmer can afford. The systems described are simple and easily installed. Standard fixtures are used throughout and can be purchased from any dealer handling plumbing supplies. These systems are so designed that they may be installed in units, or steps as finances permit, the ultimate result being a complete, modern water and sewage disposal system. Such a system will make the farm home as attractive and comfortable as the average city home, and might well be the goal of every farmer and homemaker.

Step No. 1. Pump, Sink, and Drain

The first step, which consists of installing a pump, sink, and drain, is probably more effective in saving labor than any that can follow. It eliminates the drudgery of carrying water into the house and solves the problem of disposing of much of the waste from the kitchen. If a well or cistern is located not more than 100 feet from the house, and if the low water level is not more than 20 feet below the sink, this system can be installed at no great cost.

The sink should be at least 18 by 24 inches, with an enameled back attached. It should be hung on two brackets fastened to the wall. A drain board opposite the pump is very desirable. The sink

should be carefully located so as to be convenient and at the height best suited to the individual who is to use it.

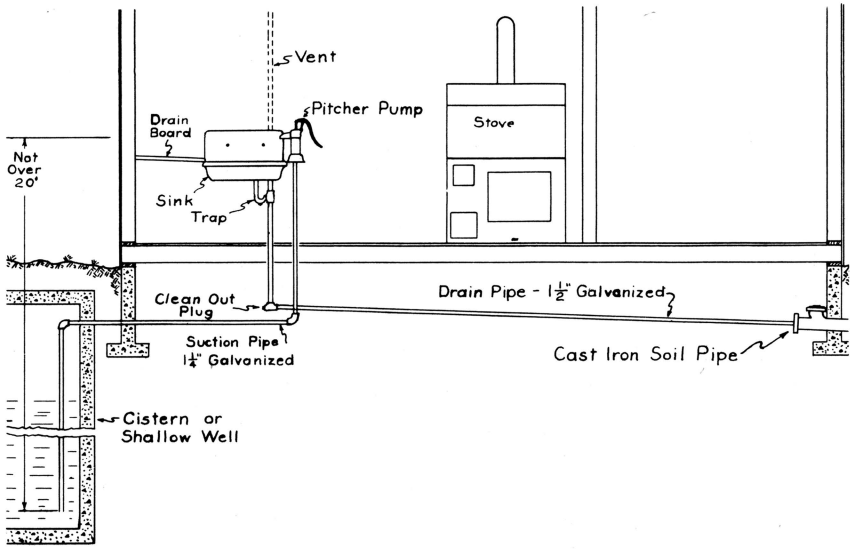

Fig. 1.—A pump, sink, and drain is a practical, simple system which eliminates the drudgery of carrying water into the house, and solves the problem of disposing of much of the kitchen waste.

Sink Trap and Drain.—A trap must be installed under the sink to prevent foul gas and odors from coming back into the kitchen. From the sink trap a 1½-inch pipe should run through the floor and connect into a 4-inch cast iron soil pipe which runs through the house wall. From the cast iron soil pipe a line of 4-inch vitrified sewer tile should be laid to a point 40 or 50 feet from the house, and at least 100 feet from any well supplying water for the house. The tile should be laid with a fall of from ⅛ to ¼ inch per foot, and all joints should be cemented to make them water tight. From the end of the vitrified sewer tile, a line of common 4-inch drain tile should be laid with loose or open joints, and with a fall of about ¼ inch per foot. The necessary length of this tile line will depend upon the porosity of the soil, 50 to 75 feet usually being sufficient for average conditions. Where the soil is heavy and tight, it is advisable to lay the tile in a trench of gravel, the trench being about 2 feet deep, and the tile being laid not over 18 inches deep. See Fig. 8. In case there is a large amount of grease in the waste water, a grease trap as described later in this circular, should be installed in the sink drain.

The Pump.—Water is supplied at the sink by a simple hand pitcher pump. It can be mounted on a shelf or on a wall bracket. From the pump a 1¼-inch pipe should run down through the floor and out into the cistern or well. The pump does not have to be located over the well or cistern as long as the low water level is not more than 20 feet below the sink. In cases where the water level may be 18 to 20 feet below the sink, or where the pump is at some distance from the cistern, a foot valve on the lower end of the pump pipe will make the pump easier to prime.

Step No. 2. The Addition of Bath Tub and Lavatory

A bath tub and lavatory may be installed and connected to the sink drain as shown in Fig. 2. Water must be carried to the tub and

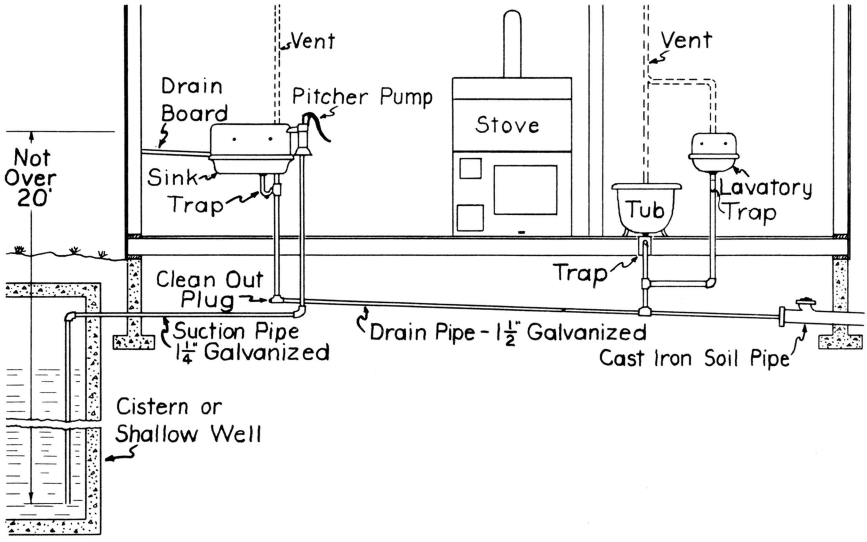

Fig. 2.—A bath tub and lavatory may be installed and connected to the sink drain.

lavatory, of course, but the chore of carrying out the waste water is eliminated.

Step No. 3. Water Under Pressure

The next step consists of the installation of a pressure system of some kind. See Fig. 3. At this point, the kitchen pump will not be needed unless it can be used to pump soft water into the kitchen. If it is not needed, it may be sold to someone starting this progressive plan of home improvement.

If electric current is available, water can be furnished under pressure by a small automatic pumping unit. This unit may be placed in the basement, if there is one; if not, in a closet, or in the kitchen or any other convenient place so long as it is safe from

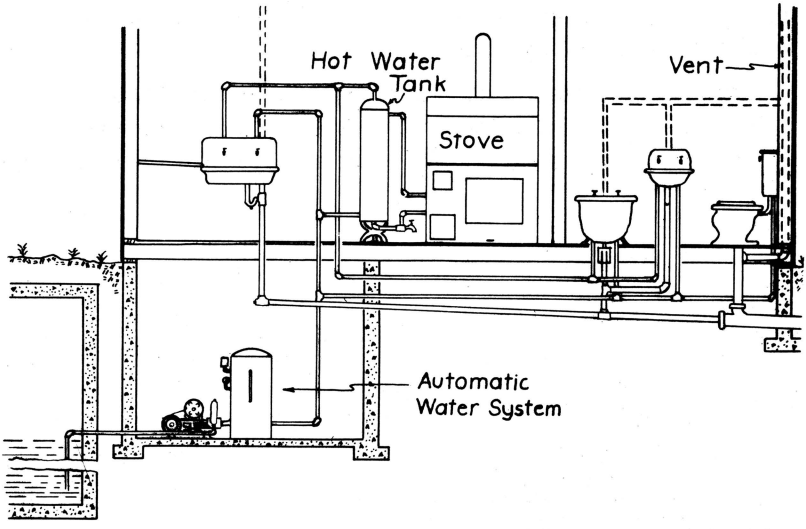

Fig. 3.—A pressure water system makes it possible to supply running hot and cold water to both the kitchen and the bathroom.

freezing. It is automatic in operation and will require very little attention. It will supply water under pressure to the bathroom and to an indoor toilet as well as to the kitchen.* At this point a water heater can be added. When a complete, modern bathroom with indoor toilet is installed, a septic tank, as described in this circular, should be installed also.

SEWAGE DISPOSAL FOR FARM HOMES

The disposal of household wastes in a manner that does not require too much time and energy, and that does not develop unsanitary conditions, is a problem worthy of much consideration. The cities have solved the problem by installing a network of sewers reaching to each building, by establishing routes for regular collection of garbage, and by employing men to clean the streets and alleys. Such an extensive system is not needed in rural communities because the population is scattered, and sunshine and other

*For other types of pressure systems, see the Missouri Agricultural Extension Service Circular 260, "Water for the Farmstead".

natural agencies break down waste matter and prevent it from becoming a nuisance or danger to health.

The Sanitary Earth Pit Privy

The sanitary earth pit privy (Fig. 4) is designed to provide safe and convenient disposal of body wastes at a minimum cost where

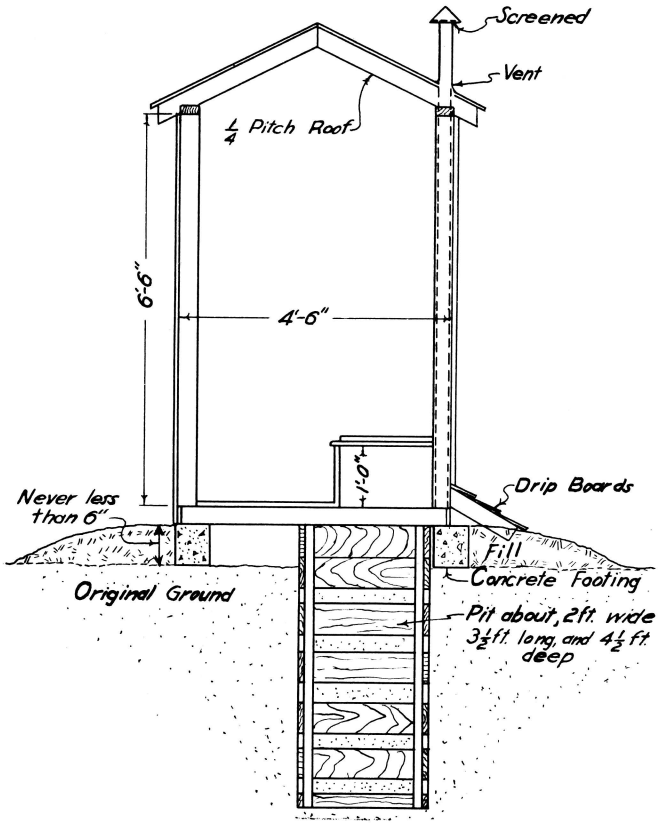

Fig. 4.—A sanitary earth pit privy provides for safe disposal of body wastes where a sewage system is not available.

a sewage system is not available. It consists of a privy house constructed over a pit so as to exclude all flies and animals from the contents of the pit. Complete plans for constructing a sanitary earth pit privy of slightly different design and somewhat more economical to construct may be secured from the Missouri State Board of Health, Jefferson City, Missouri. (See cut on page 14).

The privy should be located at least 100 feet from any well, spring, or cistern used for drinking water. It should be so located that surface and underground drainage will be away or down hill from the water supply.

An earth pit privy should not be placed where a limestone ledge, slate, or other formation with cracks or crevices, lies closer than 10 feet below the surface of the ground. Earth pit privies are not recommended in localities where the water supply is less than 15 feet below the surface.

Water-Tight Concrete Vault Privy

In locations where the soil is very open, or where an earth pit privy would endanger the water supply, a water-tight concrete vault privy (Fig. 5) is recommended. By liberal use of lime the

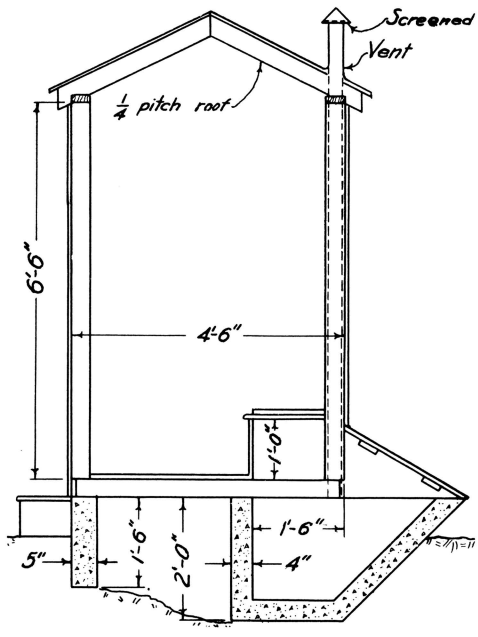

Fig. 5.—Where the soil is very open or where an earth pit privy would endanger the water supply, a water-tight concrete vault privy is recommended.

vault can be kept dry, and by cleaning it once or twice a year, sanitary conditions can be maintained.

The Septic Tank

Where a complete water and plumbing system is installed in the farm home, the septic tank (Figures 6 and 7) is by far the safest and most satisfactory means of disposing of the sewage and household wastes. The septic tank is essentially a water-tight box made of concrete or other suitable material buried in the ground. The sewage is delivered into the tank through a sewer tile from the house. The sewage is then slowly digested and largely liquified

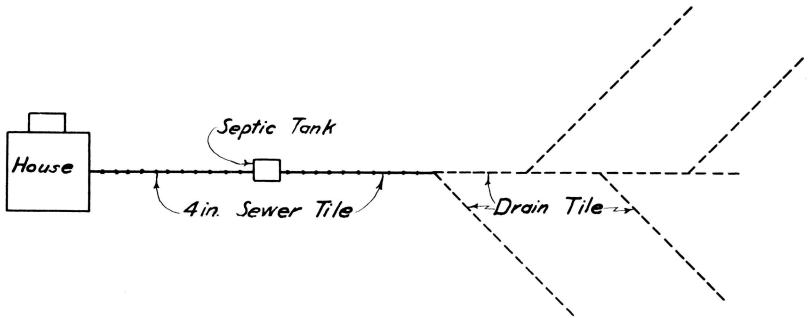

Fig. 6.—An underground tile system is usually the best method of disposal of the discharge from a septic tank.

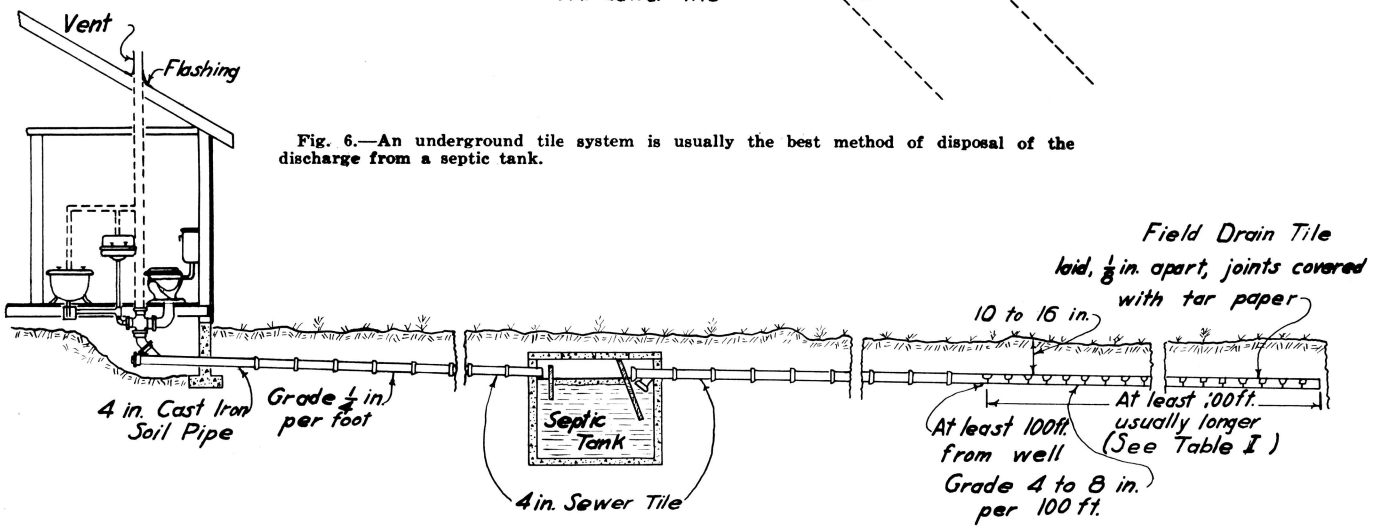

Fig. 7.—Where running water is available, the septic tank is by far the safest and most satisfactory means of disposing of sewage and household wastes.

by microscopic organisms. While the discharge from the tank is practically clear and odorless, it cannot be considered as pure or safe. It should be disposed of in a safe manner such as by running it into a suitable underground tile line or absorption bed, where it is further purified by the action of natural agencies.

Cess Pools are Unsatisfactory and often Dangerous.—Cess pools were formerly used to some extent for disposing of sewage. Their use is now condemned, however, because of the great danger of contaminating the water supply. A cess pool is simply an underground hole or pit into which the sewage is piped. The liquid then leaches away into the soil.

Location of the Septic Tank

Although the septic tank may be located quite close to the house, it is better for it to be at least 30 feet away. It should be at least 50 feet, preferably farther, from any well or spring, so that in case of a slight leak in the tank the water supply would not be endangered. The septic tank should be so located that the drainage from it will be away from or down hill from nearby wells or springs.

The septic tank should be so located that the desired fall of about ¼-inch per foot may be obtained in the sewer line between the house and the tank, and so that the outlet from the tank will be about the right depth of 12 to 16 inches for average soil, or somewhat shallower where the subsoil is tight. The tank should also be located adjacent to or near an area that would be suitable for disposal of the discharge from the tank.

Sewer Line Between House and Septic Tank

The sewer line between the house and the septic tank should be of bell-mouth sewer tile with the joints tightly cemented to prevent leakage. The tile line should be laid on an even grade about ¼-inch per foot. Grades much steeper than this may cause the sewage to enter the tank with too much force and unduly agitate the contents of the tank. Grades much less than this may not insure a positive flow. It is very important that the tile be carefully laid on an even grade without humps or hollows in it. It is also important that no excess cement or other material be allowed to work into the inside of the tile while it is being laid as this might obstruct the flow through it.

Methods of Disposing of Septic Tank Discharge

A subsurface irrigation system is usually the most satisfactory method of disposing of the discharge from a septic tank. The discharge may, under certain conditions, be run into streams, open ditches (in rolling country) or upon the surface of the ground, although such methods are usually not as satisfactory as the underground disposal tile. Discharge into a stream may be permitted if the minimum stream flow is 20 to 30 times the discharge from the septic tank, and if the stream is not used for public water supply or bathing purposes. Permission should be secured from the public health officials before allowing a septic tank to discharge into a stream. If the discharge is run into an open ditch or upon the surface of the ground, it should be at a place that will not endanger any source of water or create a nuisance. Sunny slopes and open porous soil are desirable wherever the discharge is to be run out upon the surface.

The Underground Tile Disposal System

If the outlet of the septic tank is not at least 100 feet from nearby wells or springs, then bell-mouth sewer tile with tightly cemented joints should be used to carry the discharge at least this distance, preferably somewhat farther, from the wells or springs.

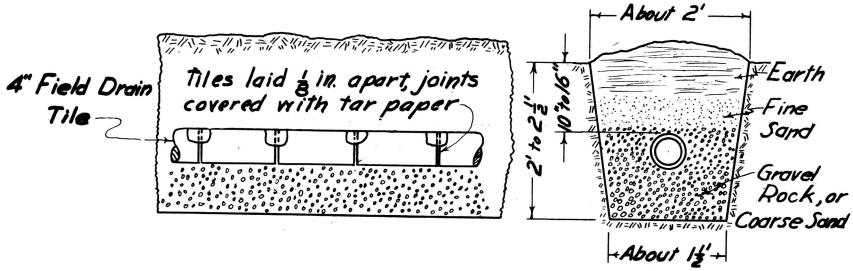

Fig. 8.—Where the soil is very tight, the disposal tile should be laid in a gravel-filled trench.

The disposal tile line should be made of 4-inch field drain tile laid on a grade of between 4 and 8 inches per 100 feet. Better distribution of the discharge may be obtained over the entire length of line if about half of the tile nearest the septic tank is laid on a grade of 8 inches per 100 feet, and the other half on a grade of 4 inches per 100 feet. The tile should be laid about ⅛-inch apart, and at a depth of 10 to 16 inches below the surface of the ground.

Pieces of tar paper, burlap, or broken tile should be laid over the joints to prevent silt from entering the tile when the ditch is filled.

Amount of Disposal Tile Needed.—The length of distribution tile needed depends upon the amount of water to be absorbed and the absorptive power of the soil. The following table may be used as a basis for determining the proper length. In no case should the total length be less than 100 feet. It is much better to have a little more than needed, than not enough. One line of tile will ordinarily be sufficient. For lines over 200 feet long, however, or in cases where it is not convenient to make one long line, it may be better to use V-branches and run two or more lines parallel to each other and 10 to 14 feet apart.

TABLE 1.—LENGTH OF DISPOSAL TILE NEEDED
(100 feet is the minimum length)

Type of Soil	Feet of Tile per Person
Open or porous soils, such as sandy or sandy loam soils	15 to 30
Moderately porous soils, such as loam or silt loam soils	30 to 50
Tight soils, such as clay loam or clay soils with some sand or gravel	50 to 100
Very tight soils	30 to 50, laid in gravel-filled trench

Tile Laid in Gravel-Filled Trench.—Where the soil is very tight, with a tendency towards dampness on the surface, the disposal line should be made by digging a trench from 2 to 2½ feet deep and about 1½ to 2 feet wide. About a foot of crushed rock or gravel is then put in the bottom of the trench and the tile laid to grade on this fill. The tile is then covered with a layer of crushed rock or gravel, followed by a layer of earth. It may be more practical under some conditions where the soil is moderately tight, to use a gravel-filled trench of a somewhat shorter length than would be required if the tile were not laid in gravel.

Provide for Extension of Disposal Tile if Needed.—The tile disposal system should be so located and planned that an additional length of tile, or other branch lines, can be installed at a later date if this should prove desirable. If the ground over the disposal lines remains damp, it is an indication that additional length of tile line is needed.

Size of Septic Tank to Build

The size of tank to build depends upon the number of persons served, and the amount of waste materials from the kitchen or farm dairy. For average conditions septic tanks are designed to hold 60 to 70 gallons per person served. Table 2 gives recommended sizes of tanks.

TABLE 2.—RECOMMENDED SIZES OF SEPTIC TANK

No. Persons Served	Inside Dimensions in Ft.			Cu. Yds.	Approx. Amts. Material Req'd*		
	Length	Width	Depth	Concrete	Sacks Cement	Cu. Yds. Sand	Cu. Yds. Gravel
7 or less	6	3	5	2⅛	13½	1⅛	1½
8 to 10	7	3	5	2⅜	15	1¼	1¾
11 to 14	8	3	5	2⅝	16½	1⅜	2

*Based on a 1-2¼-3 mix and using 5 gallons of water per sack of cement with sand of average dampness.

Good Quality Concrete Should be Used for Septic Tanks

The principles of making good concrete should be observed in building concrete septic tanks. With sand of average dampness about 5 gallons of water should be used for each sack of cement.

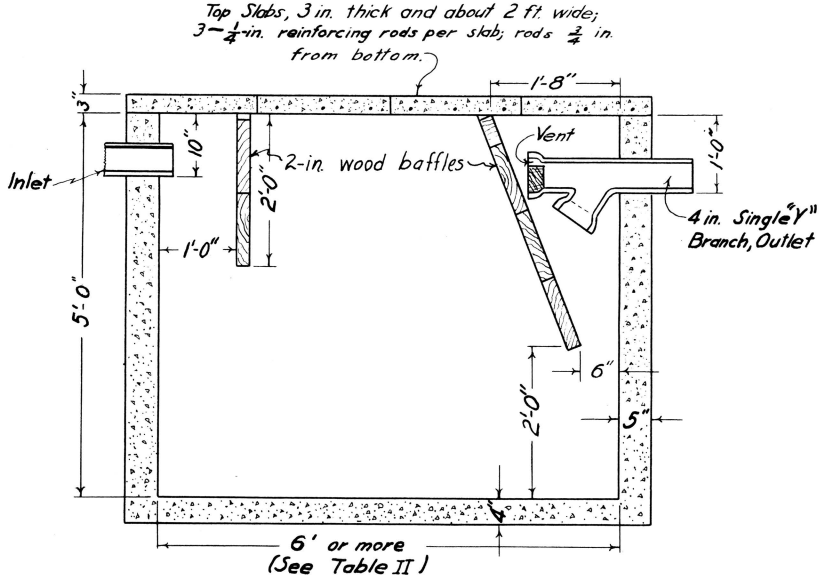

Fig. 9.—A concrete septic tank is easily constructed with home labor.

A mixture of 1 part cement, 2¼ parts of sand, and 3 parts of gravel or crushed rock will usually be about right. The amounts of sand

or rock may be varied somewhat if necessary to give a good, workable mix, but the amount of water per sack of cement should not be increased unless the sand is very dry. In no case should more than 6 gallons of water be used per sack of cement. The use of too much water definitely weakens the concrete. The fresh concrete should be well spaded and tamped in the forms to give a good dense concrete free from honeycombing. Thirteen to 14 sacks of cement will be required for a tank large enough for seven people. For amounts required for other sizes of tank, see Table 2.

The slabs for the top may be made in forms laid on the ground. They may be made about 3 inches thick, 2 feet wide, and long enough to lay across the tank. Three $\frac{1}{4}$-inch reinforcing rods should be used in each slab, placing the bars the long way of the slab and about $\frac{3}{4}$-inch from the bottom of the slab.

Grease Traps

If the water from the kitchen sink contains very much grease, a trap should be installed in the drain between the sink and the septic tank to prevent the grease from entering the septic tank or

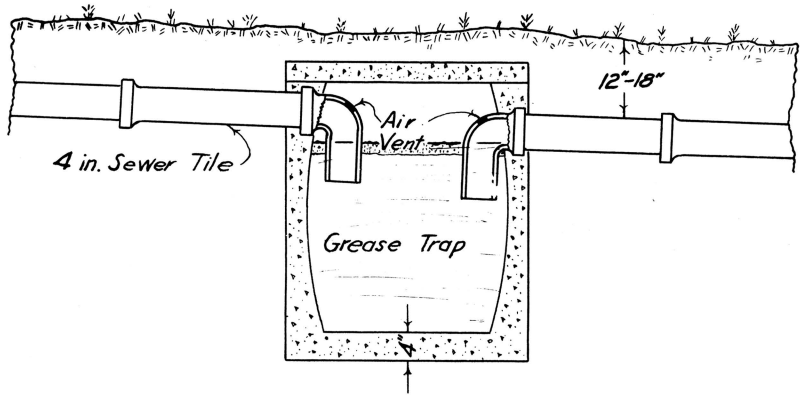

Fig. 10.—If the waste water from the sink contains very much grease, a grease trap should be installed in the drain between the sink and the septic tank.

the tile disposal system. Too much grease interferes with the bacterial action in the septic tank and tends to clog the tile lines. A grease trap is particularly desirable on a farm where a large number of milk utensils are washed at the kitchen sink. Such a trap is simply a small reservoir or receptacle buried in the ground, in which the waste water is allowed to stand long enough for the

grease to rise to the top. See Fig. 10. The trap is cleaned by removing the lid and skimming off the grease at intervals. Grease traps may be purchased or made of concrete or large tile at home. In an average home, where the water from the sink does not contain large amounts of grease, the sink may be connected to the regular drain and all waste carried through the septic tank.

Care and Operation of the Tank

After the tank is built and filled with water it is ready for use. Certain chemical and disinfecting agents used in cleaning sinks, lavatories, and toilets are harmful to the bacteria in the septic tank which digest the sewage. Such disinfectants and cleaning agents should therefore be used sparingly or at infrequent intervals.

Down spouts and gutters which carry off roof water should never be connected to a septic tank, as such large quantities of water would carry sewage on through the tank before it has time to completely decompose. Neither should cellar drains be connected to the septic tank since too much water might at times be run through the cellar drain into the tank. Also, unless considerable care is taken to replenish the water in the cellar drain trap frequently, foul odors might come back up the drain into the cellar.

After several years of use it may be necessary to clean the tank. If the scum on the surface of the liquid in the tank becomes as much as a foot thick, or if several inches of sludge accumulate in the bottom, the tank should be cleaned. This is done by removing the contents with a diaphragm pump or a bucket. Many septic tanks have given satisfactory service from 10 to 15 years without cleaning.

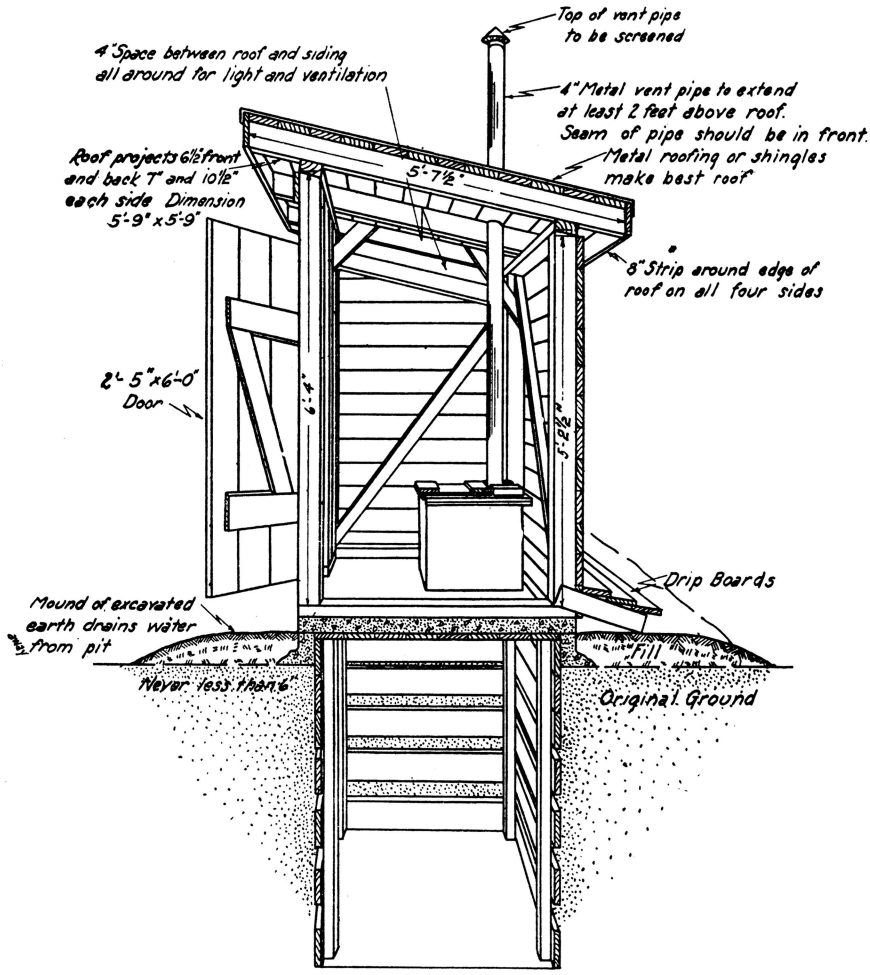

Fig. 11.—Plans of this sanitary pit privy may be secured from the State Board of Health, Jefferson City, Missouri. It is of somewhat different design and somewhat more economical to construct than the one shown in Fig. 4, page 5.

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J. W. BURCH, Director, Agricultural Extension Service
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