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UNIVERSITY OF IDAHO

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Director

Farm Sewage Disposal for Idaho Conditions

—BY—

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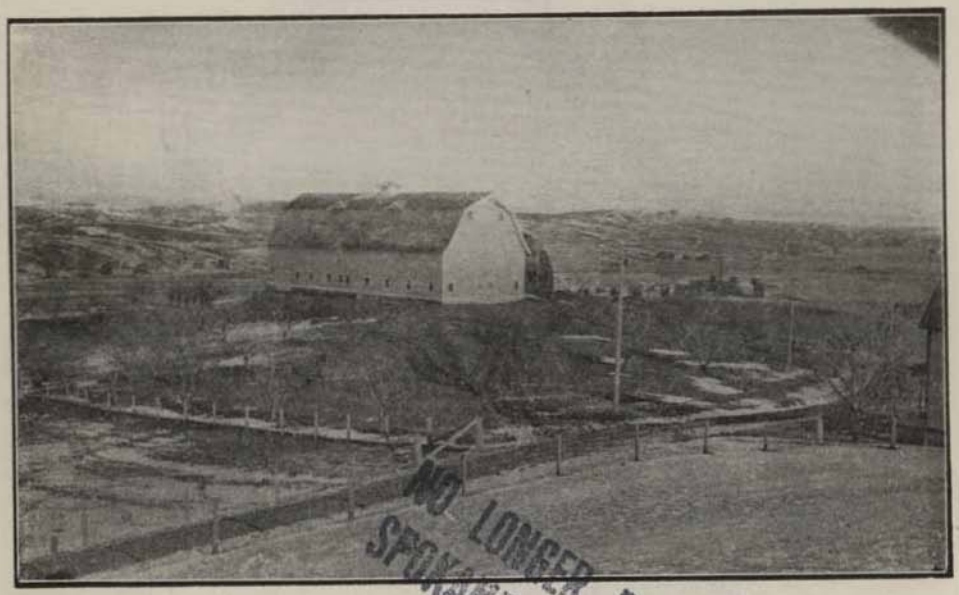

Horse Barn on the University Farm

COOPERATIVE EXTENSION SERVICE IN AGRICULTURE AND HOME ECONOMICS
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nted and distributed in furtherance of the purposes of the Cooperative Agricultural Extension Service provided for in Act of Congress, May 8, 1914.

WATER SUPPLY

The installation of a sewage disposal system for the modern farm house requires that water under at least eight pounds pressure be conducted into the building. This pressure may be secured by making use of the force of gravity or by utilizing the pressure resulting when air is compressed in a pressure tank designed for this purpose. Many farmsteads in Idaho are located on the side or at the base of a hill. In this case, an underground cistern similar to the one used on the University farm, placed on the hill above the buildings will give sufficient pressure to operate the equipment of the modern bath room.

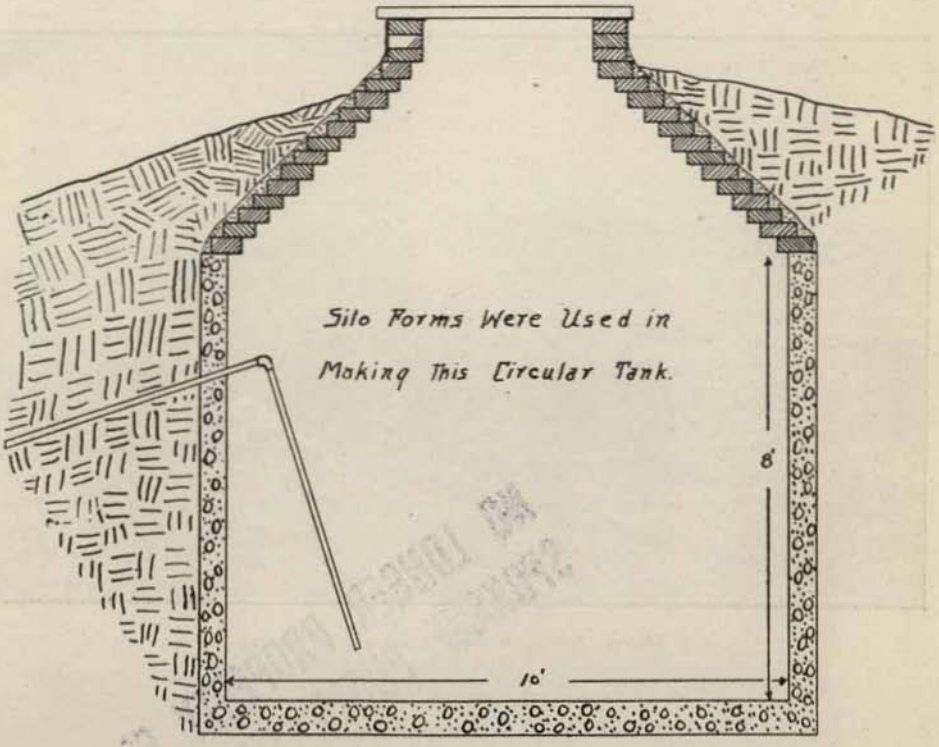

Figure 1—Storage Tank on University Farm

In determining the size of a storage tank to build, the following table may be of use:

Amount of Water Used Per Day

Per person	20 gal.
Per horse	7 gal.
Per cow	6 gal.
Per hog	3 gal.
Per sheep	2 gal.

The quantity used will, of course, vary with the season but the above figures will give an average of the amounts used.

Where a windmill furnishes the power for pumping about five days storage should be provided for. Where a gas engine is used a two days supply will be sufficient.

In determining the height to place the cistern above the house, the following will give approximate results. Multiply the height in feet by .4 and the result will be pounds pressure per square inch. We should have at least eight pounds pressure to operate the bath room fixtures successfully. If a tank was placed thirty feet above the house there would be about twelve pounds effective pressure.

One pipe is sufficient for pumping water into the tank and supplying it to the house. This should be a one inch pipe in order that the water may be supplied rapidly enough under the low pressure. A cutoff valve should be placed in this line so that the pressure could be shut off at any time and a check valve is necessary in the line from the pump.

The tank shown in the accompanying figure was built with silo forms and where these are available such a tank can be made in a comparatively short time and at a minimum cost. If such forms are not at hand the rectangular tank would probably be the better one to build.

An elevated tank placed on a specially constructed tower, on top of a silo or in the attic of the house will give good results if the pipes leading to the tank can be insulated from frost. A tank in the attic will require some strengthening of the joists to carry this extra load. Such a tank should also be provided with a drain to carry off the water that condenses on the outside of the tank in summer. Otherwise it will spoil the plastering in the room below.

In a great many cases the air pressure system is the better one to install. The pressure tank can be placed in the basement where it will be safe from frost. The water may be pumped and the pressure secured by a hand pump, an electric motor or by a gas engine. A windmill can also be used if the pressure is not allowed to run too high. In some of the systems air and water are pumped into a tank together. The air, being elastic, will be compressed and crowded into smaller space as more water is pumped in. This air will then produce pressure to force water about the house until it has again regained the original volume.

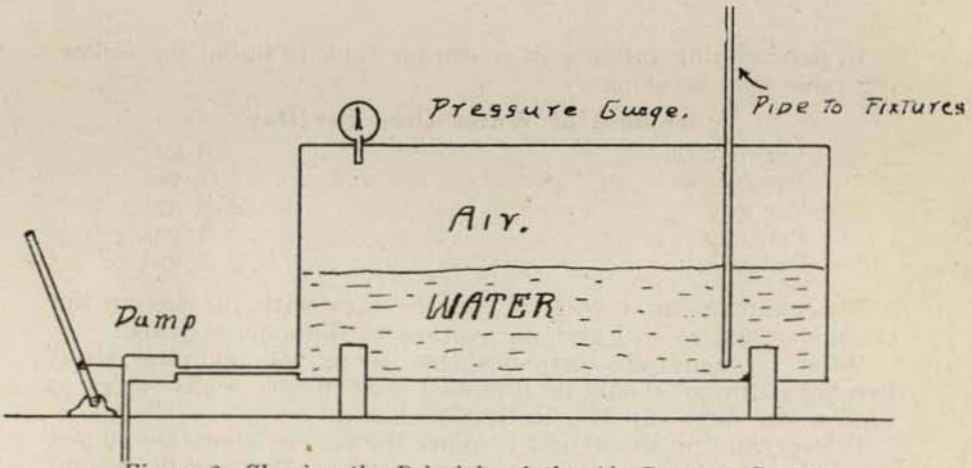

Figure 2—Showing the Principle of the Air Pressure System

There are several excellent fresh water systems on the market. In these systems the air is stored in a tank under pressure and is used to force the water from the well to the house as it is used. The following figure shows the essential parts to such an installation.

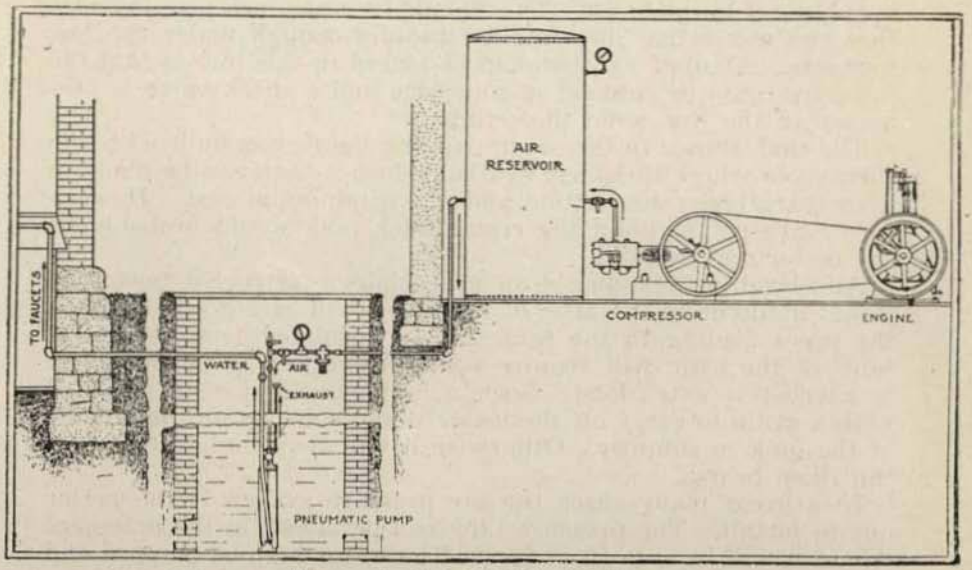

Figure 3—Fresh Water System

PLUMBING FIXTURES

Several grades of plumbing fixtures may be purchased ranging from the enameled sheet iron to the porcelain. A heavy enameled ware is easily kept clean and looks good under ordinary usage.

The following figure shows a simple installation and includes the fixtures absolutely necessary in the modern bath room and kitchen.

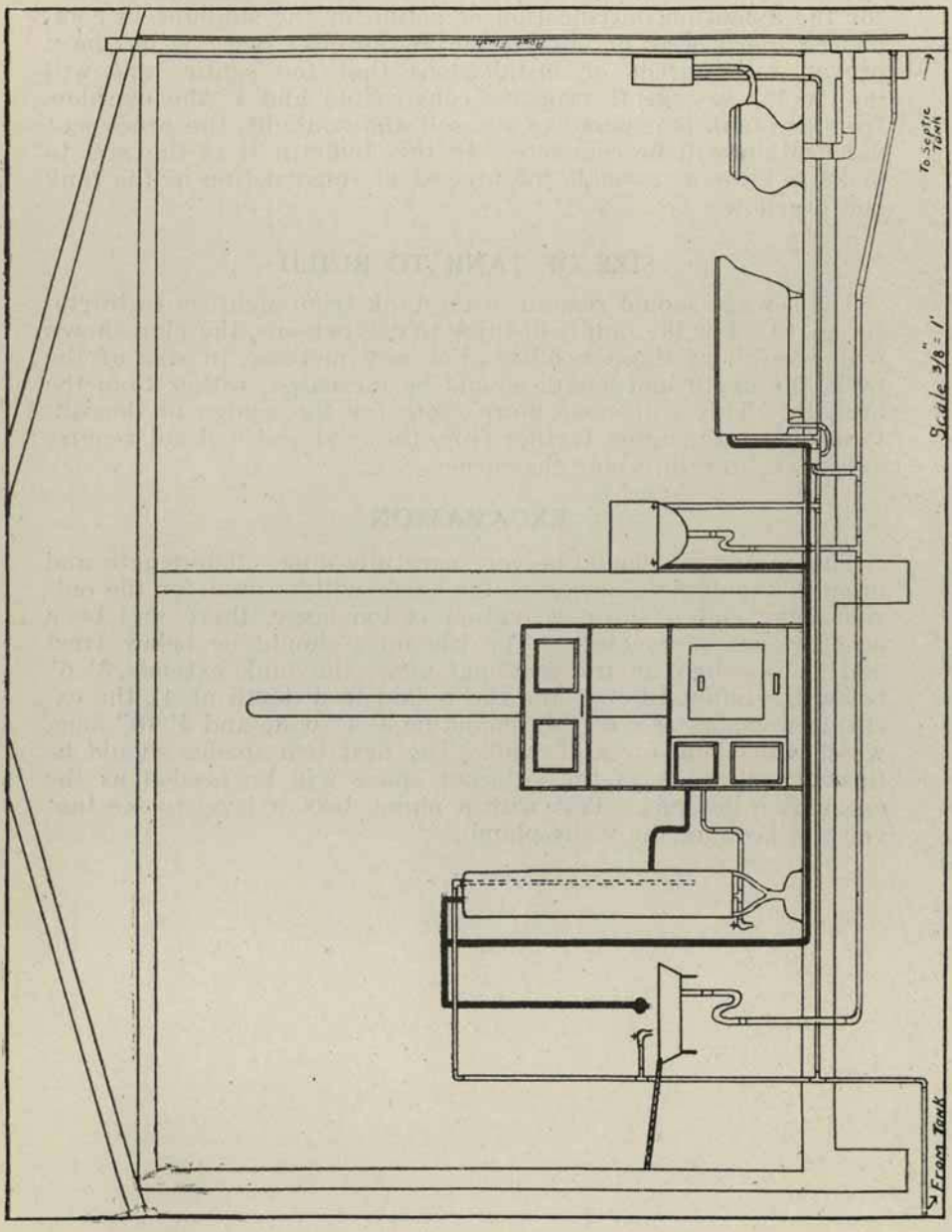

Figure 4—Section Thru Bath Room and Kitchen

THE SEPTIC TANK

It will not be our purpose here to go into detail in regard to the bacterial action which effects the breaking down of the sewage in the septic tank, nor will an attempt be made to account for the oxidation, nitrification or action of the sunlight in completing the process of purification in the filter bed. It has been proven in hundreds of installations that the septic tank will liquify the sewage if properly constructed and if the overflow from the tank is exposed to air, soil and sunlight, the process of purification will be complete. In this bulletin it is the aim to make as clear as possible the process of construction of the tank and overflow.

SIZE OF TANK TO BUILD

The sewage should remain in the tank from eighteen to thirty-six hours. For the family of three to five persons, the plan shown will give about those results. For any increase in size of the tank, the depth and length should be increased, rather than the breadth. This will make more room for the sludge or deposit. It will place the outlet farther from the inlet and will not require extra care in reinforcing the corner.

EXCAVATION

The excavation should be very carefully done. The length and breadth should be accurate as the earth will be used for the outside form and if the exacavation is too large, there will be a needless use of concrete. The tile lines should be below frost and as is shown in the sectional view, the tank extends 3' 6" below the outlet tile. If the tile is laid to a depth of 4', the excavation would be 7' 6". It should be 4' 4" wide and 4' 10" long, which will allow for a 5" wall. The first two spades should be thrown well back as the adjacent space will be needed as the excavation deepens. Test with a plumb bob or level to see that you are keeping the walls plumb.

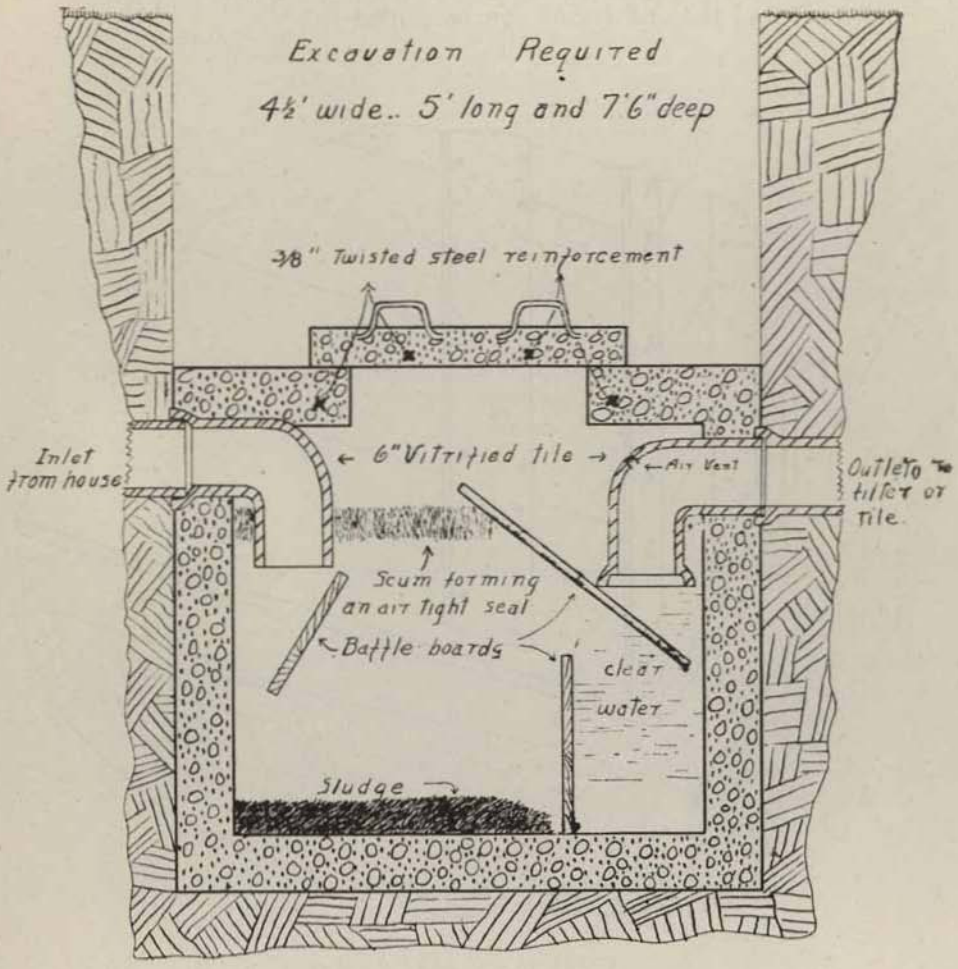

Figure 5—Sectional View

FORMS

The side walls can be made in the form of a door with the battens placed 10" from the ends as is shown in the accompanying figure. The end forms are made in a similar way and are held out in place by two narrow strips nailed ¾" from the ends on the side forms. When the forms are dismantled these strips are pried off and the end forms can be pulled in.

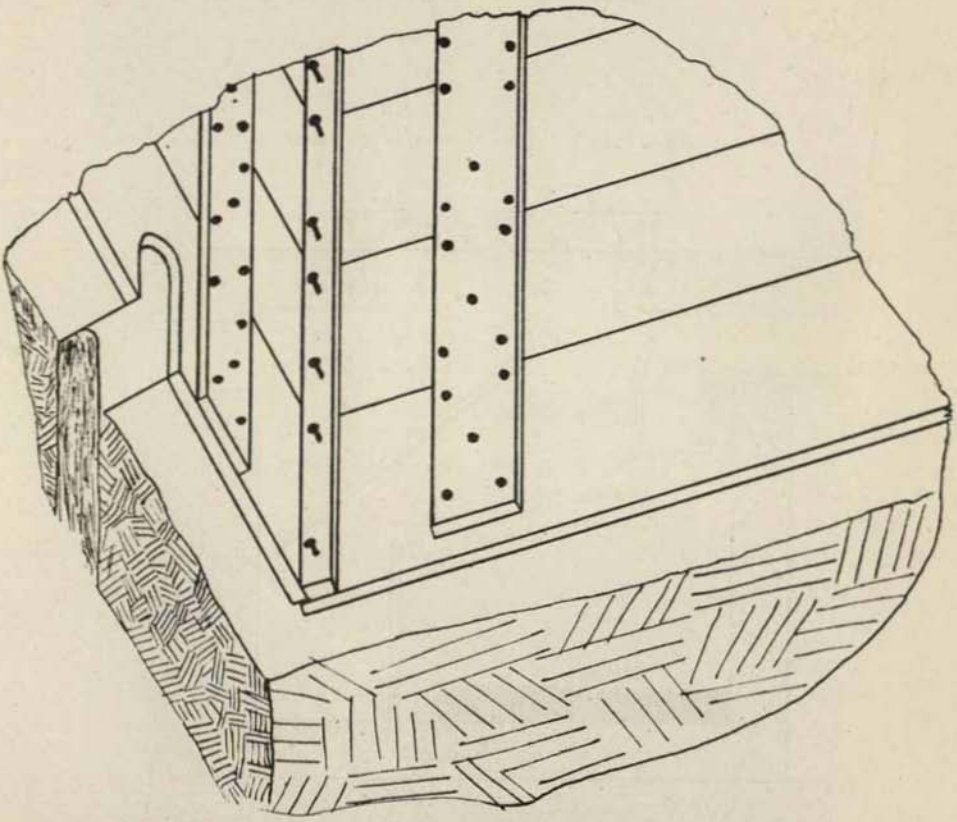

Figure 6—Corner View Showing Forms in Place

In order that the baffle boards may be held in place it will be necessary to make some grooves in the concrete walls. The easiest way to do this is to nail 2"x2" pieces on the outside of the forms as is shown in the cut below. If these pieces are beveled they will be more easily removed.

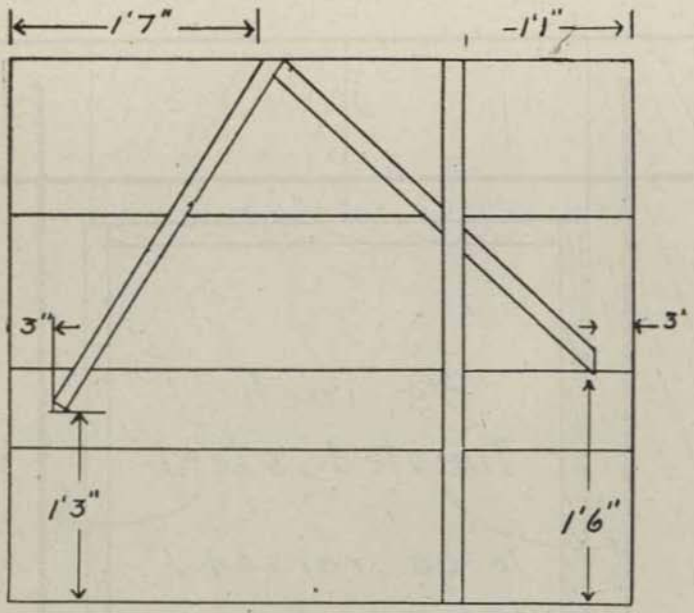

Figure 7—Side View of Forms

1½"x1½" strips nailed on outside of side forms to form a groove for the baffle board

The top of the tank may be made of planks or it may be made of reinforced concrete. If it is made of wood it will be necessary to replace the cover at the end of about five years. The following figure shows the position of the reinforcement in the concrete cover.

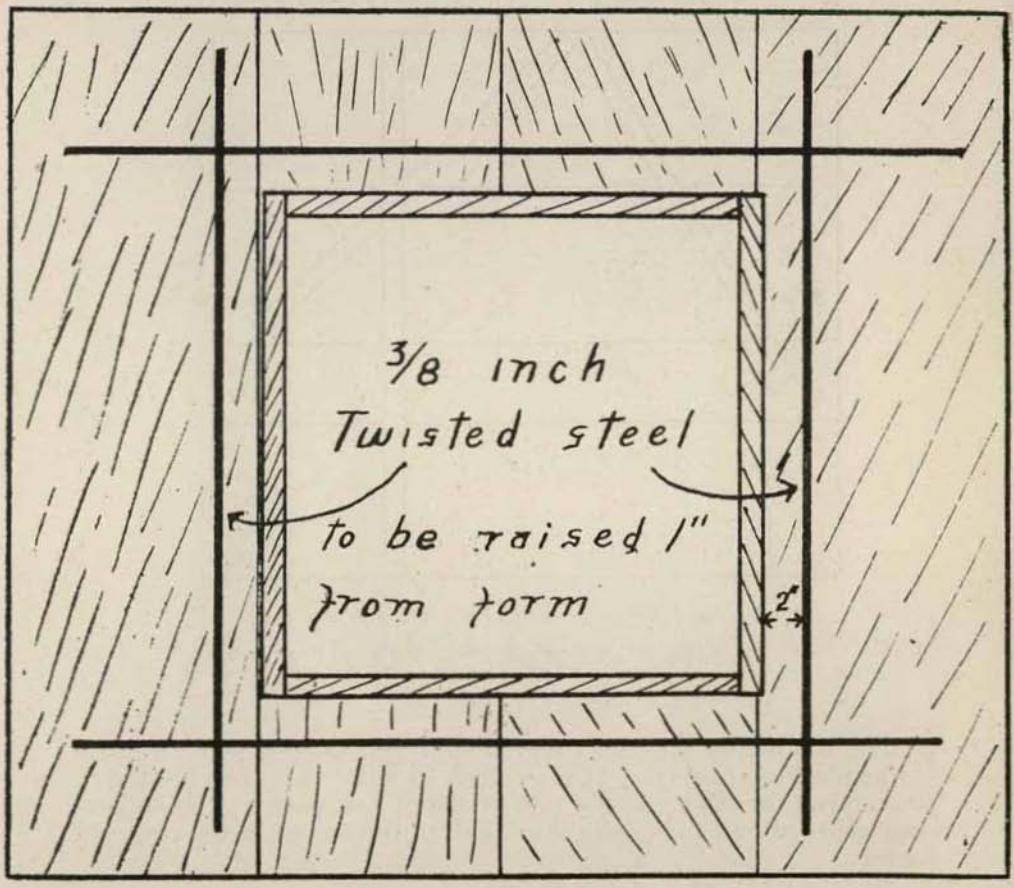

Figure 8—Top View Showing Reinforcement

CARE OF THE PLANT

After the forms have been removed the baffle boards should be put in place. Then the cover may be put in place. This may be made of planks or it may be made of reinforced concrete. The tank should be run full of water and then it is ready to be covered. When the earth has settled it may be sodded over as it should not have to be disturbed for a period of years. The sludge collects very slowly, probably at the rate of about one inch a year. Grease, lye and soap interfere with the action of the septic tank if admitted to it without being properly diluted. In most installations the wash water is run thru the tank and in no case has it caused trouble. The grease from the kitchen sink should be piped into the tile below the tank as it might very easily stop the action of the tank.

If the soil is at all porous the overflow from the tank may be run into a blind tile. This tile should be at least sixty feet long in a gravel subsoil and where the soil is not porous it should be two to three hundred feet. This tile should be laid as shallow as possible and still avoid frost. The bacteria which complete the process of purification of the sewage are active only in the upper layer of soil.

A good method of connecting the sewer tile to the drain tile is shown in the following figure. Another plan that is often used is to lay the sewer tile above the drain with about six inches of gravel between them.

If drainage is very poor and the soil is extremely tight it might be necessary to use an automatic siphon and a filter bed.

Precaution. Conduct the overflow to a safe distance from the water supply in waterproof sewer tile and then use the required length of drain tile to allow it to filter into the soil.

For further information write to the Agricultural Engineering Department, University of Idaho, Moscow, Idaho.

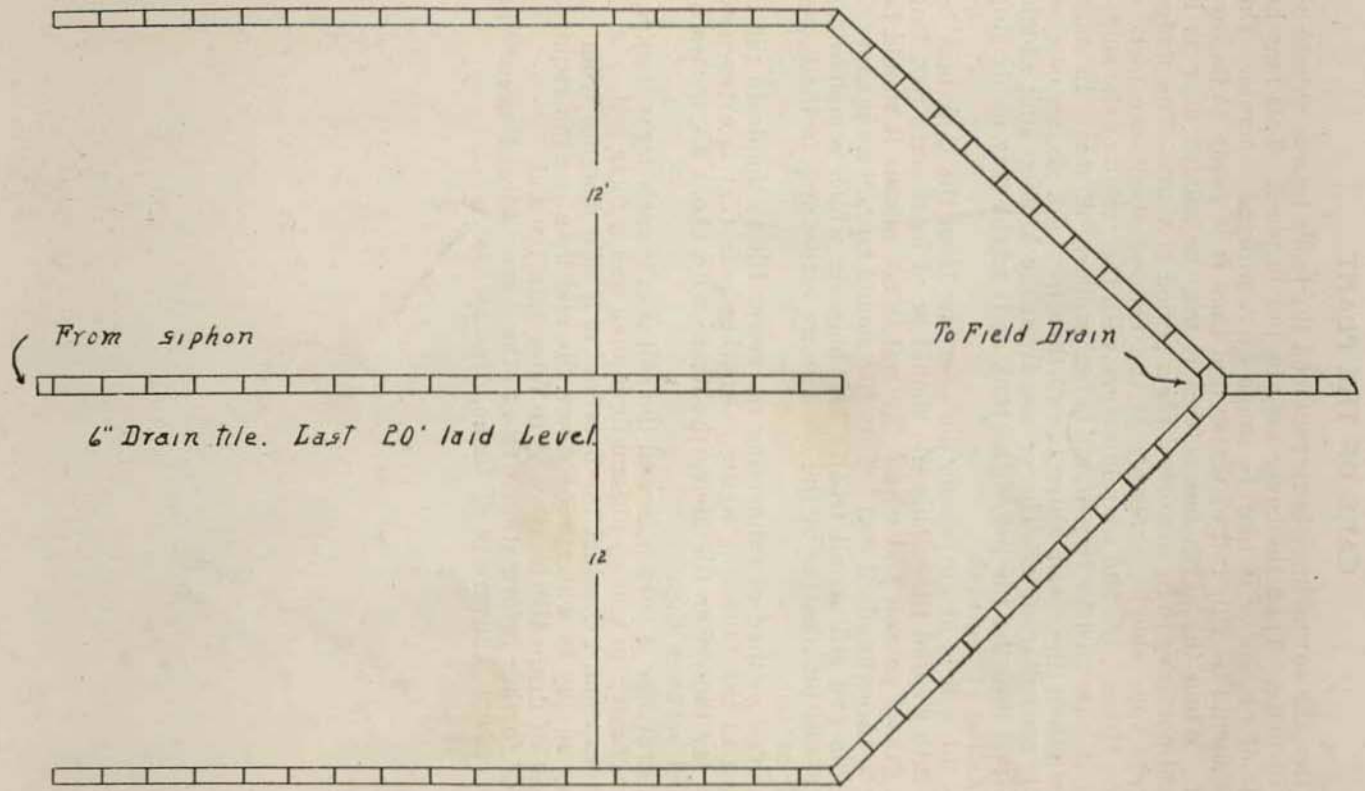

Figure 9—Filter Bed