

PRACTICAL FARM DRAINAGE.

WHAT SIZE OF TILE TO USE.

In every drainage problem we are confronted with the question, "What size of tile shall we use?" a question that cannot be answered offhand. The amount of water that will flow through a pipe depends upon three factors—the size, the roughness and the slope—so when we are asked what size of tile to use in a given case, we must determine first the area to be drained; and, secondly, the slope—the roughness is a constant factor and already known. The acreage that various sizes of tiles are capable of draining on various slopes has been carefully marked out by McConnell, and his table is subjoined:

TABLE OF SIZE OF TILE PIPE OF MAIN DRAIN.
(McConnell.)

FALL.		Acres Drained.					
		3-inch Tile.	4-inch Tile.	6-inch Tile.	8-inch Tile.	10-inch Tile.	12-inch Tile.
1 ft. in	20.....	18.6	26.8	74.4	150.0	270.0	426.0
"	30.....	15.1	21.8	60.4	128.0	220.8	346.0
"	40.....	12.9	18.6	51.6	108.8	189.6	298.4
"	50.....	11.9	17.0	47.7	98.0	170.4	269.0
"	60.....	10.9	15.6	43.4	90.0	156.0	246.0
"	70.....	10.0	14.5	39.9	83.0	144.4	228.1
"	80.....	9.3	13.4	37.2	77.0	135.0	213.0
"	90.....	8.1	12.6	35.0	72.5	127.0	200.5
"	100.....	7.3	11.9	33.1	69.2	120.6	190.5
"	150.....	6.7	9.5	26.6	56.0	97.3	154.4
"	200.....	5.7	8.2	22.8	48.0	83.9	132.5
"	250.....	5.1	7.5	20.4	42.4	74.4	117.0
"	300.....	4.6	6.9	18.4	38.2	65.5	107.0
"	400.....	4.1	5.9	16.5	32.6	60.3	90.7
"	500.....	3.7	5.2	14.8	30.1	54.0	81.6
"	600.....	3.3	4.7	13.3	28.0	48.6	74.0
"	800.....	2.9	4.1	11.4	24.0	41.9	65.0
"	1,000.....	2.6	3.7	10.2	21.2	37.2	56.0
"	1,500.....	2.1	3.0	8.5	16.8	30.8	47.0
"	2,000.....	1.9	2.8	7.4	15.0	25.0	40.8

Suppose a man has 12 acres to drain and the slope of his main is 1 foot in 600, then we look down the list of falls till we find 1 foot in 600, and follow this line to the right. A 3-inch tile would not do; it drains only 3.3 acres. A 4-inch tile drains only 4.7 acres; a 5-inch tile, not given, but probably drains about 7 to 9 acres; a 6-inch tile fills the bill, as it is capable of draining 13.3 acres. The size to use for any other slope is determined in the same way. This rule applies to submains and the laterals as well as to the mains. Owing to the great amount of friction in small tile compared with the volume of water they carry, they are much more likely to clog with sediment than are the larger ones; so much so, indeed, that a 2-inch tile should never be used except on a steep grade. They are almost sure to clog in time on a slow grade.

DEPTH AND DISTANCES APART.

A mistake that beginners often make is that of putting their drains too shallow. This arises from not understanding fully the action and function of the drain. To begin with, why is it necessary to drain? Because the roots of plants cannot live and thrive in soil containing excessive water. This being so, we must next ask how deep do the roots naturally go in the soil where the conditions as to drainage are perfect? If they go six inches only, then it is sufficient to drain our soil on the surface alone. If they go three feet deep, then for best results we must drain three feet deep. But, again, how deep do they go? This varies somewhat with the crop, but the roots of corn, winter wheat, oats, barley and clover, some of our staple crops, penetrate at least from three to four feet in average field conditions. Then how deep should we drain? From three to four feet, in order that the roots of these crops may have full opportunity to penetrate the soil. It may be suggested that two feet would be sufficient for the early needs of the crop, and that as the season advanced the water would naturally recede farther below, thus giving the roots plenty of space. This argument would have some weight but for one fact: The "water table" in drained land is not level, but curved. If, in a field that is underdrained, one were to dig a series of holes four feet deep every ten feet between two drains; and if after a heavy rain he were to observe the water in the holes for a day or two, he would find that in a very short time no water remained in the hole at either drain, but the one situated midway between the drains would stand full for a long time, and the others would have less and less in them as he approached the drains, thus showing that the water-table is a curved surface, beginning at either drain and rising between. How fast does it rise? That varies with the soil and with the time since rain. In a clay loam in fairly good condition, when flow in drains begins to lessen it will be found that the water-table rises 1 foot in about 25; in loam, 1 foot in 33; in lighter soils the rise will be slower still. The closer the drains are together the less the height of the crest of the water-table above the drains, the farther apart the higher the crest; hence the closer the drains are together the shallower they may be, the farther they are apart the deeper they must be. The depth and distance apart must be so chosen that midway between the tiles the soil will be drained a foot and a half or two feet within about forty-eight hours after rain, for if the roots are submerged longer than this they begin to suffer. Applying the gradients of 1 foot in 24 for clay loam, and 1 foot in 33 for loam,

we arrive at the general conclusion that if drains are from 3 to 3½ feet deep, they should be placed from 50 to 66 feet apart in clay or clay loam, and from 75 to 100 feet apart in lighter soils. But this is only a general conclusion, and judgment must be used in each individual case.

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A DOG WHEEL POWER.

Editor "The Farmer's Advocate":

I will try to explain to you the construction of the dog wheel and the attachment to the pump. The wheel consists of, first, the hub (a), which is of hard wood, oak preferred, twelve inches in diameter, two inches thick. To this hub is fast-

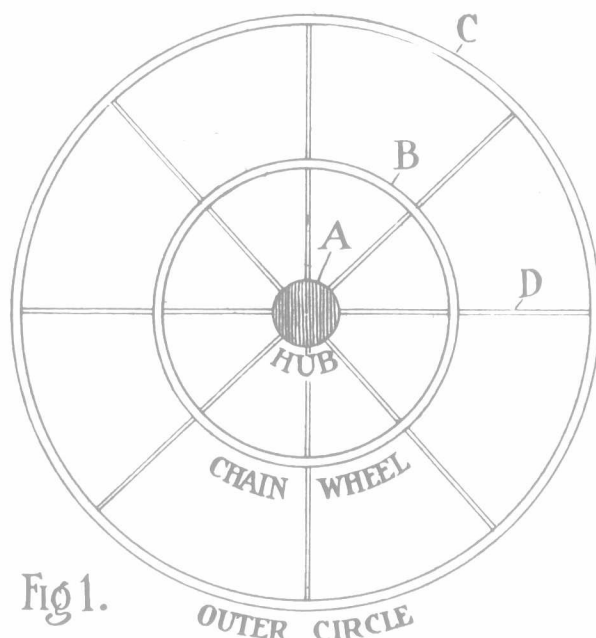


Fig. 1.

tened the spokes (d); the first pair cross at right angles, thus making four spokes; the others are fitted into the angles; fasten securely with screw nails to the hub. The spokes are 1 x 4-inch pine or basswood. The outer circle (c), also 1 x 4 inch, is fastened to the spokes. Having done this, you have a wheel. Two of these wheels are required. Now bore the holes in the hub of each and put a shaft through them, and set up in the position you wish to have it to run. Place those wheels 26 inches apart on the shaft. Now, with narrow boards 20 inches long, cover them all the way around. The dog runs on this sheeting and

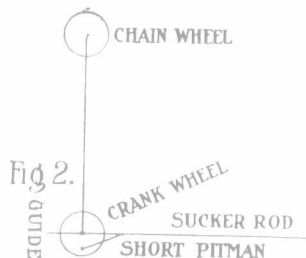


Fig. 2.

between the spokes on either side, working, you will see, right in the wheel now complete. The wheel can be made 8, 9 or 10 feet high, according to the height of the ceiling where it is set up.

The chain wheel (b) consists of two circles, 1 x 3 inches, nailed together, with a groove in the center for the chain. This circle is four or five feet in diameter, and is bolted to the spokes. The wheel is supported by an upright on either side, 2 x 8 or 3 x 8, which you choose, through which the shaft runs. Some have the shaft tight in the uprights, and the wheel turning on the shaft. I have the shaft tight in the wheel, and slip box-

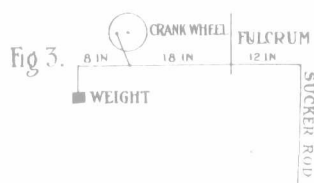


Fig. 3.

bearings in the uprights to run on, which makes it run easier, I think. One advantage of having the shaft stationary is a stick can be fastened to it to tie the dog to while learning. Care must be taken in starting the dog. Some will take to it at once, others will take considerable coaxing, but nearly all enjoy it when they get used to it.

The material for these wheels can be bought for \$5.00 at the planing mill, all ready to put together, so you see the cost is very small.

Having completed the wheel, you can attach it to the pulper by means of a pulley on the pulper shaft. For pumping water, a line shaft, long or short, is required, according to the distance to the pump. On one end of the shaft is a pulley, 12 inches in diameter, to connect with the wheel by a chain; at the other end is a crank to connect

with the sucker rod in the pump. This connection is made by having a short pitman, say 12 inches long, one end fastened to the crank, the other to the sucker rod. This takes the swing, and allows the sucker rod to move straight up and down. The rod should extend above the crank, if possible, and a guide placed on it to steady it. A six-inch stroke is quite sufficient.

If the pump is not too hard, this will generally work satisfactorily. I had to resort to another plan on account of having too large a bucket in the pump and the water low in the well. For an ordinary wood pump, a 3½ or 4-inch bore is large enough. I have the line shaft fastened to the joist overhead. Instead of connecting the crank immediately to the sucker rod, I have what we call a jig-stick, as shown in Fig. 3. This stick is fastened to the crank wheel by means of a short pitman, 12 inches long. The other end is fastened to the sucker rod. A fulcrum is fastened to the joist overhead; to this is attached the jig-stick, not in the center, but 12 inches from the sucker rod and 18 inches from the crank wheel, thus giving more power to lift the water. The stick extends past the crank-wheel connection about 8 inches, and to this end is a weight, to steady the jerk of the sucker, and also helps to lift the water.

This plan is working quite satisfactorily with me. The power is inexpensive, compared with a windmill or gasoline engine, and does light work, such as described, equally as well. I have an extra chain wheel on mine, also two chains. The pulper is run from one side, and the pump the other, and in all (the shafts, pulleys, etc., included), the cost was less than \$10.

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GROWING CORN ON HEAVY CLAY.

Editor "The Farmer's Advocate":

Growing hoe crops on clay land is discouraging work to most farmers, hence many do not attempt it, the soil is liable to bake after sowing, it is often hard to get the plants started, it cannot be worked in showery weather, and if the fall should be wet it is unpleasant harvesting the crop.

We have been farming such a farm for upwards of 30 years, and have farmed light lands previously. We have been able to grow much heavier crops, with no more labor on our heavy farm than on the light one.

In growing corn on heavy land, it is all-important that the land be fall plowed, as spring plowing, usually, cannot be brought into a sufficiently friable condition to produce good germination, but if fall plowed fairly deep, in lands 15 feet wide, and all water courses well opened out, so that water cannot stand upon it, it will be in fine condition about the 20th of May to prepare for the crop.

A sod, while good for light land, is not the best on clay, for the reason that the decay of the sod is too slow in clay. It is much better to sow peas or oats on the sod the season previous to growing the corn or root crop. By that time the sod is thoroughly decayed, and mixes readily, under cultivation, through the soil, and is immediately available for plant food. A good coat of manure is necessary to add humus to the soil. It is better applied in the fall, but may be applied in the spring (after the land has been well worked with cultivator, or disk, so as to form a good seed-bed as for a grain crop).

We prefer horse manure, as it is generally shorter and mixes more readily with the soil than any other, besides being more heating and decaying more rapidly. We put it on at the rate of about 15 loads per acre, spreading it evenly, then plow it in with gang plow (no deeper than it has been cultivated). This is important, as we do not want the subsoil mixing with the soil pulverized by the frost. Level down with roller, to leave a smooth surface for drilling the seed. This leaves the four inches of surface soil well filled with manure, and in a fine friable condition if the work has been done under dry conditions.

We do this preparation work the first favorable time after spring seeding; if the weather be unfavorable, we simply wait until it is, as we have found by experience that the 1st of June is early enough to plant corn on clay; one of the best crops we ever grew was planted on the 17th June. By deferring planting till then the soil becomes properly warmed, germination and growth is rapid, danger from frost is reduced to a minimum; also the soil is less liable to be packed by heavy rains.

Before or immediately after sowing, we sow a small bag of land plaster per acre. This acts very favorably on clay soils, promoting a rapid decay of vegetable matter, stimulates growth, and hastens the maturity of the crop. These are all important considerations in growing a corn crop.

We have tried almost every variety of corn on the market, and have decided in favor of the flint varieties as most suitable and certain for us to grow. They are hardier, sow better with the drill, mature earlier, are more easily handled, and cure better for fodder (we have no silo). We find the Compton's Early and North Dakota best suited to our land.

We sow with the grain drill (setting the feed to sow 1½ bushels of wheat per acre), shutting off all the feed runs but the third from each end, then drive as for grain sowing. This puts the rows 35 inches apart, with a 10-hoe drill. Most beginners sow too thickly; a plant every foot is sufficient to produce a good crop;