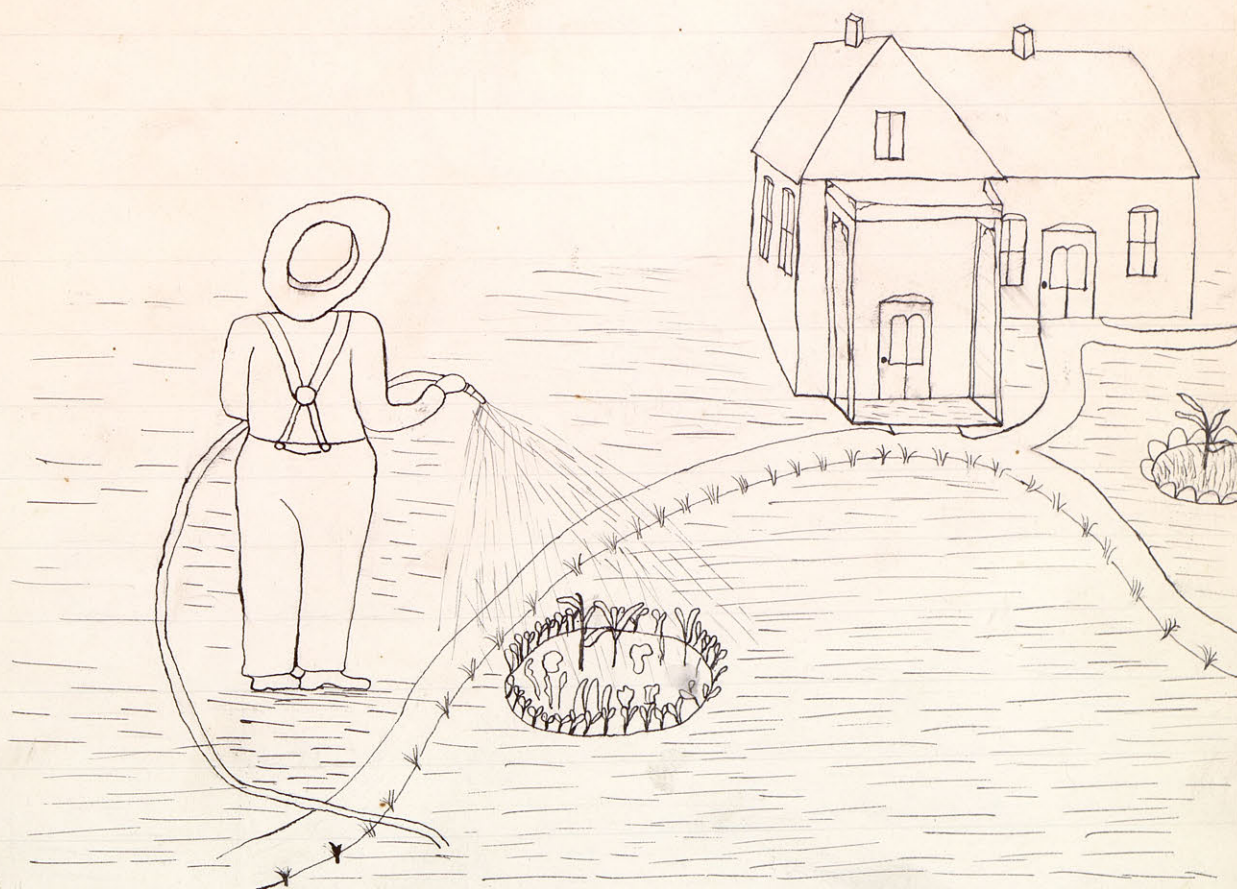


PRACTICAL WESTERN IRRIGATION.

Mr. Hester, '94.



Practical Western Irrigation.

As the eastern part of the United States is rapidly becoming more thickly populated, every nook and corner of ground is being brought into use. Better means of growing and cultivating crops are being devised all the time, rents have necessarily become higher and higher, and yet the supply is not sufficient. In order to solve the problem of what to do next, the ever-progressive American people have steadily been pushing westward since the early colonial days.

It was in the '50's that the tide of immigration had reached the borders of Kansas. Her delightful climate and fertile soil were evidently suited to agriculture, and so it has always proved to be. For the past thirty years, eastern Kansas has furnished as profitable farming lands and as happy homes as can be found in the United States.

Again the supply is not sufficient. Land is too high-priced and too much rent is required. And again the tide moves on. Western Kansas, the Indian Territory, Texas, Colorado, and the other western states are to be used for agricultural purposes. But here very serious obstacles are encountered. The soil is as good as elsewhere, the air as pure, and the climate as delight-

ful; but the soil and climate are different from farther east. Consequently other crops must be raised, men must learn how to raise them, and most of all there is not sufficient moisture at the time when most needed. The clouds refuse to pour out their water, and it seems as though these portions of the country will have to be abandoned as a farming country. After six and eight years' trial, some more and others much less, many hundreds of the white-covered "prairie schooners" have given it up in despair and wended their way "back east."

In this emergency the few really more plucky and perhaps more enterprising people who have still stayed in the western countries have adopted artificial means of supplying the deficiency of water. And so irrigation has been and is fast being brought into use in several of the western states. In Utah, especially, farming has been carried on very successfully by means of irrigation for many years, which otherwise would be absolutely impossible. The same is true of surrounding states, though not so extensively, probably, as in Utah. It has not been until quite recently that our own state has tried irrigation to any considerable extent. And it was not much before 1889 that the windmill was thought of as being of any importance in this direction. At present with the rapid and pleasing development of the irrigation problem, the outlook is very promising. It seems certain that farming in the western part of our state may be successfully and no doubt very profit-

ably carried on by this means.

There are three primary means of irrigation, rivers, artesian wells, and common wells which last are used by means of wind-mills, horsepower, or by small engines.

The rivers and creeks of western Kansas are comparatively rare but by skilful use of what there are many thousands of acres are and will be watered from their contents. The Arkansas, the Arkansas (middle fork of the Republican), two Nevers, Prairie Dog, Sappa, two Solomons, Saline, Smoky Hill, White Woman, Cimarron, and Medicine rivers and creeks afford water for irrigation of large tracts of ground; that is, taken in the aggregate. This is, no doubt, the first and most apparent method tried. The immediate valleys of such rivers and creeks can, of course, be well watered. As a part of the same system, ~~a~~ part of the water of streams may be induced to leave the main channel and follow an artificial channel, which may and often does lead large quantities of water miles away from the main stream. Then from these as from the main stream, ditches are made and laterals from them, and thus a great deal of the bottom land can be well watered.

But at best this means this means, though apparently the most extensive and important, is confined to the valleys, while the large scope of the country cannot be benefited. During the driest seasons when water is needed most, the streams are the lowest; and, indeed some of them are entirely dry. One man has as much right to the water as another. So

when the first man get well prepared to use it, the other man and perhaps several others, who live nearer the source of the stream than he, will appropriate it to their use.

The second means is that of artesian wells, of which there are a few in the state. This source is so small in extent as to be hardly worth considering. Meade county has a district where artesian are dug and are quite valuable. There are also two or three other districts in the state where they may be found. But even where they may be obtained, they are almost sure to be of great depth, they are very expensive, the risk of not getting flowing water at all is very great. And where one good well is obtained, so many others are soon dug in the neighborhood of it that it and all the rest are likely to be of little use. Even if alone the supply is likely ^{to give} entirely out on account of the lack of sufficient pressure to raise the water to the surface, or to become so small as to be of little use.

The third and really most important means of irrigation to the majority of farmers is the seemingly insignificant windmill. Its possibilities as already stated, have only been thought of a short time. Every man man on a farm may and generally each one has a ~~windmill~~ well. Common experience teaches that all the wells of any vicinity are practically of the same depth. So it remains to try to see what can be done.

No one doubts, any longer, that the supply of water which can be raised up from what is called the underflow is amply

sufficient. Its source is no doubt from the clouds directly. Statistics show that the total annual rainfall in any part of the state is far more than enough to raise all kinds of crops; and geologists, scientists, and experimenters have proved that enough of the rainfall sinks into the ground, and is there ready for use, to raise ~~all~~ kinds of crops if properly distributed. There is very little evidence that this water has come from foot-hills of mountains or has sunk away from the bottom of river-beds, while the evidence proof seems conclusive that it has gone down from the top of the ground.

Our base of supplies, then, for water will be in proportion to the total annual rainfall in the district where wanted. This base of supplies, then, ~~for water~~ which is called "sheet water" is not uniformly deep, but is remarkably so. The depth is owing to the locality. The water almost always lies in beds of so-called "grit," which is a layer of porous sand, gravel, and conglomerate. Underneath is almost always a strata of impervious clay of some kind. With such a bottom as this the water freely circulates from one place to another.

One well in the middle of a quarter-section of land might, theoretically, use all the water on the farm. The next problem that confronts us is how to raise the water to the surface. The force required to raise the water is evidently directly as the depth. So that for wells 100 feet deep or more the force required is great and the returns that may be ex-

spected are comparatively small. Wells less than fifty feet deep may be bored, but when deeper than they must be dug, because to do any considerable irrigating it requires very large windmills, pipes, and cylinders. Just how large and in what proportions are ~~problems~~ most excellent subjects for present experimenting. Mr. Goodwine, of Dodge City, Kans., has a well five feet in diameter, perhaps fifty feet deep, with a twenty-two foot windmill. He has a 24 inch cylinder, and the mill has an eight-inch stroke, which throws a gallon of water at a stroke. With this equipment he is able to thoroughly water ten acres. He thinks that with a ~~the~~ 12 inch stroke, which would throw one and a half gallons at a stroke, with larger pipes and cylinder, that fifteen or twenty acres can be thoroughly watered. Others are trying two ten-foot mills with pipes and cylinders — both mills pumping into the same ~~at~~ reservoir to take the place of one large mill. The plant established by this Experiment Station, at Garden City, Kans., last spring, has a well forty feet deep, twelve inch cylinder, and a sixteen foot windmill. With this equipment the intention is to thoroughly irrigate only only five acres.

Horse-power is used for this purpose to a limited extent, and still more formidable is the use of steam power. Marked advantages in favor of a small engine are that a sufficient and definite amount of water may be pumped in a short time, at regular intervals and independent of wind.

Another important factor is the reservoir. For watering

five acres, the reservoir should be about 100 feet square, and four feet deep, or its equivalent. It is better, however, to have it deeper and not so large a surface in order to prevent so much so much evaporating, accumulating of trash, &c. Evidently it should be placed on the highest ground intended for use. If the ground has considerable slope, the the reservoir may be an excavation in the ground of the size wanted. But it is generally placed on top of the ground, made of walls built of dirt. The reservoir of this Station at Garden City, already spoken of, is built right on level ground. The walls are about five feet high, seven or eight feet through at the bottom, and two or three feet thick at the top. The reservoir may be built simply of dirt, of lumber banked up with dirt, or of solid stone wall, according to the time, trouble, and expense to be devoted to it. At first there will be some trouble on account of leaking. The water will soak away in the ground and out through the walls. But in a short time the most porous ground will become compact, apparently a sediment forms, and the leakage will be practically stopped. The same waste and trouble are true of the ditches, which in a short time will also become settled and compact and give little further trouble.

Another kind of reservoir is an elevated tank of any size desired, with a system of pipes attached. This is the way many western towns are supplied with water. It may, however, and often is done by individual enterprise. The tank is



elevated about ten feet from the ground and pipes buried in the ground conduct the water to the various places as wanted.

Such a plan is necessarily much more expensive, is confined to a small area of ground, and can only be applied on a small scale in general. It has advantages over the other way of being much more economical, water can be supplied to a lawn of any kind, to flower beds, to all parts of the dwelling house for domestic use, and to the barn-yard water tank, as well as to strawberries and other small garden. Indeed the means of storing water go very nicely together — a small ~~pump~~ ~~sap~~ windmill supplying the elevated tank and one or more larger ones supplying the reservoir.

Last in the system come the main ditches and large and small laterals. To use these to the best advantage on a large scale requires a great deal of study and skill. If our reservoir can be placed on the top of a slight ridge and the ground on either side is to be irrigated, there may be two gates, one at each end, to let water out of the reservoir and into the main ditches. Then the ground is laid out in plots as in the accompanying cut. The plots should not be more than twenty feet wide, and the beds about forty feet long, owing to the surface of the ground. When the water is to be run into the first "bed" the main ditch is partially closed or checked by throwing a shovelful or more of dirt into one edge of the stream, which turns the water off into the side channel already prepared for it. When enough water has

been used the dirt is removed from the main channel, the side channel is closed with a few shovelfuls of dirt and the stream all goes on. In the same way there may be smaller laterals to draw the water more evenly over the ground into the adjoining beds. Still again these streamlets may be subdivided ~~into~~ and water carried each way. Or it is often just flooded over the ground from the last divisions. This all depends very much on the surface of the ground, the amount of water to be obtained, and the kind crop in cultivation.

It is remarkable that perfectly level ground may be quite thoroughly watered in this way. Indeed the water may be made to run either way when the ground is nearly level. When the ground is hilly or quite sloping more care and exertion are required. If the water is to be conducted for some distance the main ditch must be kept on the highest ground, regardless of direction, length of ditch, or whose property it runs over. Also when the ground is sloping the water will wash the water down hill unless great care is taken of it. To prevent this the ditches are run diagonally across the field, and if necessary the plots and beds are laid out accordingly.

Such is roughly the way that irrigation is done by means of ditches. Finally, there are some serious objections to farming by irrigation and to living in such a hot dry country as requires irrigation. Very much hard, manual

labor is required which seemingly should be supplied by nature. The luxuriant growth of vegetation is only on the ground where the labor is applied, while the surrounding land may be brown or bare. And the air lacks that invigorating freshness which comes after a shower on account of the cooling of the atmosphere, and the washing and cooling of the atmosphere, and the washing and dissolving of impurities out of the air.

But on the other hand, we believe that such hindrances to healthfulness are far over-balanced by a healthful dry atmosphere, the lack of stagnant water, and other decaying vegetable matter. Aye more than that! On irrigated ground crops are sure and sure to be good. There is no dependence on rainfall, plans are not interfered with and can be carried out systematically, there is no loss of time on account of floods nor draughts, much less ground is needed because the yield of crops is at least doubled, there is no plowing of ground which does not yield anything, the unirrigated grazing land is also more valuable when near where plenty of feed is raised. And, too, windmill irrigation is really better than rivers because there is no dependence on melting snow nor injury to dams, nor is there any danger of other men getting all the water.

By this means of irrigation, it is very fairly estimated that any moderate-sized family can make a good living

on five acres, and with fifteen acres they can become wealthy. In order to be fully convinced of its merits and perhaps fall in love with western Kansas, says Professor Failure, a person only needs to spend a few days in Dodge or Garden City, or some similar locality and see what nice crops of all kinds are raised in this way.

What, then, with five, ten, fifteen, or twenty acres of ground around the home under irrigation where good crops are assured every year and with 160 or 320 acres of land at almost every man's disposal, which are very far from being non-productive, but which produces fair crops most of the time, it may be expected that the western part of the state will in the right near future be as profitable farming country and make as happy homes as can be found in eastern Kansas. (2700 words)

THE END.

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