Sept. 20, 1932. W. RICHMOND 1,878,295

PROCESS FOR RECLAIMING LANDS AND MAINTAINING LANDS IN A CONDITION SUITABLE FOR CULTIVATION OR HABITATION

Filed June 28, 1927 2 Sheets-Sheet 1

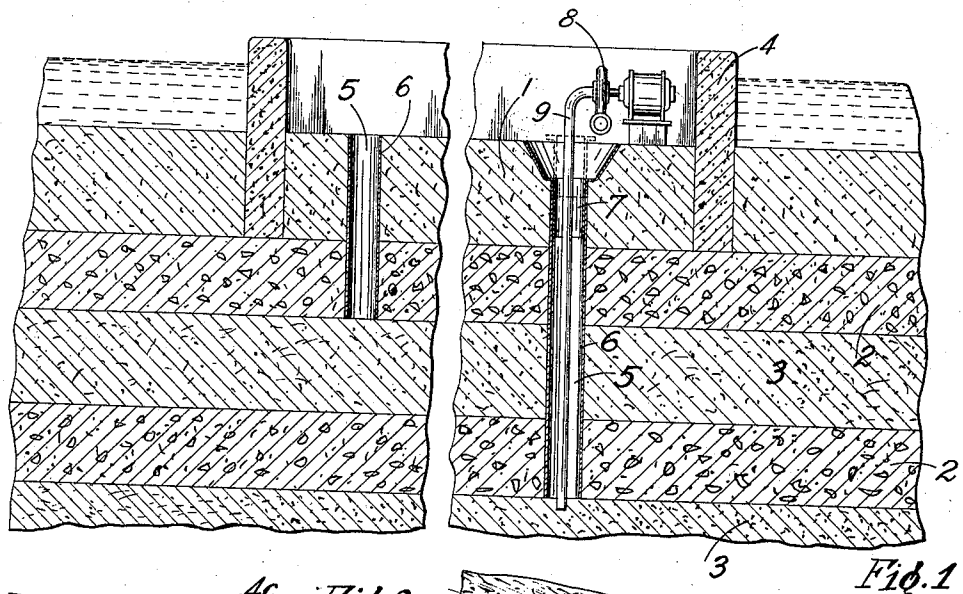



Fig. 1

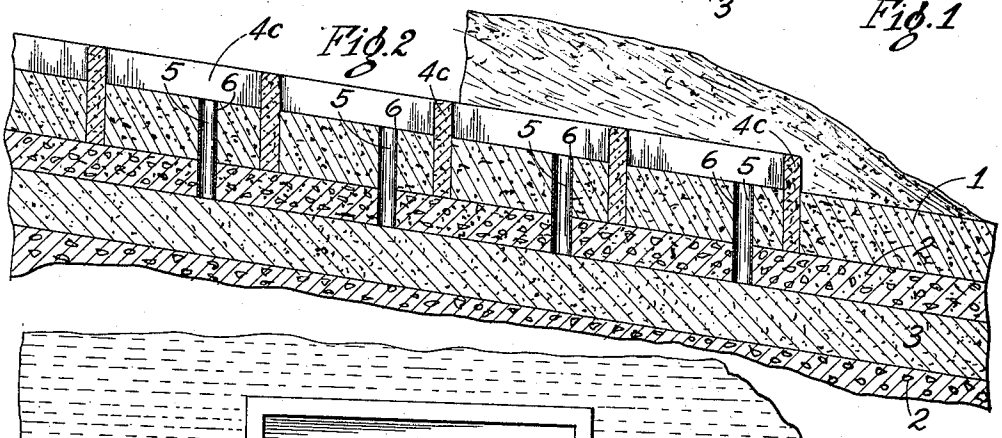



Fig. 2

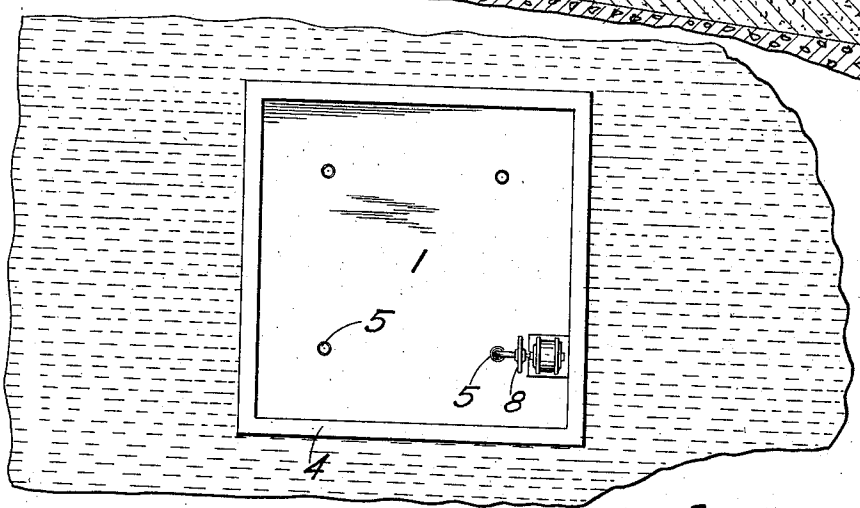



Fig. 3

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Sept. 20, 1932. W. RICHMOND 1,878,295

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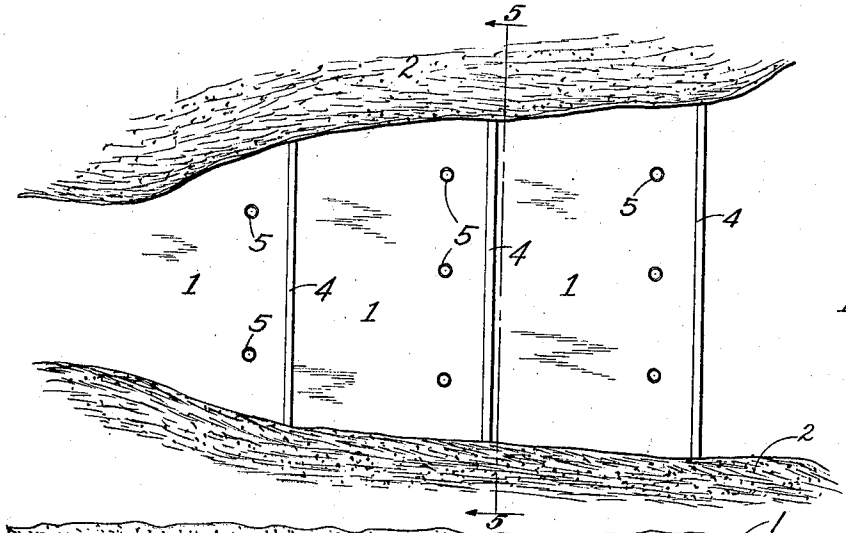



Fig. 4

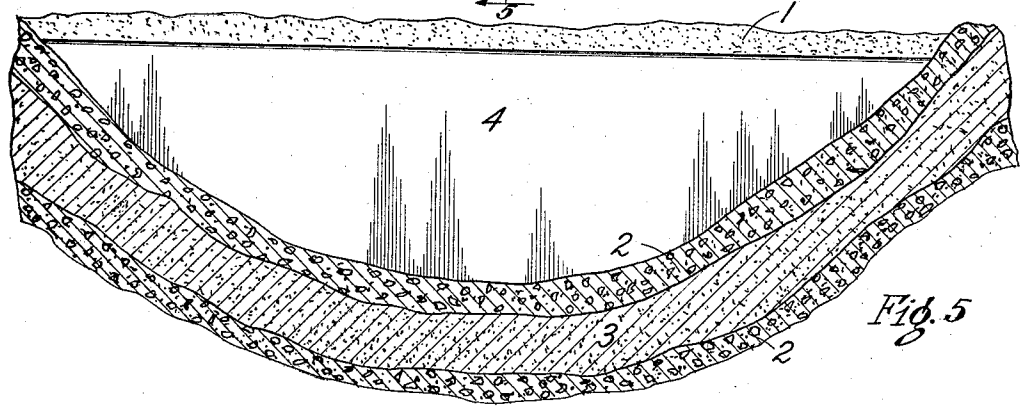



Fig. 5

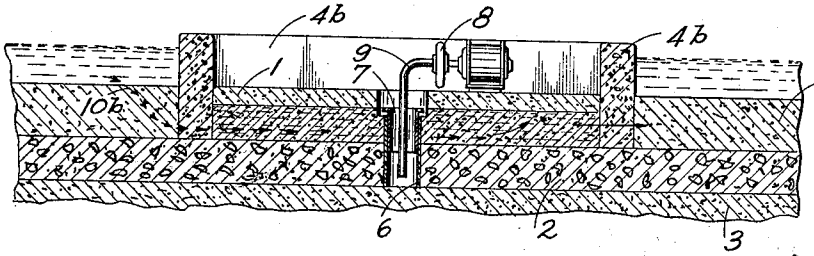



Fig. 6

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# UNITED STATES PATENT OFFICE

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## PROCESS FOR RECLAIMING LANDS AND MAINTAINING LANDS IN A CONDITION SUITABLE FOR CULTIVATION OR HABITATION

Application filed June 28, 1927. Serial No. 202,131.

This invention is an improvement in the method and means for controlling the water table of land and relates more particularly to a method of draining and irrigating land including that normally of a boggy or marshy nature.

Heretofore in the improvement of land by drainage and irrigation, resort has been made to open the drain ditches or canals passing through the land along the lower portions thereof. In some cases canals have been formed by means of dikes and the water from the adjacent land is pumped over the dikes into the canal and discharged. However, such methods have proven very unsatisfactory in that, aside from the large expense involved in constructing and maintaining such drainage canals, a large portion of the useful land area is actually lost as it must be used for these canal purposes. Furthermore, in the case of excessive rains the canals are apt to overflow and damage the lands or themselves be damaged and rendered unfit for future use. Another great disadvantage of such systems is that the land is drained of all the water which is completely disposed of except for a relatively small quantity which may remain in the canals at all times and which serves no useful purpose.

With these problems in mind, it is one of the objects of my invention to maintain positive control of the water table of lands, as for instance, where the land tends to lie under water, the land may be drained to a predetermined water level above or below the surface without the use of canals, pipe lines or the like.

Another object of my invention is to so control the water table level that different levels may be obtained rapidly without injuring crops growing on the land.

Still another object of my invention is to prevent frost from injuring crops growing on the land by causing a quantity of the relatively warm sub surface water to circulate on or close to the surface of the land during the periods of low temperatures.

In the case of lands of peaty nature which are subject to fire, my invention offers a ready means for protection against fires.

Another object of my invention is to control the water on lands the contour of which renders drainage by the methods now in use excessively expensive or impossible, without erosion.

By the use of my invention, I am able to accomplish all of these desirable results at a very negligible initial and operating cost per acre of land.

These and other objects will become apparent in the following specification in which reference is made to the drawings, like reference numerals indicating the same parts in the various views in the drawings.

In the drawings:—

Fig. 1 is a cross sectional view through a parcel of land with means, in accordance with my invention, for controlling the water table.

Fig. 2 is a cross sectional view through a sloping parcel of land adapted to be drained and otherwise treated in accordance with my invention.

Fig. 3 is a plan view of the parcel of land shown in Figure 1, but on a reduced scale.

Fig. 4 is a plan view of the section of land illustrated in Fig. 2, showing the manner of isolating a tract.

Fig. 5 is a sectional view taken on line 5—5 of Figure 4 but is shown in slightly enlarged scale.

Fig. 6 is a cross sectional view similar to Figure 1 and shows a slightly modified form of dike or barrier.

Briefly, my invention may be applied to otherwise tillable land which is by its nature and its natural environment, either flooded or boggy or subject to inundation and which rests upon a porous stratum separated therefrom by hardpan, rock or any impervious stratum. My invention likewise may equally and effectively be applied to arid lands or to lands actually under cultivation, where control of the water table is desired.

In most lands of this nature it will be found that this geological formation exists.

Referring more particularly to Figure 1, in which I have illustrated one embodiment of my invention, the tillable land indicated at 1, is of varying thickness, sometimes as

much as ten to twenty feet deep. This stratum overlies a stratum, such as designated at 2, of rock or hardpan, which is substantially impervious to water. Below the stratum 2 is found a porous stratum 3, usually of very coarse or porous rocks. This porous stratum is of such a nature that water will flow therethrough with a noticeable current as distinguished from mere seepage, and usually extends many miles to a lower level and discharges into some larger body of water.

In many localities several of these impervious and porous strata occur alternately, one over the other, to a great depth. To utilize these strata for the purposes above described, I form a septum, or dike 4, which protrudes above the land surface a sufficient distance to extend above the surface flood water, thereby isolating the particular parcel or area of land to be reclaimed. These dikes preferably extend down to the impervious stratum to prevent the flow of water from adjacent land into the segregated parcel. However, where the septum 4*b*, Fig. 6 extends below the surface of the tillable land as illustrated in Fig. 6 the walls of the septum below the surface may be of such porosity as to permit a retarded migration of water therethrough and across the area in intimate contact with the tillable soil as indicated by the arrows 10, Fig. 6. In such cases, the water could be drained off rapidly before the level approached the land surface close enough to be harmful. The purpose of this subsurface migration is described herein.

In carrying out my invention, I drill wells 5, depending upon the size of the area whose water table is to be controlled, through the impervious stratum 2, the walls of each of the wells being supported by a suitable casing 6 extending into or through the impervious stratum. This casing not only prevents filling of the well by loose earth but also controls the height of the water table. In practice, I make the top of this casing in the form of a telescopic sleeve 7 so that it may be adjusted to any desired depth on the casing above or below the surface of the tillable stratum. By the use of such an arrangement the water table can be maintained the desired distance from the surface of the land by raising and lowering the sleeve on the casing. The porous stratum 3 usually extends over large areas and permits water to pass so freely that the wells 5 can discharge into it continuously as a fast flowing stream and the water will be carried away in sufficient quantities to take care of the heaviest rains even though they extend over a very large section. At the same time a large volume of water remains in, or is passing through the porous strata after the head of water, due to the wells, has reached the normal water level of the stratum. This water, of course, remains at a substantially constant temperature and may be easily pumped back through the well on to the land by a suitable pump 8, which may be power driven, as illustrated, having an intake pipe extending into one of the porous strata. Due to its relatively warm temperature, it will, in most cases, prevent frost and thus protect the growing crops on the controlled area. It may be drained off so quickly and the ground so thoroughly drained in a short time that the crops are not drowned out or otherwise endangered. For instance, the water could be pumped on the land prior to the frosting period, remain during the frosting period, and then could be drained off rapidly.

Having a discharge capacity which is so greatly in excess of requirements, it is not necessary to isolate the parcel of land with a water-tight septum and in some cases it is advantageous to use a semi-pervious septum and allow a retarded migration of the sub-surface waters. In many cases, I find it advantageous to use a semi-pervious septum or dike 4*b*, as illustrated in Fig. 6 and allow a retarded migration of the sub-surface water through the tillable stratum as indicated by the arrows 10*b*. This serves two purposes, first, preventing a stagnant pool of sub-surface water and also furnishing inexpensive and almost automatically controlled irrigation by maintaining a water level even with the top of the well casing and at a desired distance below the surface. In cases where the entire area is to be drained and there are no higher areas to consider, irrigation can be provided by the use of a small pump adapted to pump water out of the well and into the sub-surface pool. This can be effected at a very minimum cost as the only water needed will be that required to maintain the sub-surface pool. Since this is not exposed to the direct rays of the sun and rises slowly through the soil, the losses by evaporation are not large. Lands of a peaty nature when overdrained, are subject to the hazards of fire and in fact thousands of acres of rich farming land have been completely destroyed by fire from overdrainage by the canal methods. By my invention, a water level may be maintained sufficiently high at all times to keep the soil moist and to eliminate this fire hazard.

If the land is of sloping nature, such as illustrated in Figure 2, the septum 4*c* may be arranged in steps or terrace fashion as illustrated and a correct water table maintained on each parcel. Since the surface water is carried off on each portion without passing over other portions, erosion of the surface is reduced to a minimum if not eliminated.

Furthermore, by the use of such controlled drainage, swelling of surface streams by the rapid inpouring of successive amounts of surface drainage water is eliminated and other tillable land lying at a lower level than the land being drained is not subjected to the cumulative effects of the drainage of exten-

sive land areas at a higher level. The elevation of the well casing permits the impounding of excess water when desired for the purpose of utilizing all of the rainfall in semi-arid-regions as it is impounded on the parcel of land and permitted to saturate the tillable stratum rather than run off as surface water. This is especially desirable in the case of steeply inclined surfaces. If the land is thoroughly saturated, the adjustable top of the well casing may be lowered to the desired water table level and excess water then drained off. The septum or dike may be made very economically from puddled earth or rock which gives a somewhat impervious dike, depending on the degree of fineness and puddling.

I claim:

1. The method of water control for land overlying a porous substratum and separated therefrom by a substantially impervious stratum which consists of partially isolating a parcel of said land by partially damming off water from an elevation above the normal water level to the substantially impervious stratum and causing retarded migration of subsurface waters through the land so isolated, draining a portion of the water in said parcel to a given location below the surface of the normal water table of said parcel, removing a portion of the water from said parcel by drainage at a predetermined rate into said porous substratum whereby a water table is maintained at a predetermined depth below the surface of said isolated parcel and the water above said substratum and in said parcel may be continuously changed.

2. The method of controlling moisture in land overlying a porous stratum and separated therefrom by a substantially impervious stratum which consists of isolating the parcel by damming the water from the elevation above the normal water level to the substantially impervous stratum, passing a portion of the impounded water of said isolated parcel through a passageway through said impervious stratum whereby the water is passed from said parcel into the porous stratum, positioning the mouth of said passageway a predetermined distance below the normal water level whereby the water table may be retained at a predetermined depth below the land surface of the isolated parcel.

3. The method of controlling moisture in land overlying a porous stratum and separated therefrom by a substantially impervious stratum which consists of isolating the parcel by damming the water out of said parcel from an elevation above the normal water level to a predetermined distance below said normal water level and allowing water to migrate slowly into said isolated parcel at a lower portion thereof passing the water from said isolated parcel through an opening through the impervious stratum and discharging it into the porous stratum therebeneath, controlling the level at which the water may enter said passage whereby the water below the surface of said parcel and above said impervious stratum may be changed continuously and a predetermined water level maintained in said parcel.

4. In a water table control for land overlying a porous stratum and separated therefrom by a substantially impervious stratum, means including a dike for damming the water in the area under control, said dike extending around said area and extending from an elevation above the normal water level to the substantially impervious stratum, a passage communicating the area within the dike with the porous stratum and means for regulating the quantity of water to be retained in the area.

5. A method of water control for land overlying a sloping substantially impervious substratum which consists of arresting migration of part of the waters normally passing through said land in the direction of the downward slope of said substratum and impounding a portion of said waters above said impervious substratum and beneath the surface of said land and maintaining said impounded waters at a predetermined level below the land surface.

6. The method of controlling water on a tract of land overlying a sloping substantially impervious substratum which consists of isolating the tract of land by extending a dam from an elevation above the normal water level to the substantially impervious stratum and arresting migration of part of the sub-surface waters across said land, and impounding part of said waters in said tract and above said impervious substratum and maintaining the water table of the impounded water in the isolated tract below the normal land surface.

7. The method of controlling the water on a tract of land overlying a sloping substantially impervious substratum which consists of isolating said tract by extending a dam from an elevation above the normal water level to the substantially impervious stratum, arresting migration of the water normally passing through said tract in the direction of the downward slope of said substratum, impounding a portion of said water above the impervious substratum and beneath the surface of said tract, and removing part of said migrating water from said tract.

8. A method of water control for land overlying a porous stratum and separated therefrom by a substantially impervious stratum which consists of isolating a parcel of the land by extending a dam from an elevation above the normal water level to the substantially impervious stratum and blocking the flow of waters thereacross, passing water in said isolated parcel through a passageway in the im-

pervious stratum and discharging it into the porous stratum therebeneath, and withdrawing water from said porous stratum and discharging it into the isolated parcel at predetermined times and in predetermined quantities.

9. A method of frost protection for crops growing on land overlying a porous stratum and separated therefrom by a substantially impervious stratum, which consists of isolating the portion of land on which the crops are growing by extending a dam from an elevation above the normal water level to the substantially impervious stratum, withdrawing water from the porous stratum and discharging it into the isolated portion at predetermined times and maintaining the water so withdrawn from said porous stratum in said isolated portion during intervals of frosting temperature, and passing the excess water on the isolated portion through a passage in the impervious stratum into the porous stratum at predetermined times.

10. A water control means for land overlying a porous stratum and separated therefrom by a substantially impervious stratum, which includes a dike arranged for isolating a parcel of said land from contiguous land by damming the water from an elevation above the normal water level to the substantially impervious stratum, a conduit passing through said impervious stratum and having an inlet opening within the land so isolated.

11. A water control means for land overlying a porous stratum and separated therefrom by a substantially impervious stratum, which includes a dike arranged for isolating a parcel of said land from contiguous land, said dike extending downwardly from above the normal water level of said land to the impervious stratum, a conduit passing through said impervious stratum and having an inlet opening within the land so isolated.

12. A water control means for land overlying a porous stratum and separated therefrom by a substantially impervious stratum, which includes a dike arranged for isolating a parcel of said land from contiguous land by damming the water from an elevation above the normal water level to the substantially impervious stratum, said dike being slightly porous for permitting partial migration of waters from adjacent land across said isolated land, a conduit passing through said impervious stratum and having an adjustable inlet opening within the land so isolated.

13. A water control means for land overlying a porous stratum and separated therefrom by a substantially impervious stratum, which includes a dike arranged for isolating a parcel of said land from contiguous land by damming the water from an elevation above the normal water level to the substantially impervious stratum, a conduit passing through said impervious stratum and having an inlet opening within the land so isolated, and means for adjusting the height of said inlet opening of said conduit above the impervious stratum for maintaining the water level in the isolated land at predetermined depths above the impervious stratum.

14. A water control means for land overlying a porous stratum and separated therefrom by a substantially impervious stratum, which includes a dike arranged for isolating a parcel of said land from contiguous land, by damming the water from an elevation above the normal water level to the substantially impervious stratum, a conduit passing through said impervious stratum and having an inlet opening within the land so isolated, and means for adjusting the height of said inlet opening of said conduit above the impervious stratum for maintaining the water level in the isolated land at predetermined depths above the impervious stratum, said means including a sleeve telescopically mounted on the inlet end of said conduit.

15. A frost, irrigation and fire control apparatus for land overlying a porous stratum and separated therefrom by a substantially impervious stratum which includes a dike arranged for isolating a parcel of the land from contiguous parcels, by extending a dam from an elevation above the normal water level to the substantially impervious stratum, a conduit extending through said impervious stratum and having an inlet opening within the isolated parcel for passing water therefrom into a porous stratum, and means for adjusting the height of the inlet opening above the impervious stratum, a pump arranged for drawing water from a porous stratum and for discharging the water withdrawn from said porous stratum into said isolated parcel of land.

16. The method of controlling water on land overlying a porous stratum and separated therefrom by a substantially impervious stratum which includes isolating a parcel of the land by damming out water from an elevation above the normal water level to the substantially impervious stratum and passing excess water from said parcel into the porous stratum through an opening in the substantially impervious stratum.

17. The method of controlling the water on a tract of land overlying a sloping substantially impervious substratum, which consists of isolating the tract of land by extending a porous dam from an elevation above the normal water level to the substantially impervious stratum and partially blocking the natural flow of sub-surface waters for a distance upwardly from the said impervious substratum and thereby arresting migration of part of the sub-surface water, and impounding part of said water to maintain the water

table of the impounded water in the isolated tract above its normal level.

18. The method of controlling water on a parcel of land overlying a porous stratum and separated therefrom by a substantially impervious stratum which includes extending a dike around the area under control, isolating the parcel by partially damming off water from an elevation above the normal water level to the substantially impervious stratum, and causing migration of waters from an adjacent land across and between the surface of the isolated portion and the impervious stratum therebeneath, and passing part of the waters in said parcel through an opening in the impervious stratum and discharging it into the porous stratum.

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