June 14, 1932. O. B. RECTOR 1,862,550

DEVICE TO RETAIN MOISTURE IN LAND

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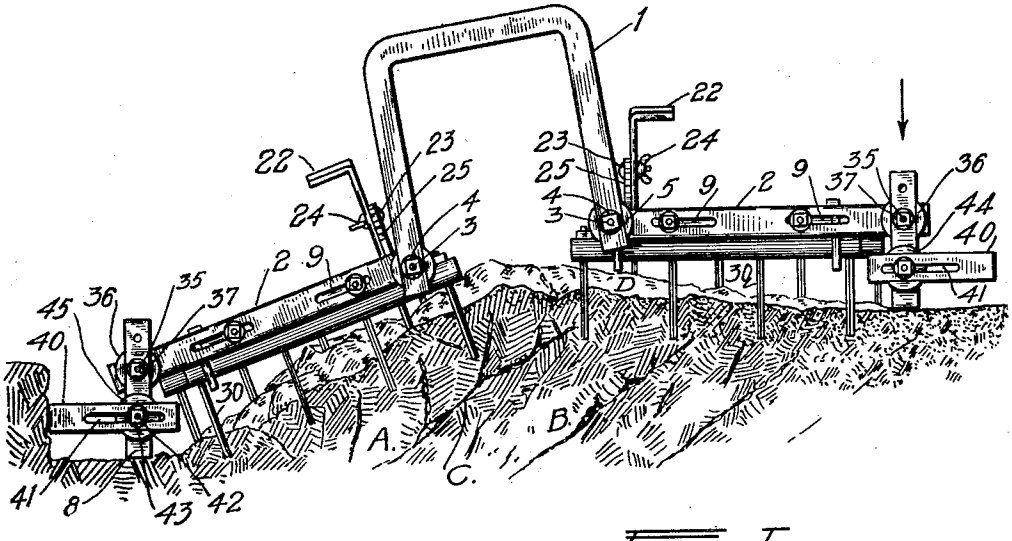


Fig. 1.

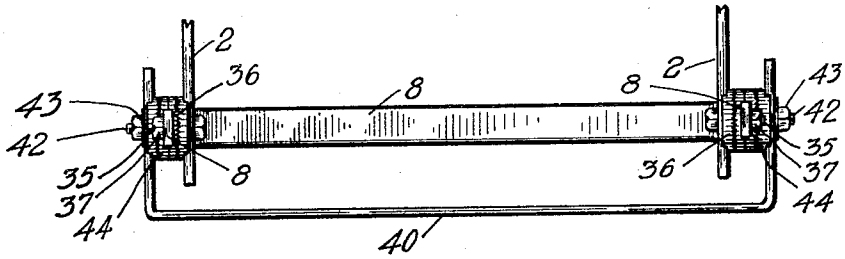


Fig. 2.

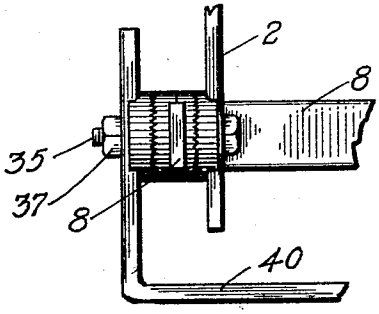


Fig. 3.

INVENTOR.
Orland Basil Rector

BY
Rolland S. Trotter ATTORNEY.

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Fig. 3.

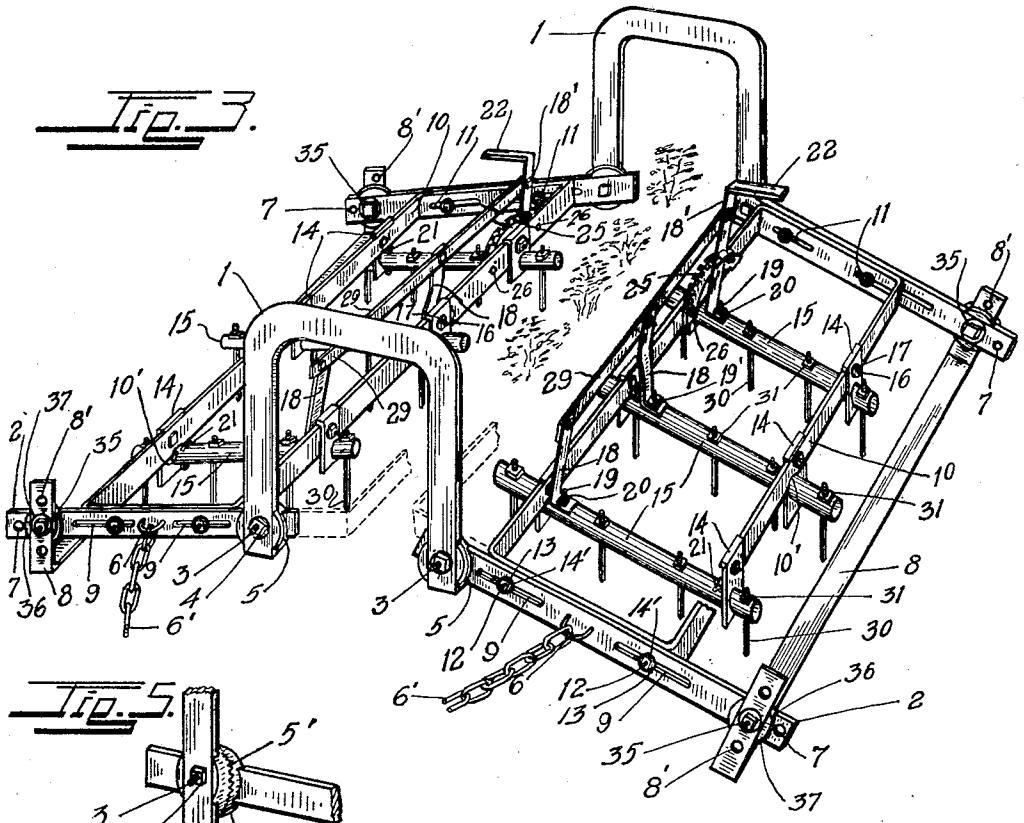


Fig. 5.

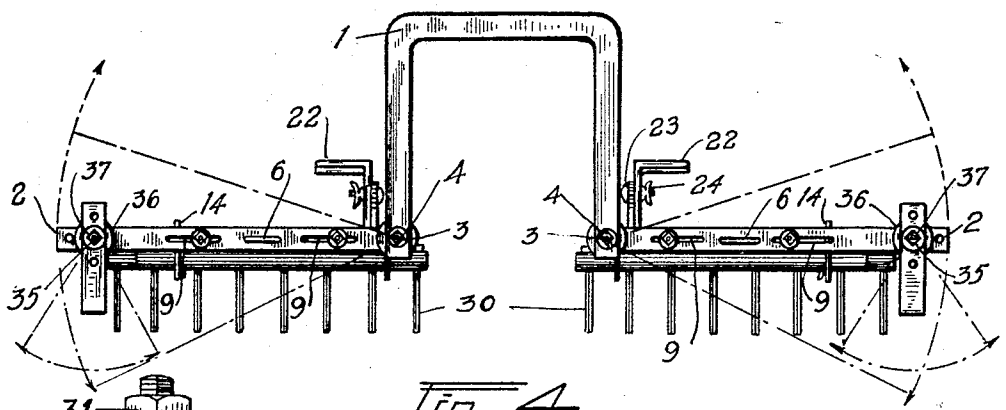


Fig. 4.

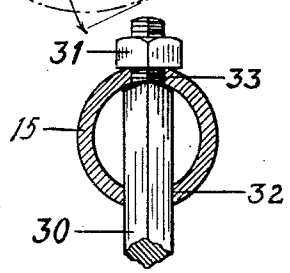


Fig. 6.

INVENTOR

Orland Basil Rector

BY

Roland S. Scott ATTORNEY.

Patented June 14, 1932 1,862,550

UNITED STATES PATENT OFFICE

ORLAND BAZIL RECTOR, OF EATON, COLORADO

DEVICE TO RETAIN MOISTURE IN LAND

Application filed February 9, 1931. Serial No. 514,585.

My invention relates to a device for retaining moisture in plowed or cultivated land.

When land is plowed, the strip of earth turned over by the plow is first bent to conform to the curve of the mold board of the plow and is then rolled on over upon the previously turned strip of earth.

In this operation the moved earth is broken up to some extent and contains great numbers of cracks or fissures due to the bending and movement caused by the plow.

These cracks and fissures permit air to circulate through the earth that has been moved and there is also chance for circulation of air between each strip of earth and the previous strip upon which it has been rolled by the plow, since one broken strip of earth merely rests roughly upon another broken strip of earth.

The amount of air space in a plowed field, whether due to cracks and fissures, breaking up of the soil or poor contact between adjoining earth strips, can be seen from the fact that the freshly plowed ground is generally higher than the adjoining un-plowed ground by an amount roughly equal to one third of the depth plowed.

The result is that the earth tends to dry out quickly, not only from the cracks and fissures and the general broken condition of each strip, but from the more or less continuous air channel between adjacent strips.

In some cases twenty four hours is enough to permit most of the moisture to be thus evaporated.

In dry territory where at best there is never too much moisture it is most important to retain in the earth as much of its moisture as is possible.

The object of my invention, therefore, is to provide a process whereby the moisture may be retained in the plowed earth by a two layer seal of fine earth formed by harrowing as the land is being plowed.

A further object is to provide a device by which my process may be carried out, and the earth given a sealed two layer harrowing as it is being plowed.

A further object is to provide such a harrow which may be made to operate with any depth or width of furrow.

A further object is to provide such a harrow which, because of the construction can also be used to harrow both sides of hills, ridges, or rows, hereinafter referred to merely as hills.

A further object is to provide such a harrow, which will automatically line up with the furrow or hill and will evenly and smoothly follow the furrow as plowed or the sloping sides of a hill without digging into or gouging into the earth and without need for even being watched as it is dragged after the plow or the cultivator.

A further object is to provide a harrow which may still be used on a hill after the crop is above the ground, when the need for a harrow is greatest.

A further object is to provide such a harrow which may be used on the sides of a hill to break up the crust formed on the surface of the ground after a rain, either before or after the crop is above the ground surface, and to destroy the weeds on the sides of the hill at any time.

A further object is to provide such a harrow which is adjustable not only for any depth or width of furrow, but also for hill angle, width of the row of plants in a hill, depth of the harrow teeth, and angle of harrow teeth along the direction of draft.

A further object is to provide such an adjustable harrow so constructed that the adjustments when made will remain as set.

A further object is to provide such a harrow of a cheap, practical construction, which will give satisfactory and trouble-proof service in the hands of the farmers.

My process consists in forming a substantially air tight layer of fine earth on the sloping face of each strip of earth just after it is turned by the plow and on the adjoining ground surface, to prevent the circulation of air through the cracks and fissures of each strip and the resulting evaporation of moisture, and turning the next strip of earth upon this fine earth formed on each strip which will tend to make a more continuous contact

between adjacent earth strips, the layer of fine earth formed extending further than each new strip so as to also seal the contact of the new strip with the previous strip, at the ground surface.

Thus there is formed a fine earth seal upon the surface of the ground, and a plurality of fine earth seals extending at an angle down into the ground upon the top of each strip of turned earth.

My device consists of a harrow of special construction which may be described as follows;—

The harrow consists of a runner frame and two tooth frames mounted on the runner frame. The tooth frames carry tooth bars pivotally mounted and joined by connecting rods whereby the tooth bars may be rotated and set at any angle by means of an adjusting arm and toothed arc segment.

The tooth frames are adjustably mounted on the runner frame.

The runner frame is composed of cross arms pivotally and adjustably attached to U-shaped central yokes, the outer ends of the cross arms being adjustably mounted on bottom runners, with side runners adjustably attached to the bottom runners, or to the cross arms. Both bottom and side runners are ground-contacting runners.

The U-shaped central yokes pass over the high part of each turned strip of earth and also permit trash or other loose material thrown up as each strip is turned, to pass through the harrow. The action of the harrow teeth tends to reduce the height of the high point of each strip as turned, and upon the next passage of the harrow this high point is still further reduced.

The U-shaped yokes also permit the harrow to be used on hills after the crop is up.

All of this will be more fully described below and illustrated in the drawings, in which;—

Figure 1 is a view showing my harrow as it would appear when following a plow, with the seals of fine harrowed earth indicated.

Figure 2 is a fragmentary plan view of Figure 1, as shown by the arrow.

Figure 3 shows my harrow as it would appear when used on a hill in which the crop is above the ground surface.

Figure 4 is an end view of my device shown in Figure 3, showing its adjustability for hill angle.

Figure 5 is a detail of the serrated washer adjustment lock.

Figure 6 is an enlarged section through one of the tooth bars.

Figure 7 is a detail showing a modified mounting of the side and bottom runners.

In Figure 1 it will be seen that the side runners 40 and the bottom runners 8 bear against the side and bottom respectively of the furrow and hence position the harrow laterally and vertically, so that the harrow teeth will properly engage the sloping side of the turned earth strip A, as well as the level ground surface adjacent the sloping surface, and so that the center of the yokes will substantially align with the high point of the earth strip.

Thus the sloping surface of the earth strip A will be covered with harrowed or fine earth which will close and seal all the cracks and fissures, and the level ground surface will also be covered with fine, harrowed earth which will close and seal the cracks and fissures of the level earth surface and which will also close and seal at the ground surface the contact between the earth strip A and the earth strip B, as at D.

Should there be any openings left along the sub-surface contact C between the strips A and B the seal at D will effectually prevent air circulation therethrough, and hence prevent evaporation of the moisture.

The slots 41 of the side runners 40 permit adjustment of the side runners to fit furrows of different widths.

The side runners 40 are attached to the bottom runners 8 by the bolts 42, nuts 43 and serrated washers 44 and 45, which are similar in construction to those shown at 5 in Figure 5.

The bottom runners 8 are attached to the cross arms 2 by the bolts 35, nuts 37 and serrated washers 36. The cross arms 2 are attached to the yokes 1 by the bolts 3, nuts 4 and serrated washers 5. This assembly forms a hinged connection between the spaced ground-contacting runners.

The yokes 1 permit the harrow to be used on a hill after the crop is above the ground surface, as indicated in Figure 3, and when used behind a plow the yokes permit the trash from each strip and the high point of the ridge to pass through the harrow, the high point being somewhat reduced in this passage by the action of the harrow teeth.

The lockable pivotal attachments between the yokes 1 and the cross arms 2 permit the harrow to be adjusted to the angle of the hill, as indicated in Figure 4.

The lockable pivotal attachments between the arms 2 and the bottom runners 8 permit angular adjustment of the bottom runners 8 as indicated in Figure 4 to accommodate for any change of the angle of the arms 2 with respect to the yokes 1.

The holes 8′ in the bottom runners 8 and the holes 7 in the arms 2 permit of adjustment of the position of the bottom runners on the arms 2 and also permit adjustment of the height of the runners, whereby the depth of the ground-engaging teeth 30 in the ground may be adjusted.

The pivotal attachments of the side runners 40 on the bottom runners 8 permit of adjustment of the side runners to co-operate with the angle of the arms 2 and of the bottom

runners 8, and the slots 41 permit adjustment for the width of the furrow.

Thus it will be seen that the runner frame provides all the necessary adjustments whereby the harrow may be made to fit all conditions that may be met with either when following in the furrow after a plow, or when operating upon a hill after a cultivator.

Thus it will be seen that the transversely aligned members, including the yoke 1 and the arms 2 of the runner frame, form transverse hinged connecting means or intermediate connecting means for the runners.

If desired the side and bottom runners may be attached at the same points on the arms 2, as shown in Figure 7. In any case the result is the same in that proper adjustment of both runners for position and angle is provided to suit any set of conditions.

When the harrow is used upon a hill, the side runners 40 may be removed as shown in Figures 3 and 4.

The arms 2 are provided with the U-shaped rivets 6, to which are attached in any proper manner, the draft chains 6'.

The arms 2 are also provided with the adjustment slots 9.

The tooth frames 10 are provided with the slots 11, and are mounted by the bolts 12, washers 13, and nuts 14' upon the arms 2, by the bolts 12 passing through the slots 11 of the tooth frames 10 and through the slots 9 of the arms 2.

The tooth bars 15 are pivotally mounted upon the frames 10 by the brackets 14, which are held to the frames 10 by the bolts 16 and nuts 17.

The tooth bars are received slightly into the frames 10 by the notches 10'.

The tooth bar arms 18 are bolted to the tooth bars by the bolts 19, washers 19' and nuts 20; the arms 18 and the pins 21 acting to prevent endwise movement of the tooth bars through the brackets 14.

The rear adjusting tooth bar arm 18' is provided with the handle 22, and its position is locked by the bolt 23 and wing nut 24. The bolt 23 passes through a slot in the arm 18' and through one of the notches of the arc segment 25, which is attached to the frame 10 by the bolts 26, washers and nuts.

The rear toothed bar arm 18' and the two arms 18 are connected together by the connecting rod 29 which is pivotally attached to all three arms.

The teeth 30 are of square section and at their upper ends are round and threaded to receive the nuts 31.

The teeth extend through the square holes 32 and their upper round ends extend through the round holes 33, the nuts 31 holding the shoulder solidly up against the inner surface of the tooth bar.

The serrated lock washers 5 are grooved to fit the yoke 1, cross arm 2 and bottom runner 8 respectively, which groove locks each washer 5 from rotation with respect to its corresponding bar.

The teeth 5' form a serrated lock against relative rotation of the engaged washers 5 and hence against change of adjustment of the corresponding bars.

That is, when the cross arms have been properly adjusted on the yokes to the angle desired, and the pivot bolt and nut are properly tightened, the angle of the bars will remain the same, and will not slowly slip or change during the operation of the harrow.

Also, when the bottom runners 8 have been properly set on the arms or bars 2, and the adjusting bolts and nuts properly tightened, the bottom runners will remain as set, even after rough usage. Likewise, the side runners 40 will remain as set, because of the associated serrated lock washers.

It will now be seen that by my process not only are all the cracks and fissures at the ground surface of a field sealed by a seal of fine harrowed earth, but the contact at the ground surface between adjoining strips of turned earth are also sealed, and that a double layer seal is provided by the plurality of fine harrowed sub-surface earth seals between each strip of earth and the adjoining strip.

The fine earth seal on the ground surface may become baked or crusted and at a later date require further harrowing. But the subsurface seals not being in direct contact with either sunshine or rain will remain a permanent deterrent to the rapid evaporation of moisture from the earth below them.

It will also be seen that my harrow may be adjusted not only to any desired depth or width of furrow by adjustment of the side runners 40 and the bottom runners 8, but it may be adjusted to the hill angle at the bolts 3, for the width of the row of plants in the hill by the adjustment of the bolts 12, of the tooth frames 10 and movement of the tooth frames along the arms 2 (as indicated by dotted lines in Figure 3), for the depth of harrow teeth in the ground by adjustment of the runners 8 on the arms 2, and for angle of teeth along the direction of draft by the bolts 23 and wing nuts 24.

The yokes 1 permit the high point of each earth strip as turned to pass through the harrow, while being partially reduced in height by the harrow teeth. The yokes also permit trash thrown up by the turning of the earth strip to pass through the harrow without catching and being dragged along by the frame or teeth.

The yokes also permit the harrow to be used after the crop is up above the ground surface; the runners make the harrow line up with the hill and run smoothly and evenly at all times without digging into or gouging into the ground, whether used in a furrow or

on a hill, and adjusting the tooth bar arms permits the angle of the teeth to be adjusted as desired.

Having now described my process and device, what I claim as new and desire to protect by Letters Patent, is as follows:—

1. In a harrow, a runner frame having ground-contacting runners, arms attached to the runners adjacent their ends and central means providing angular adjustment between the corresponding arms, tooth frames attached to the arms on opposite sides of said central means, and ground-engaging teeth carried by said tooth frames.

2. In a harrow, a runner frame having ground-contacting longitudinally extending runners and transverse means joining the runners, tooth frame means separate from, attached to, and carried by the runner frame, and a plurality of ground-engaging teeth carried by said tooth frame means.

3. In a harrow, a runner frame having ground-contacting, longitudinally extending runners, a cross arm attached adjacent each end of each runner and having a lockable angularly adjustable connection therewith, means providing a lockable angularly adjustable connection between corresponding cross arms, and a toothed frame mounted upon the arms carried by each runner.

4. In a harrow, a runner frame having ground-contacting, longitudinally extending runners, a cross arm attached adjacent each end of each runner and having a lockable angularly adjustable connection therewith, upwardly extending U-shaped yokes co-acting with each pair of aligned cross arms, means forming lockable angularly adjustable connections between the yokes and the corresponding ends of the cross arms, a toothed frame co-acting with the arms carried by each runner, and means providing a transversely adjustable mounting of the toothed frames on the corresponding cross arms.

5. In a harrow, a runner frame having ground contacting runners and transverse hinged connecting means forming a runner mounted frame unit, and toothed frame means transversely adjustable upon said connecting means of the said unit.

6. In a harrow, a runner frame having ground-contacting runners, and transverse hinged connecting means provided with central, upwardly extending U-shaped yoke means forming a runner mounted frame unit, and toothed frame means carried by said connecting means of said unit on each side of said yoke means and transversely adjustable with respect thereto.

7. In a harrow, a runner frame having ground-contacting runners and transverse hinged connecting means, toothed frame means transversely adjustable upon said connecting means, tooth bar means pivotally mounted on said toothed frame means, ground-engaging teeth carried by said tooth bar means and means carried by the toothed frame means and connecting the tooth bar means of each tooth frame means to control the angular position of the tooth bar means and the said teeth.

8. In a harrow, a runner frame having ground-contacting runners, cross arms, means providing lockable adjustable connections between the runners and the cross arms whereby the angular relations of runners and cross arms may be adjusted, inverted U-shaped yokes, means providing lockable adjustable connections between the yokes and the corresponding cross arms, toothed frames, means providing transversely adjustable mounting of each toothed frame upon the corresponding cross arms, ground-engaging harrow teeth, and means adjustably mounting said teeth upon said toothed frames whereby their angular position may be adjusted in a longitudinal direction.

9. In a harrow, ground-contacting runners, frame means joining the runners and provided with angle adjusting lockable intermediate hinge means, ground-engaging teeth carried by the frame means, and means to adjust the angle of the teeth in the direction of draft.

10. In a harrow, ground-contacting runners, frame means provided with angle adjusting lockable intermediate hinge means, means providing angle adjusting lockable connections between the frame means and the runners, tooth frames, means mounting the tooth frames on the frame means and providing transverse adjustment between them, ground-engaging teeth carried by the tooth frames, and means to adjust the angle of the teeth in the direction of draft.

11. In a harrow, a runner frame provided with ground-contacting runners, cross arms and transversely aligned members, tooth frame means separate from, attached to, and carried by the runner frame, and means, including locking means providing lockable connections between the runners and the runner frame cross arms and between transversely aligned members of the runner frame permitting adjustment of the angular relations of the parts adjacent said lockable connections.

In testimony whereof I affix my signature.

ORLAND BAZIL RECTOR.