C. W. ROOD.

DITCHING MACHINE.

APPLICATION FILED JUNE 29, 1908.

926,136. Patented June 29, 1909.

4 SHEETS—SHEET 1.

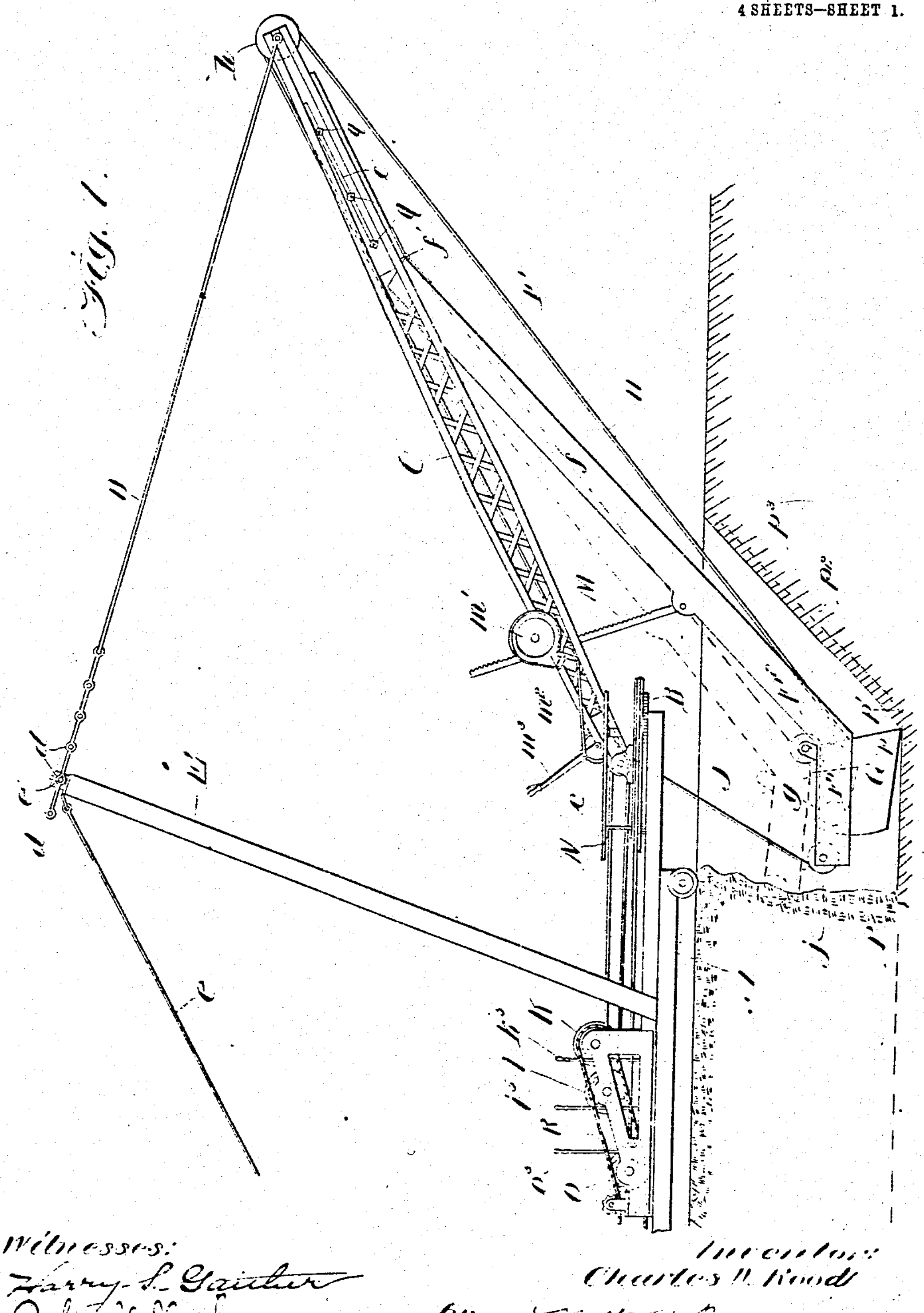

Fig. 1.

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Inventor:

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by Gaither & Chamberlain

Att'ys

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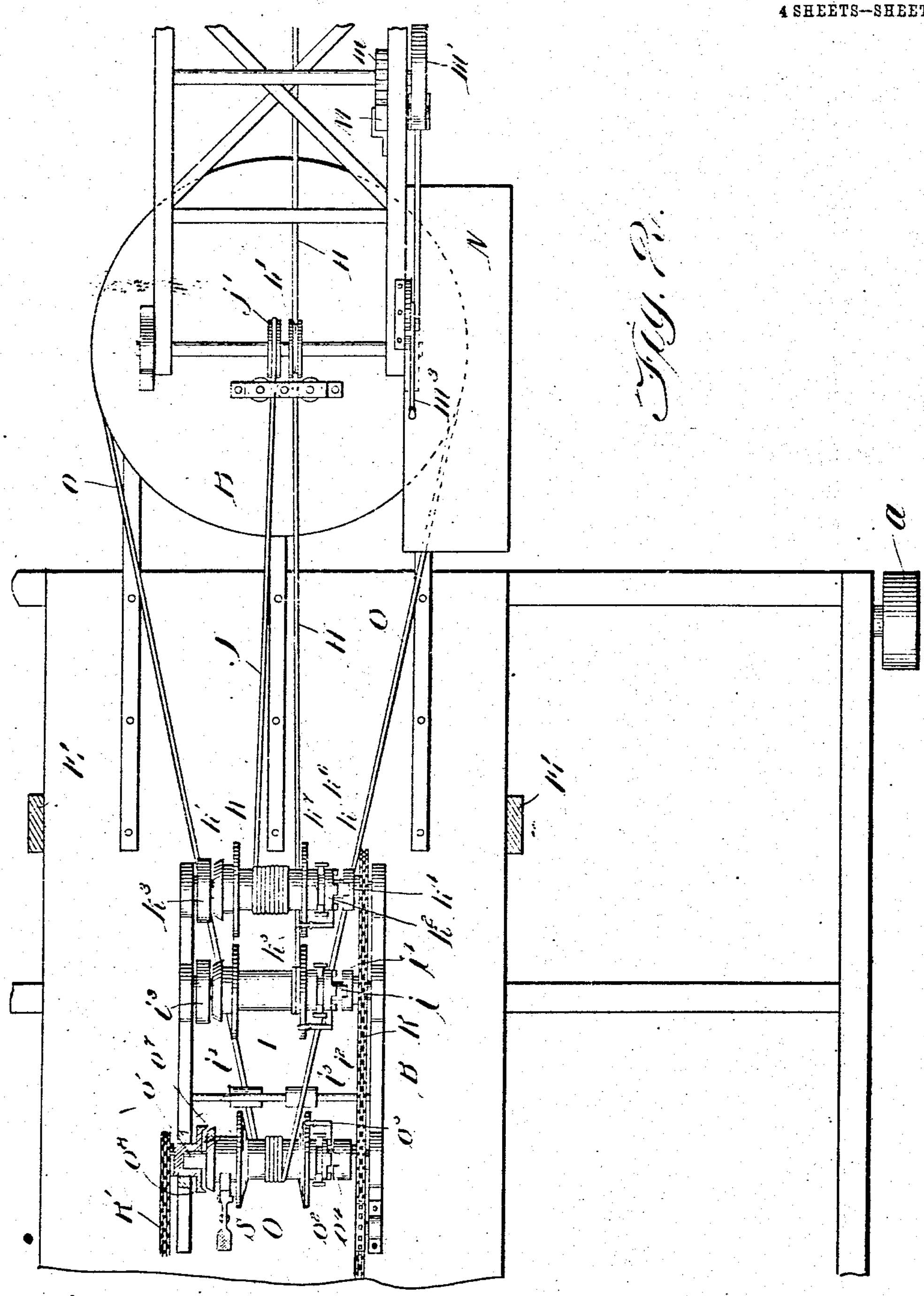

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 3.

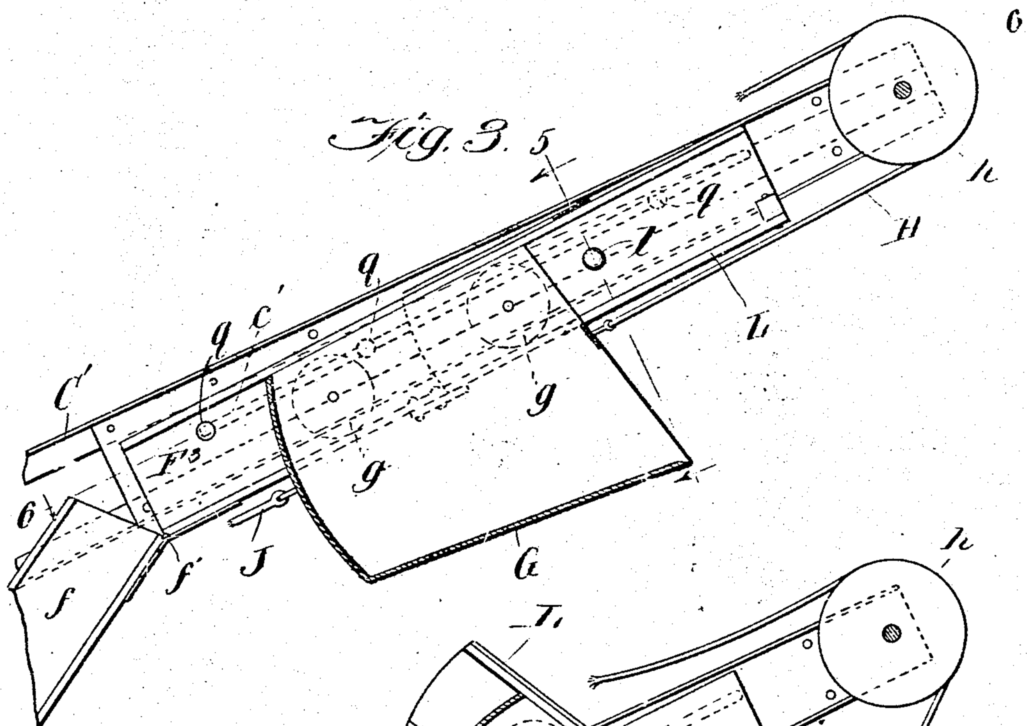


Fig. 4.

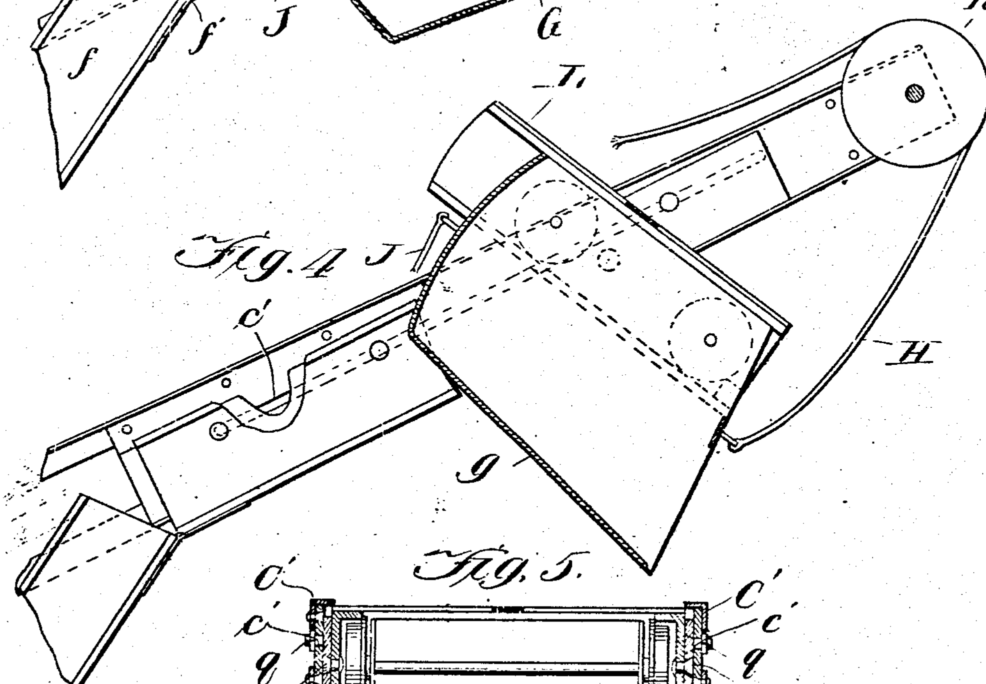
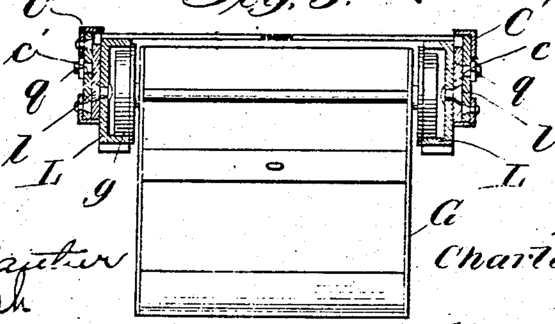


Fig. 5.



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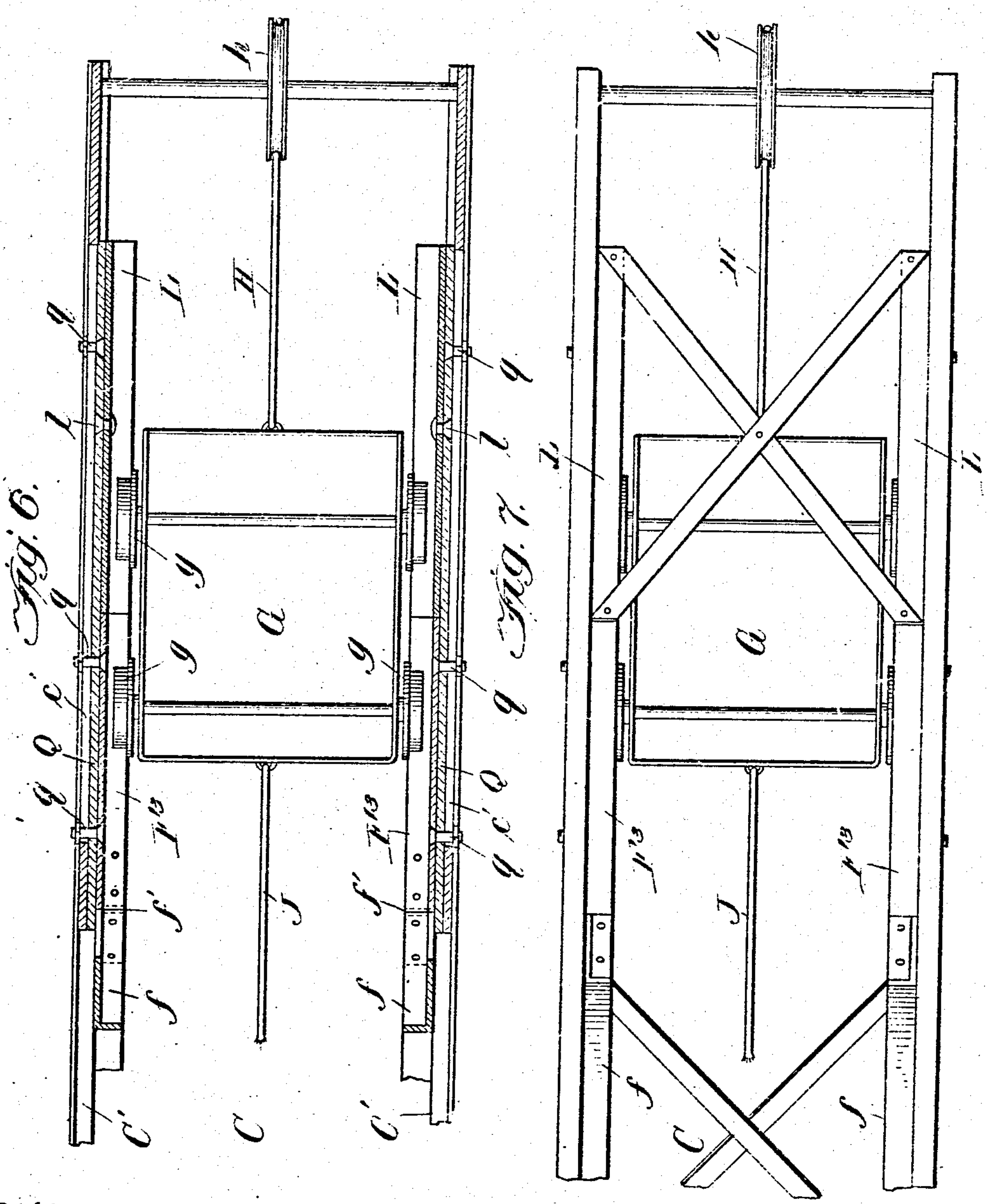

Fig. 6. Fig. 7.

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UNITED STATES PATENT OFFICE.

CHARLES W. ROOD, OF BRITT, IOWA, ASSIGNOR TO DANIEL C. BRINLEY, OF BRITT, IOWA.

DITCHING-MACHINE.

No. 926,136. Specification of Letters Patent. Patented June 29, 1909.

Application filed June 29, 1908 Serial No. 440,896.

To all whom it may concern:

Be it known that I, CHARLES W. ROOD, a citizen of the United States, residing at Britt, State of Iowa, have invented a certain new and useful Improvement in Ditching-Machines, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to excavating apparatus and more particularly to an apparatus for forming ditches.

In order to afford permanency to ditches having unsupported walls it is necessary that the walls be made to slope at an angle equal to the angle of repose of the material in which the ditch is formed.

The primary object of the present invention is to provide a simple and efficient machine for digging a ditch with smooth uniformly sloping walls.

A further object of the present invention is to provide a machine of the character specified whereby the slope of the walls of the ditch may be easily and conveniently varied to suit the character of the materials which are being excavated.

A further object of the present invention is to provide a machine of the character specified wherein the width of the ditch to be formed may be easily and conveniently varied within any desired limits.

The present invention has for a further object to provide a machine which shall be simple in construction and efficient in operation.

The various features of novelty whereby my invention is characterized will be hereinafter pointed out with particularity in the claims; but fc a full understanding of my invention and of its various objects and advantages reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a side elevation of a portion of a machine embodying a preferred form of my invention; Fig. 2 is a plan view of the part shown in the left hand portion of Fig. 1, the scale of Fig. 2 being, however, larger than that of Fig. 1; Fig. 3 is a view on an enlarged scale of the inner side of the outer end of the swinging crane, the excavating bucket being shown in its elevated position just previous to dumping; Fig. 4 is a view similar to Fig. 3 showing the excavating bucket in its dumping position; Fig. 5 is a section taken on line 5—5 of Fig. 3; Fig. 6 is a section taken on line 6—6 of Fig. 3; and Fig. 7 is a plan view of the same part shown in Fig. 6.

In the drawings I have illustrated a machine which is adapted to straddle the ditch, it being provided with rollers resting upon the ground on opposite sides of the ditch. The type of supporting truck for the excavating apparatus, is however, immaterial and very little of it has been shown since my invention may be applied with equal advantage to trucks which are adapted to run on the top of the ground, or upon the bottom of the ditch or upon supporting structures which are intended to float upon water in the portion of the ditch already excavated.

Referring to the drawings, A indicates the supporting structure of the digger and *a* indicates rollers upon which the supporting structure rests. At the extreme outer end of the supporting structure is a turn-table B which carries a crane C, the crane being pivoted to the turn-table as at *c* so as to be free to swing in a vertical plane. The crane is supported at any desired angle by means of a guy rope D which connects the outer end of the crane with the top of an upright E. This upright may be suitably braced in any suitable manner as, for example, by means of a guy-rope *e* passing to the rear end of the apparatus.

F is a swinging track hinged at its upper end to the crane and extending at its lower end to a point beneath the supporting platform. G is a dipper or bucket which is adapted to travel from the bottom to the top of the track F, taking a cut from the bottom to the top of the ditch during such movement. The track may be made of two parallel channel iron members *f* having their flanges turned toward each other and the bucket or dipper may be provided with wheels or rollers *g* which run upon the flanges of the track members. The bucket or dipper is hoisted by means of a hoisting rope H attached to the front thereof, passing over a pulley *h* at the outer end of the crane, thence passing over a pulley *h'* upon the turn-table and to a drum I upon the supporting platform. A second rope or cable, connected to the rear end of the excavator, passes over a pulley j at the lower end of the track member, thence over a pulley j' on the turn-table, and has its free end connected to a drum K adjacent to the drum I. It will be seen that by unclutching the drum K and driving the drum I the excavator will be drawn upwardly; while upon driving the drum K and leaving the drum I idle the excavator will be drawn to the extreme lower limit of its movement. Adjacent to the upper end of the swinging track is a short section of track L pivotally connected at an intermediate point to the crane as at l. The parts are so proportioned that when the bucket or dipper is drawn upwardly it runs upon this auxiliary track section and, when its center of gravity passes outwardly beyond the pivotal point l, the auxiliary track swings upon its pivot as indicated in Fig. 4 and permits the contents of the bucket or dipper to be discharged.

The swinging track is normally locked in position by means of an elongated rack bar M which is pivoted at one end to the swinging track and engages with a pinion m revolubly supported upon the crane. Connected with this pinion is a brake disk m'. A brake-band m^2 surrounding this disk is controlled by a brake lever m^3 preferably located upon the crane directly above the turn-table so as to be within reach of an operator upon a platform N arranged at one side of the crane as shown. It will be seen that when the brake is applied the swinging track will be locked in any position which it may then be occupying. The turn-table is controlled in any suitable manner as, for example, by means of an endless cable o passing around the turn-table and over a drum O.

The operation of the digger is as follows, assuming the parts to be occupied in the position shown in Fig. 1, wherein the excavator is at the bottom of a ditch P: the lowering drum is released and the hoisting drum is set into operation. The excavator is first drawn parallel with the bottom of the ditch, cutting into the material from p to p'. The front rollers of the excavator now leave the horizontal portion F' of the track and enter upon the inclined portion F^2 and, as the winding of the hoisting cable proceeds, the cutting edge of the excavator follows the dotted line p^2 through the material to be excavated and cuts away a layer of material p^3. The loaded bucket is then drawn upwardly to the end of the track and the crane is swung laterally. Then the hoisting of the excavator is continued until the excavator runs upon the auxiliary track section and dumps as has been previously described. The hoisting drum is then locked in position and the lowering drum set in operation, the brake being at the same time released. Since the excavator cannot return to its lower position while the hoisting rope is taut, the lower end of the swinging track will be lifted. The winding of the lowering cable and the resulting lifting of the lower end of the swinging track are continued only long enough to permit the excavator to clear the walls of the ditch in lowering and, as soon as sufficient clearness has been provided, the brake is applied and the hoisting cable released. The winding of the lowering cable is now continued and the excavator is drawn to the bottom of the ditch. The crane is then returned to a point just at one side of its previous position so as to properly place the excavator for making a cut just at one side of the previous cut. The brake and the lowering rope are then released so as to permit the excavator to drop upon the bottom of the ditch, whereupon the brake is again applied so as to lock the swinging track in place. The operations just described are again repeated and in fact are repeated until the excavator has traveled through an entire semi-circle from one side of the ditch to the other so that a layer of material has been cut from the entire wall bounding the front end of the ditch. After this has been accomplished the entire apparatus is moved forward a distance equal to the depth of the cut previously made and the cutting operations are resumed. When it is desired to vary the angle at which the walls of the ditch will be formed, the outer end of the crane is raised or lowered as the case may be and the guy rope D is adjusted so as to hold the crane in its new position. The adjustment of the guy-rope may be accomplished in any suitable manner as, for example, by providing it with a number of separated eyes d and securing the end of the guy-rope to the upright by means of a pin e' which passes through one of the eyes and the top of the upright. To alter the position of the crane the pin e' is withdrawn and after the crane has been properly positioned, the pin is inserted through the most convenient eye in the cable. This method of adjustment is noted simply as indicative of the various common methods which will answer for this purpose. In order that ditches of different widths may be excavated I provide means for shifting the swinging track bodily so as to vary the point of its connection with the crane. To this end I provide a pair of plates Q, Q which are fastened to the inner sides of the two members C' of the crane by means of bolts q which pass through elongated slots c', c', in the crane members. The auxiliary track sections L are pivoted to the plates q and the hinge connection between the swinging track and the crane is also formed through these plates. Each of the plates may conveniently be provided with a short fixed section of track F^3 placed directly in rear of and forming continuations of the track members L when these latter members occupy their normal positions. Each of the channel members f is preferably hinged to the rear end of one of the track sections F^3 by means of any suitable form of hinge f'. When it is desired to alter the width of ditch which the machine will excavate the bolts q are loosened and the plates Q are slid longitudinally within the limits permitted by the pin and slot connections afforded by the elongated slots and the bolts passing through them; and, when the proper adjustment is obtained, the bolts are again tightened so as to hold the track members securely in position. It will be seen that by placing the hinged connection for the swinging track, together with the dumping track, upon the adjustable plates there is no danger of changing the relationship between the swinging track and the dumping track when the adjustments are made; and furthermore the adjusting operation may be accomplished very quickly and conveniently.

Any suitable driving and controlling means for the drums may be employed, the particular operating mechanism for the cables forming *per se* no part of the present invention. In the drawings the drums I, K and O are indicated as loosely mounted upon shafts i, k and o'. These shafts are indicated as being continuously driven through a sprocket chain R which is in turn driven by any suitable motor (not shown). Secured to one end of the drum K is a brake member k' and at the opposite end a clutch member k^2. k^3 is a stationary brake member for coöperating with the brake member k', and k^4 is a clutch member fixed to the shaft k and arranged to coöperate with the clutch member k^2. The drum is moved axially so as to bring into operation either the brake or the clutch by means of a lever k^5 which is provided with a fork k^6 entering a groove k^7 in the drum. The drum rotates freely within the fork but when the lever is oscillated in the plane parallel with the axis of the drum the drum is caused to move axially in one direction or the other depending upon the direction of oscillation of the lever. The drum I is shown as having brake members i', i^3, corresponding to the brake members associated with the drum K; clutch members i^2, i^4, corresponding with the clutch members k^2, and k^4; and with actuating lever i^5 similar to the actuating lever of the other drum.

In Fig. 2 of the drawings both the hoisting and lowering drum are shown in neutral positions so that in order to lock either drum against motion it must be moved laterally to bring the brake members into engagement, while to cause either drum to be operated it must be moved in the opposite direction so as to throw in the clutch. It is necessary to drive the drum O positively in both directions and to this end in addition to clutch members o^2 and o^4 corresponding to the clutch k^2 and k^4 and the actuating lever o^5 corresponding to the actuating lever k^5 I have provided a second clutch device comprising a member o^7 carried upon the opposite end of the drum and a driving clutch member o^8 which rotates in the direction opposite to that of the shaft o'. When the drum is shifted into the position shown in Fig. 2 it is rotated in one direction through the clutch members o^7 and o^8 and when shifted to the other limit of its axial movement it is rotated in the opposite direction through the clutch members o^2 and o^4. The clutch member o^8 may conveniently form a bearing for one end of the shaft o' as shown and have attached thereto a sprocket wheel o^9 which is continuously driven in the proper direction by means of a sprocket chain R'. In order to hold the drum stationary an ordinary foot brake as indicated at S may be employed.

It will now be seen that I have provided a digging machine whereby it is possible to excavate ditches having any desired width and any desired slope of the side walls, to make the side walls perfectly even and smooth and whereby the excavated material may be deposited at any desired point along side of the ditch or into some sort of vehicle for carrying the excavated material away. At the same time the machine is comparatively light and simple in construction and may be operated with a minimum expenditure of labor and power.

While I have illustrated and described in detail only a preferred embodiment of my invention and certain well known mechanisms indicative of general types of mechanisms necessary for carrying out my invention I do not desire to be limited thereto since in its broad aspects my invention may take many other forms as will be evident from the terms employed in the definitions of my invention constituting the appended claims.

Having now fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an excavating apparatus, an excavating dipper, a downwardly inclined track for guiding the dipper, said track having its lower end projecting laterally from the remainder of the track, an oscillating support for said track, means for moving said dipper along said track, and means for oscillating said support.

2. In an excavating apparatus, a swinging crane, a track depending from said crane, said track having its lower end projecting laterally from the remainder of the track, an excavating dipper mounted on said track so as to be guided thereby, means for moving said dipper along said track, and means for swinging said crane.

3. In an excavating apparatus, a crane

supported to swing about a vertical axis, an inclined track connected to the crane and extending downwardly and inwardly toward said axis, an excavating dipper mounted on said track so as to be guided thereby, and means for moving said dipper along said track.

4. In an excavating apparatus, a crane supported to swing about a vertical axis, an inclined track connected to the crane and extending downwardly and inwardly toward said axis, an excavating dipper mounted on said track so as to be guided thereby, means for moving said dipper along said track, and means adjacent to the upper end of said track for dumping said dipper.

5. In an excavating apparatus, a track, means for supporting said track in any one of a plurality of different inclined positions, said track having its lower end projecting laterally from the remainder of the track, an excavating dipper mounted upon said track, and means for moving said dipper.

6. In an excavating apparatus, a track, means for supporting said track in any one of a plurality of different inclined positions, said track having its lower end projecting laterally from the remainder of the track, an excavating dipper mounted upon said track, means for moving said dipper, and means for swinging said track about a vertical axis passing adjacent to the lower end thereof.

7. In an excavating apparatus, a track, means for supporting said track in any one of a plurality of different inclined positions, said track having its lower end projecting laterally from the remainder of the track, an excavating dipper mounted upon said track, means for moving said dipper, and means adjacent to the upper end of said track for dumping said dipper.

8. In an excavating apparatus, a track, means for supporting said track in any one of a plurality of different inclined positions, said track having its lower end projecting laterally from the remainder of the track, an excavating dipper mounted upon said track, means for moving said dipper, means for swinging said track about a vertical axis passing adjacent to the lower end thereof, and means adjacent to the upper end of said track for dumping said dipper.

9. In an excavating apparatus, a platform, a crane mounted on said platform so as to be revoluble about vertical and horizontal axes, means for holding said crane in any angular position with respect to said horizontal axis, a track depending from the outer end of said crane, an excavating dipper mounted on said track, means for moving said dipper along said track, and means for swinging said crane about said vertical axis.

10. In an excavating apparatus, a platform, a crane mounted on said platform so as to be revoluble about vertical and horizontal axes, means for holding said crane in any angular position with respect to said horizontal axis, a track depending from the outer end of said crane, an excavating dipper mounted on said track, means for moving said dipper along said track, means for swinging said crane about said vertical axis, and means adjacent to the upper end of said track for dumping said dipper.

11. In an excavating apparatus, a platform, a crane mounted upon said platform so as to be revoluble about a vertical axis, an inclined track hinged to and depending from the outer end of said crane, an excavating dipper mounted on said track, means for moving said dipper along the track, means for raising and lowering the lower end of said track, and means for swinging said crane about said vertical axis.

12. In an excavating apparatus, a platform, a crane mounted upon said platform so as to be revoluble about a vertical axis, an inclined track hinged to and depending from the outer end of said crane, an excavating dipper mounted on said track, means for moving said dipper along the track, means for raising and lowering the lower end of said track, means for swinging said crane about said vertical axis, and means adjacent to the upper end of said track for dumping said dipper.

13. In an excavating apparatus, a crane, an inclined track depending from said crane, means for varying the point of connection between the upper end of the track and the crane, an excavating dipper mounted on said track, and means for moving said dipper along said track.

14. In an excavating apparatus, a crane, an inclined track depending from said crane, a swinging track section carried by the crane adjacent to the upper end of said inclined track and arranged to be overbalanced when the dipper occupies a predetermined position thereon so as to dump the dipper, and means for moving said dipper along said inclined track and into said predetermined position on the said swing track section.

15. In an excavating apparatus, a crane, an inclined track depending from said crane, a swinging track section carried by the crane adjacent to the upper end of said inclined track and arranged to be overbalanced when the dipper occupies a predetermined position thereon so as to dump the dipper, means for moving said dipper along said inclined track and into said predetermined position on the said swing track section, and means for simultaneously adjusting the positions of the inclined track and said swinging track section relatively to said crane.

16. In an excavating apparatus, a crane arranged to swing about a vertical axis, a track hinged to said crane and projecting downwardly therefrom, said track having a

laterally-extending portion at the lower end, means for varying the inclination of said crane, means for varying the point of connection of said track upon the crane, an excavating dipper mounted on said track, a hoisting rope connected with said dipper and passing around the outer end of the crane, a second rope fastened to the said dipper and extending upwardly adjacent to the lower end of said crane, and means for winding and unwinding said ropes.

17. In an excavating apparatus, a crane arranged to swing about a vertical axis, a track hinged to said crane and projecting downwardly therefrom, said track having a laterally-extending portion at the lower end, means for varying the inclination of said crane, means for varying the point of connection of said track upon the crane, an excavating dipper mounted on said track, a hoisting rope connected with said dipper and passing around the outer end of the crane, a second rope fastened to the said dipper and extending upwardly adjacent to the lower end of said crane, means for winding said hoisting rope or holding it taut, and means for winding said second rope.

18. In an excavating apparatus, a crane arranged to swing about a vertical axis, a track hinged to said crane and projecting downwardly therefrom, said track having a laterally-extending portion at the lower end, means for varying the inclination of said crane, means for varying the point of connection of said track upon the crane, an excavating dipper mounted on said track, a hoisting rope connected with said dipper and passing around the outer end of the crane, a second rope fastened to the said dipper and extending upwardly adjacent to the lower end of said crane, means for winding said hoisting rope or holding it taut, means for winding said second rope, and means for locking said track to the crane at any desired inclination or for releasing it so as to permit it to drop by gravity or to be raised upon winding up said second rope.

In testimony whereof, I sign this specification in the presence of two witnesses.

CHARLES W. ROOD.

Witnesses:
C. W. ERWIN,
H. HENDRICKSON.