(No Model.)

4 Sheets—Sheet 1.

G. M. PILCHER.

DITCHING MACHINE.

No. 513,824.

Patented Jan. 30, 1894.

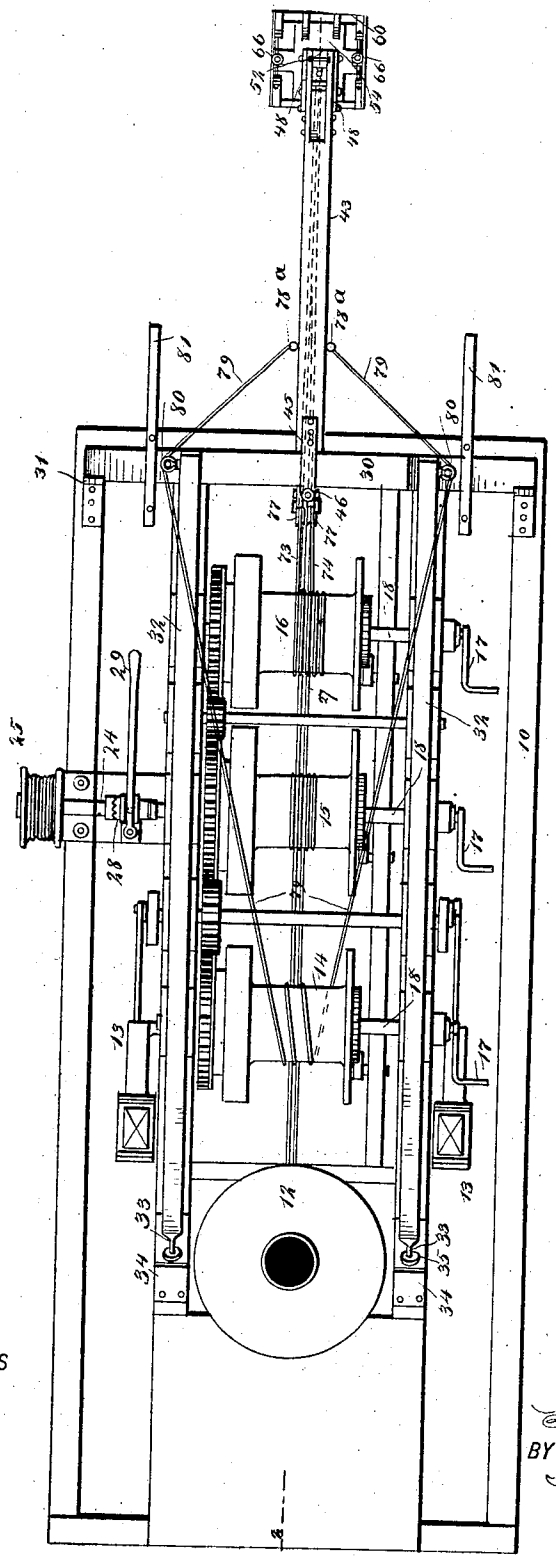


Fig. 1.

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G. M. Pilcher

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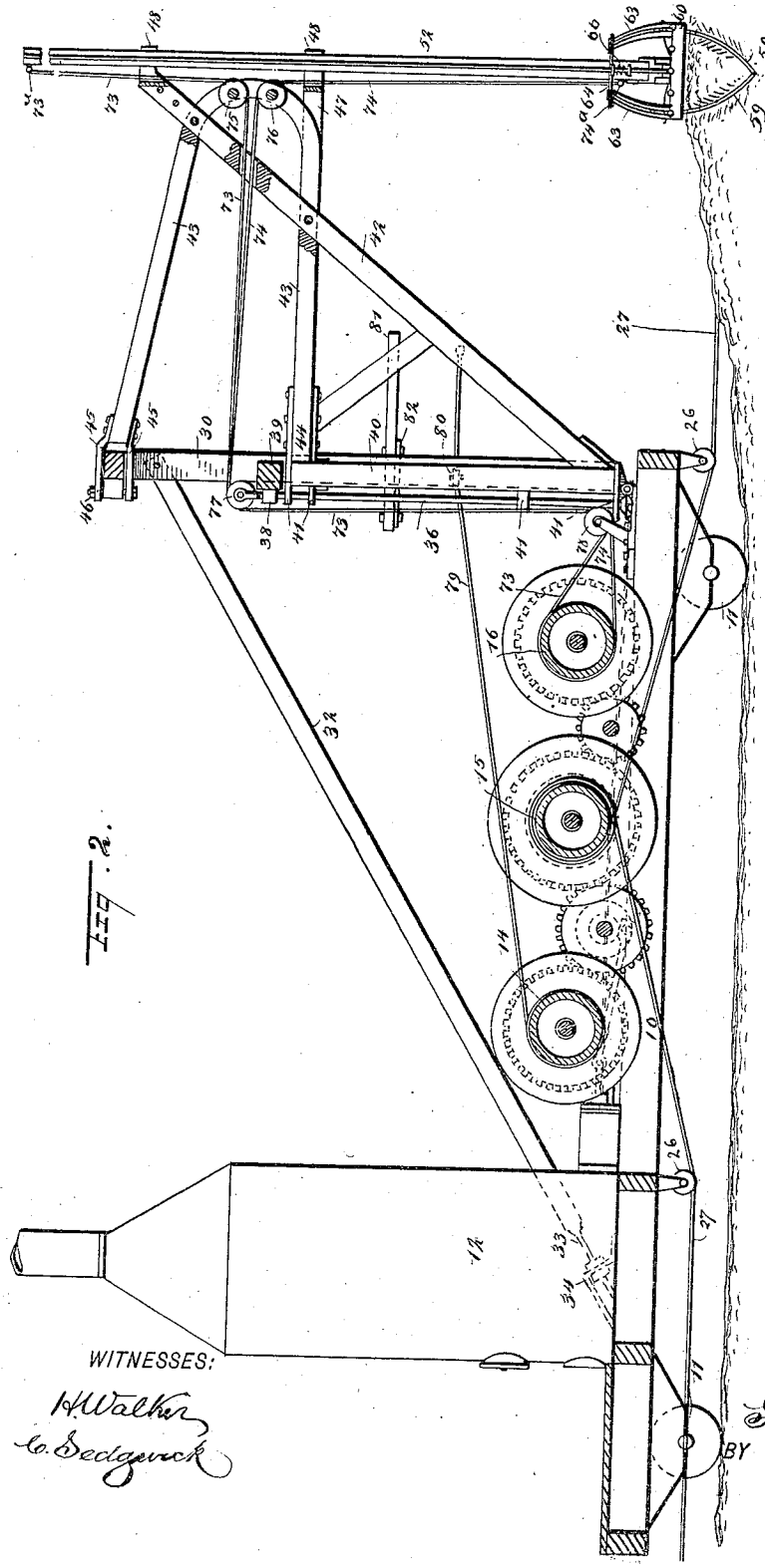


Fig. 2.

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Fig. 3.

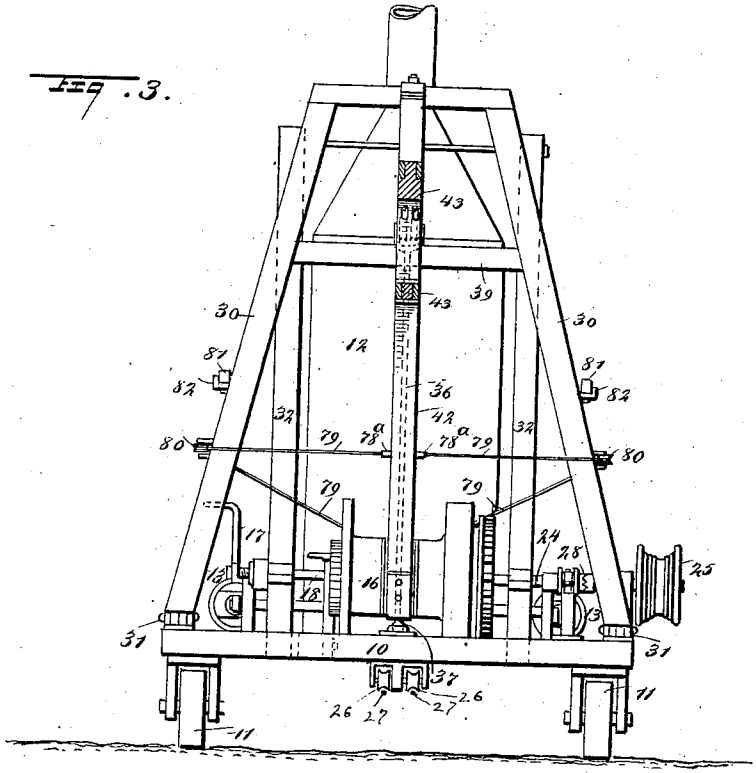


Fig. 4.

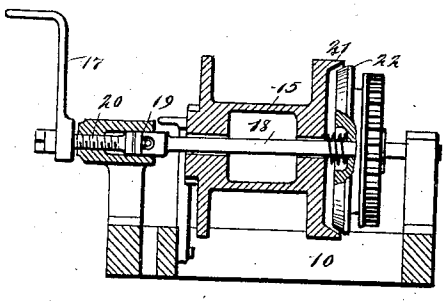
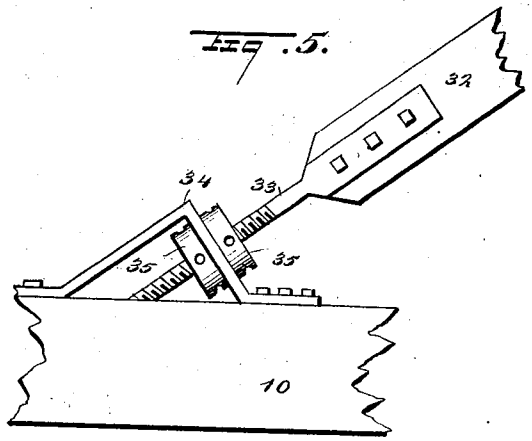


Fig. 5.

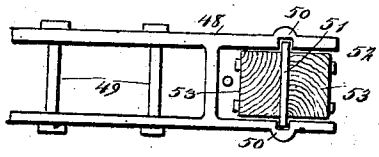


WITNESSES:

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Fig. 6.



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Fig. 8.

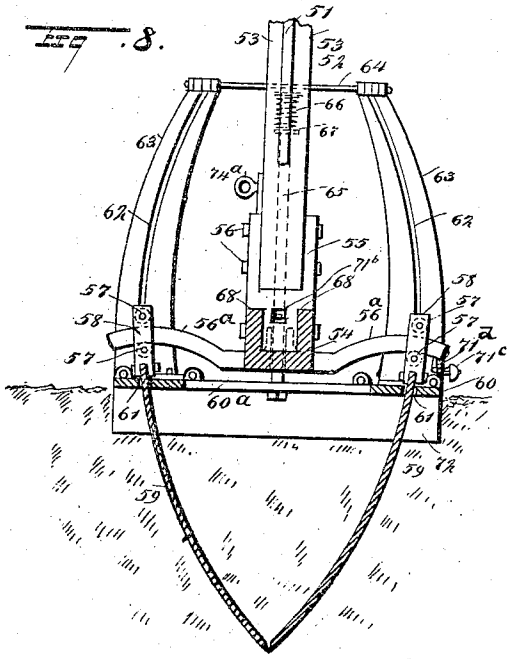


Fig. 7.

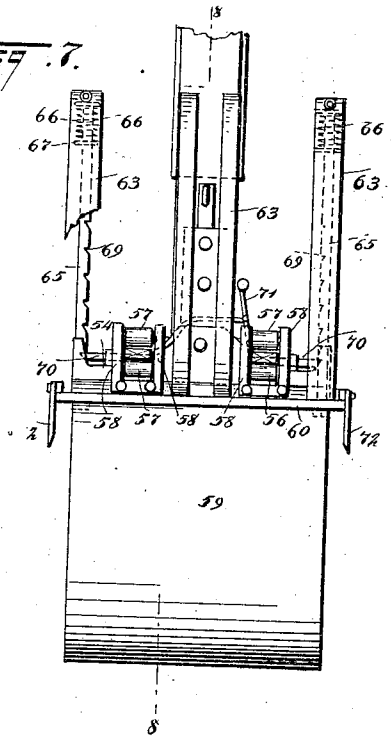


Fig. 9.

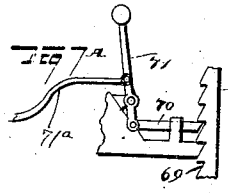


Fig. 10.

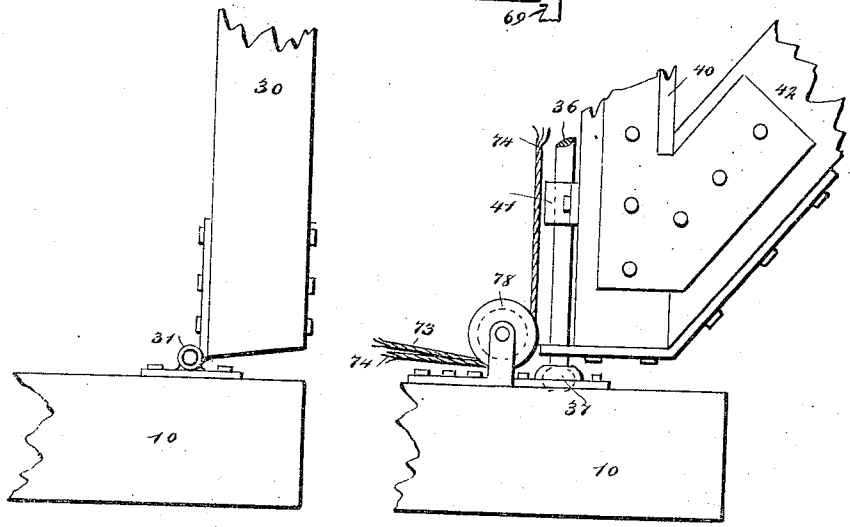
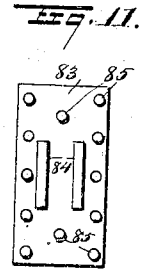


Fig. 11.



WITNESSES:

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Fig. 12.

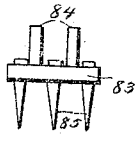


Fig. 13.



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UNITED STATES PATENT OFFICE.

GEORGE M. PILCHER, OF LOGANSPORT, INDIANA.

DITCHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 513,824, dated January 30, 1894.

Application filed March 7, 1893. Serial No. 464,947. (No model.)

To all whom it may concern:

Be it known that I, GEORGE M. PILCHER, of Logansport, in the county of Cass and State of Indiana, have invented a new and Improved Ditching-Machine, of which the following is a full, clear, and exact description.

My invention relates to improvements in ditching machines; and the object of my invention is to produce a practical, durable, and efficient machine which is adapted to be moved along over a ditch, which is adapted to rapidly excavate a smooth wall ditch, and which is provided with an attachment adapted to break up frozen ground and rock.

To this end my invention consists in certain features of construction and combinations of parts, as will be hereinafter described and claimed.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar figures of reference indicate corresponding parts in all the views.

Figure 1 is a plan view of the machine. Fig. 2 is a vertical longitudinal section on the line 2—2 in Fig. 1. Fig. 3 is a broken sectional end view of the machine. Fig. 4 is a detail sectional view of one of the friction drum clutches. Fig. 5 is an enlarged view of the screw and nut mechanism for adjusting the guys which support the upright frame. Fig. 6 is a sectional plan of the driving rod and one of its guides. Fig. 7 is a broken side elevation on an enlarged scale, of the shovels, the guide frame for the same, and the guide mechanism for operating the shovels. Fig. 7ª is a detail view of the ratchet mechanism which locks the driving frame to the guide frame. Fig. 8 is a vertical section on the line 8—8 in Fig. 7. Fig. 9 is an enlarged view of the hinge connection between the carriage and the upright frame. Fig. 10 is a broken detail elevation of the boom and carriage, showing the manner in which the boom is supported so as to swing horizontally. Fig. 11 is a detail plan view of the pick which is used for breaking up frozen or hard ground. Fig. 12 is a side elevation of the pick; and Fig. 13 is a side elevation of the hammer which may be attached to the driving rod for breaking rocks.

The machine is provided with a portable carriage 10 which has preferably a platform and which is provided with wheels 11 adapted to straddle a ditch and run on planks or other supports. The carriage is provided with a boiler 12 and engine 13 which may be of any usual type, and any suitable hoisting mechanism may be used for operating the shovels; that is, for raising and lowering them and also for raising and lowering the pick and hammer, as hereinafter described, but a convenient form of mechanism is shown in which three friction drums 14, 15 and 16 are used, which are geared together, as shown in Figs. 1 and 2, and each of which may be thrown out of gear by a suitable crank lever 17. Any suitable drums capable of being thrown out of gear may be employed, however. The mechanism operated by the cranks 17 I do not claim as my invention, but it is shown in Fig. 4. Each drum is mounted loosely on a shaft 18 which is journaled in suitable supports on the carriage 10 and the shaft 18 connects at one end by means of a ball joint 19 with a screw 20 to which the crank lever 17 is applied, and which is threaded in a support, as shown in Fig. 4. One end of the drum has a concave flange 21 which is adapted to contact with a cone pulley 22 carried by the shaft 18, and the drum is normally pressed out of contact with the pulley 22 by a spiral spring, as shown in the drawings. By turning the shaft, the screw 20 is operated and the cone pulley drawn against the flange of the drum or pushed away from the same, according as to whether the drum is to be driven or released. One of the shafts is prolonged, as shown at 24 in Fig. 1, and on this long shaft, which projects beyond one side of the carriage, is a grooved pulley 25 around which a cable may be placed for hoisting or other purposes. The pulley is thrown in and out of gear by means of a clutch 28 on the shaft 24, which clutch is controlled by a lever 29 and is not shown in detail. The carriage is propelled either forward or backward by means of a cable 27 which is wound around the drum 15 and extends downward and beneath guide pulleys 26 on the carriage bottom, one strand passing out from the carriage at one end and the other strand passing out at the opposite end. The two ends of the cable

may be made fast in the usual way and by winding the cable on the drum, the carriage is moved.

At the front end of the carriage is an upright frame 30, the lower end of which is hinged to the carriage, as shown at 31, and this frame is adapted to support the boom and the driving mechanism carried thereby, as hereinafter described. The frame is braced by rigid guys 32 which are pivoted to the frame near the top and which extend rearward to a point near the rear end of the carriage, each guy having at its lower end a bolt 33 which enters a hanger 34 on the carriage to which it is adjustably secured by the jam nuts 35. It will be seen that by adjusting these nuts the pitch of the frame 30 will be regulated, and in this way the frame may be adjusted so as to carry the driving rod in a vertical position, as hereinafter described, even though the carriage is running on a comparatively steep grade.

In the front of the machine, near the center of the frame 30, is an upright shaft 36, the lower end of which is stepped on the carriage by a ball and socket joint 37. The upper end of the shaft is journaled in a hanger 38 secured to a cross bar 39 on the frame 30. Extending parallel with the shaft is a post 40 which is hung so as to turn horizontally around the shaft, the post being connected therewith by means of hangers or brackets 41 which are secured to the post and journaled on the shaft. This post forms part of a horizontally swinging boom, which extends forward from the upright frame 30 and which has a main brace or beam 42 which extends diagonally upward and forward from the foot of the post. A curved brace 43 which is secured to the beam 42, is secured at its lower end, as shown at 44 to the upper end of the post 40, is secured at its upper end between straps 45 which clasp the top cross bar of the frame 30 and are pivoted to the back side thereof, as shown at 46, and a forwardly extending arm 47 which aligns with the lower member of the brace 43. The upper end of the beam 42 and the outer end of the arm 47 are provided with guide frames 48 through which the driving rod moves vertically, one of these frames being shown clearly in Fig. 6, and the frame is bolted to the beam or arm by bolts 49, the frame having opposite members to clasp the beam or arm and the frame has, in its sides and near its outer end, grooves 50 in which runs the center plate 51 of the driving rod 52. This rod comprises the longitudinal center plate 51 and timbers 53 which are bolted to opposite sides of the plate, as shown in Fig. 6. It is adapted to move upward through the guides 48, carrying with it the digging mechanism, and then to be dropped through the guides so as to force the digging mechanism into the ground. To the lower end of the driving rod is secured the driving frame 54 which extends at right angles to the driving rod, and has, on its upper side, a socket 55 adapted to be secured by bolts 56 to the lower end of the driving rod 52, and this construction enables the driving frame to be easily detached when the pick or rock hammer is to be fastened to the driving rod. The driving frame has outwardly extending curved arms 56^a on its opposite sides, which enter between rollers 57 which are journaled in hangers 58, the latter being secured to the curved shovels 59 which extend downward and converge, so that when in their lowest position their lower edges meet, as illustrated in Fig. 8, thus forming a scoop which is capable of raising the dirt held between the shovels.

The shovels 59 are adapted to slide vertically through slots 61 in a guide frame 60 which extends parallel with the driving frame 54 and which is open in the center, as shown at 60^a in Fig. 8. The shovels are also adapted to move in slots 62 which are produced in the upwardly extending and inwardly curved guides 63, these being arranged on opposite sides of the guide frame and have their upper ends connected by cross rods 64 which strengthen them. These grooves or slots 62 cause the shovels, when raised, to converge at their upper ends and be separated at their lower ends, thus opening them so that they may discharge the material which they have raised.

On opposite sides of the guide frame and on the sides at right angles to the guides 63 are upwardly extending ratchet bars 65, which have springs 66 at their upper ends, these abutting their lower ends with a sliding collar 67 on the ratchet bar. The collars 67 are adapted to contact with the flanges 68, see Fig. 8, on the upper side of the driving frame 54, so that when the two frames—that is, the driving and guide frames—are dropped the flanges 68 will strike the collars 67 and the springs 66 will absorb a portion of the jar so as to prevent any of the connected parts from being broken. The ratchet bars 65 also serve the purpose of holding the shovels together when the latter are lowered, and this is the chief function of the bars. To this end the ratchet bars are provided on inner sides with notches 69, the inclinations of which are on the lower portions, and these notches are adapted to engage dogs or pawls 70 which slide laterally in suitable supports on the driving frame 54 and which are pivotally connected with a lever 71, as shown in Figs. 7 and 7^a, and the dogs are normally pressed into engagement with the ratchet bars by suitable springs. One dog connects directly with the lower end of the lever below its pivot, and the other dog connects with the lever above its pivot, by a rod 71^a which passes through a hole 71^b in the driving frame, see Fig. 8, and thus the dogs may both be operated at once. It will be seen then that when the shovels are forced downward into the ground so as to scoop up a quantity of earth, the dogs 70 will slide down, the ratchet bars engaging them

notch by notch and when the driving frame, guide frame, and shovels are raised, the ratchet bars and pawls will prevent the frames from separating and the shovels from opening. When the shovels are to be opened, the lever 71 is thrown outward so as to retract the dogs and permit the guide frame to drop and the shovels to open. The shovels are driven into the ground, as already described, by the dropping of the driving rod and the two frames 54 and 60. This causes the guide frame 60 to stop when it strikes the ground, while the continued movement of the driving rod forces the shovels downward and together. To indicate when the shovels are full, a gong 71^c is arranged upon the guide frame 60 and it has the usual pivoted hammer 71^d, the shank of which extends into the path of the driving frame 54 so that when the latter has nearly reached the downward limit of its stroke it strikes the hammer and rings the gong.

On opposite sides of the guide frame and at right angles to the plane of the shovels are depending blades 72 which are buried in the earth every time the shovels descend, and which cause the ditch dug by the shovels to have smooth and vertical sides. The guide rod is raised and lowered by means of cables 73 and 74 which are secured to eye bolts 73^a and 74^a at the upper and lower ends of the guide rod, but it will be understood that the guide rod will drop of its own weight when its connected gearing is released, as hereinafter described. The cables 73 and 74 extend substantially parallel with the rod and pass over guide pulleys 75 and 76 and back through the brace 42 over guide pulleys 77 at the top of the shaft 36, thence downward nearly parallel with the shaft 36 and beneath guide pulleys 78 which are journaled in suitable supports near the foot of the shaft, and thence around the friction drum 16, the cables being wound in opposite directions so that as one is shortened the other will be lengthened. The guide rod and the mechanism carried by it may be shifted from side to side, so as to bring the shovels into the right vertical plane, by swinging the boom which carries the guide rod and this is effected by the tiller cables 79 which are secured to opposite sides of the brace 42, as shown at 78^a, and which extend over guide pulleys 80 turning in suitable brackets on the frame 30 and from thence back around the drum 14; the ropes or cables being wound in opposite directions so as to permit the boom to be readily turned by the turning of the drum. The side movement of the boom is limited by arms 81 which are bolted in supports 82 on the sides of the frame 30 and which extend into the path of the brace 43, and these arms may be adjusted so as to give any necessary swing to the boom.

In operating the machine, the frame 30 is adjusted so as to be in a substantially vertical position, the boom is swung so as to bring the guide rod above the ditch, the guide rod, the driving frame 54 and the guide frame 60 are raised by means of the cable 74 and drum 16, and the guide rod is then dropped by throwing the drum 16 out of gear, and if necessary, additional power may be applied by means of the cable 73 so as to drive the rod violently downward. When the frame 60 strikes the ground, the blades 72 are buried in the earth and the guide frame stops, but the driving rod and the guide frame 54 continue downward thus forcing the shovels downward and together, a quantity of earth being collected between them. The shovels are locked by the dogs 70, as already described, and the driving rod is raised by means of the cable 74 and drum 16, the boom is swung to one side by means of the tiller cables 79 and the drum 14, and the load is deposited by swinging out the levers 71 and releasing the dogs 70, this operation causing the guide frame to drop and the shovels to open. If the ground is extremely hard, a pick 83 may be used before the shovels are put in use, this pick having teeth 85 on its under side to enter the ground and lugs 84 on its upper side which are adapted to embrace the lower end of the driving rod and to be bolted thereto. When the pick is used the guide frame and driving frame are removed by removing the bolts 56 and slipping the socket 55 from the driving rod, and the lugs 84 may then be bolted to the rod. The pick is operated by simply forcing the driving rod up and down in the manner described, and the teeth 85 enter the earth and loosen it up so that the shovels may be thereafter employed; or if desired where loose material, such as broken rock, hard gravel, &c., is raised, ordinary lifting buckets may be attached to the driving rod in any convenient way, the buckets filled by laborers, and the machine used merely as a hoisting machine. If rock is to be broken, the digging mechanism may be detached, as described, and a steel-faced hammer 86 attached to the driving rod; this hammer being very heavy and having parallel lugs 87 which embrace the rod and can be bolted thereto. When the hammer is used, the driving rod is raised in the manner specified, and the driving rod is dropped by throwing the drum 16 out of gear which causes the hammer to descend with great force so as to break in fragments the rock beneath.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A ditching machine, comprising a horizontally swinging boom arranged at one end of the carriage and provided with guides at its free end, a vertically movable driving rod held to slide in the guides of the boom and provided with guides at its lower end, a cable mechanism for operating the driving rod, and

movable converging shovels working in the guides at the lower end of the driving rod, whereby the shovels will be forced downward and together by the descent of the said rod, substantially as described.

2. A ditching machine, comprising a carriage, an upright swinging frame mounted thereon, mechanism for adjusting and fastening the frame, a horizontally swinging boom secured to the frame, a vertically movable driving rod carried by the boom, cable mechanism for operating the rod, and a digging device carried at the lower end of the rod and operated by its movements, substantially as described.

3. A ditching machine, comprising a carriage, a swinging upright frame on the carriage, longitudinally adjustable guys extending from the carriage to the frame, a horizontally swinging boom carried by the frame, a vertically movable driving rod held at the free end of the boom, a cable mechanism for operating the driving rod, and digging mechanism arranged at the lower end of the rod and adapted to be operated by the movements of the latter, substantially as described.

4. In a ditching machine, the combination with a vertically movable driving frame, of converging shovels carried by the frame, a guide frame held loosely to the driving frame and in which the shovels work, and means for locking the driving and guide frames together, substantially as described.

5. In a ditching machine, the combination with a vertically movable driving frame, of converging shovels loosely connected with the said frame, a guide frame held loosely to the driving frame beneath the same and provided with guides in which the shovels work, and means for locking the driving and guide frames together, substantially as described.

6. In a ditching machine, the combination with a vertically movable driving frame, of converging shovels loosely connected with the said frame, a guide frame loosely connected with the driving frame beneath the same, and provided with guides in which the shovels work, cutters on opposite sides of the guide frame and at right angles to the shovels, and means for locking the driving and guide frames together substantially as described.

7. In a ditching machine, the combination with a suitable support and a vertically movable driving rod, of a driving frame secured to the lower end of the rod, a guide frame held loosely to the driving frame beneath the same and having upwardly extending guides, converging curved shovels extending through the slots in the guide frame, a loose connection between the upper portions of the shovels and the driving frame, and a locking device to lock the shovels together, substantially as described.

8. In a ditching machine, the combination, with the vertically movable driving rod, of the driving frame secured to its lower end and provided with upwardly extending arms, a guide frame held beneath the driving frame and provided with slots near its opposite sides, upwardly extending curved guides secured to the guide frame, curved shovels held to move in the slots of the guide frame and in the curved guides of the frame, rollers carried by the shovels and adapted to embrace the arms of the driving frame, and mechanism for locking the shovels together, substantially as described.

9. In a ditching machine, the combination, with the vertically movable driving rod and the driving frame secured to the lower end of the rod and having oppositely extending arms, of the slotted guide frame held beneath the driving frame and provided with upwardly extending slotted guides, curved shovels held to move in the slots of the guide frame and guides, rollers carried by the shovels and held to run on the arms of the driving frame, ratchet bars secured to the guide frame and extending upwardly therefrom, and dogs carried by the driving frame and adapted to engage the ratchet bars of the guide frame, substantially as described.

10. In a ditching machine, the combination, with the vertically movable driving rod and the driving frame secured thereto, of the slotted guide frame held beneath the driving frame and provided with upwardly extending curved guides, sliding shovels operated by the driving frame and held to move in the slots and guides of the guide frame, and parallel depending blades secured to opposite edges of the guide frame, substantially as described.

11. In a ditching machine, the combination with a supporting frame, of an upright frame hinged to the forward part of the supporting frame, means for adjusting the inclination of the hinged frame, and a boom mounted in the hinged frame to swing horizontally, substantially as described.

12. In a ditching machine, the combination with a supporting frame, of an upright frame hinged to the forward part of the supporting frame, rigid guys pivoted to the upper end of the hinged frame and having their other ends adjustably connected to the supporting frame, and a boom mounted in the hinged frame to swing horizontally, substantially as described.

GEORGE M. PILCHER.

Witnesses:
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