

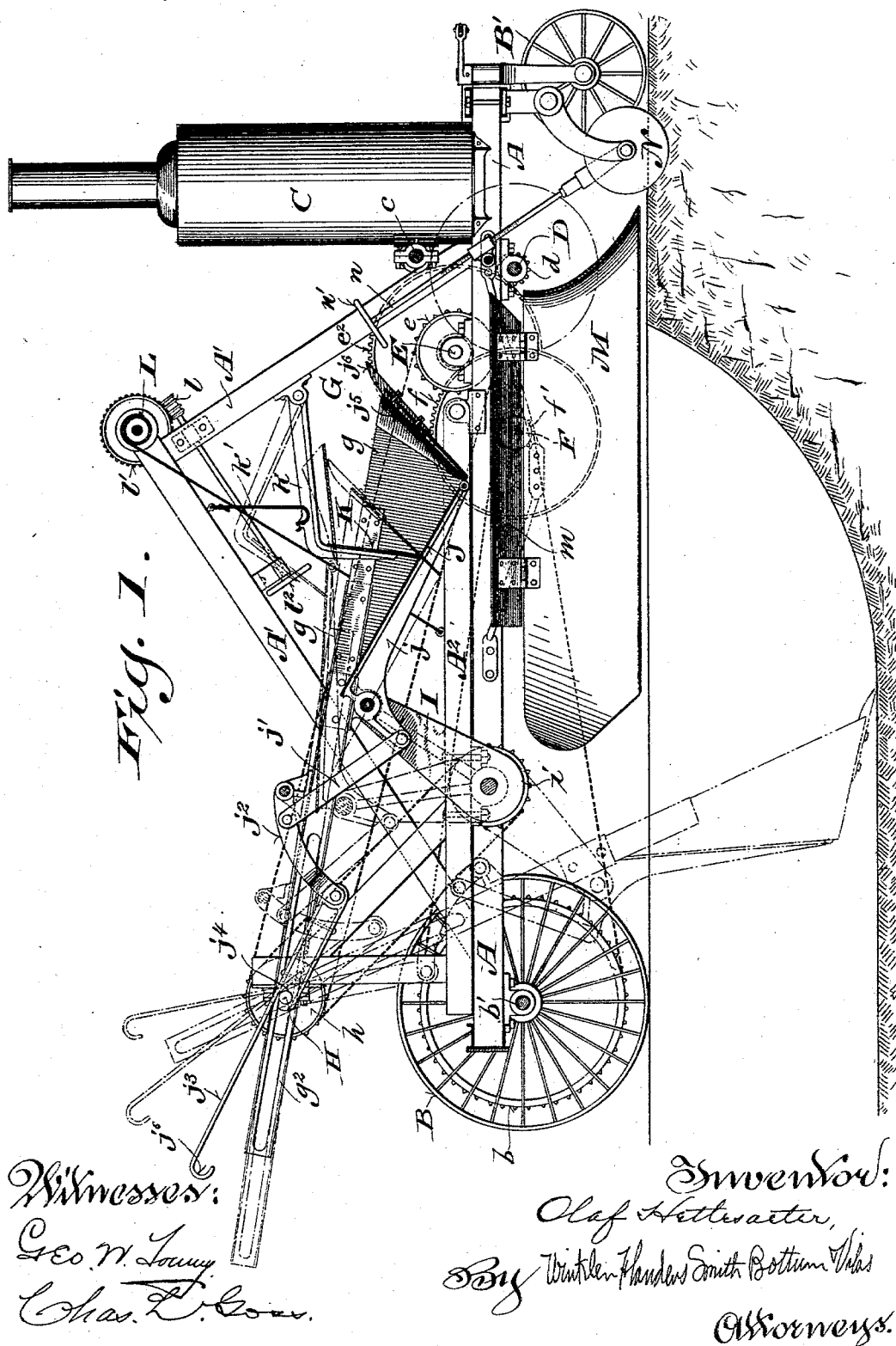
(No Model.)

2 Sheets—Sheet 1.

O. HETLESAETER.
DITCHING MACHINE.

No. 561,939.

Patented June 9, 1896.



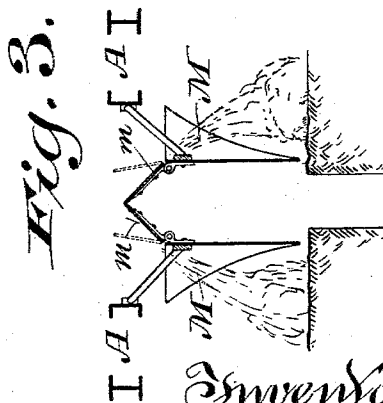
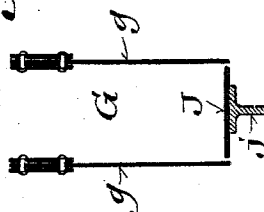
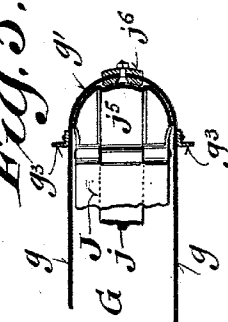
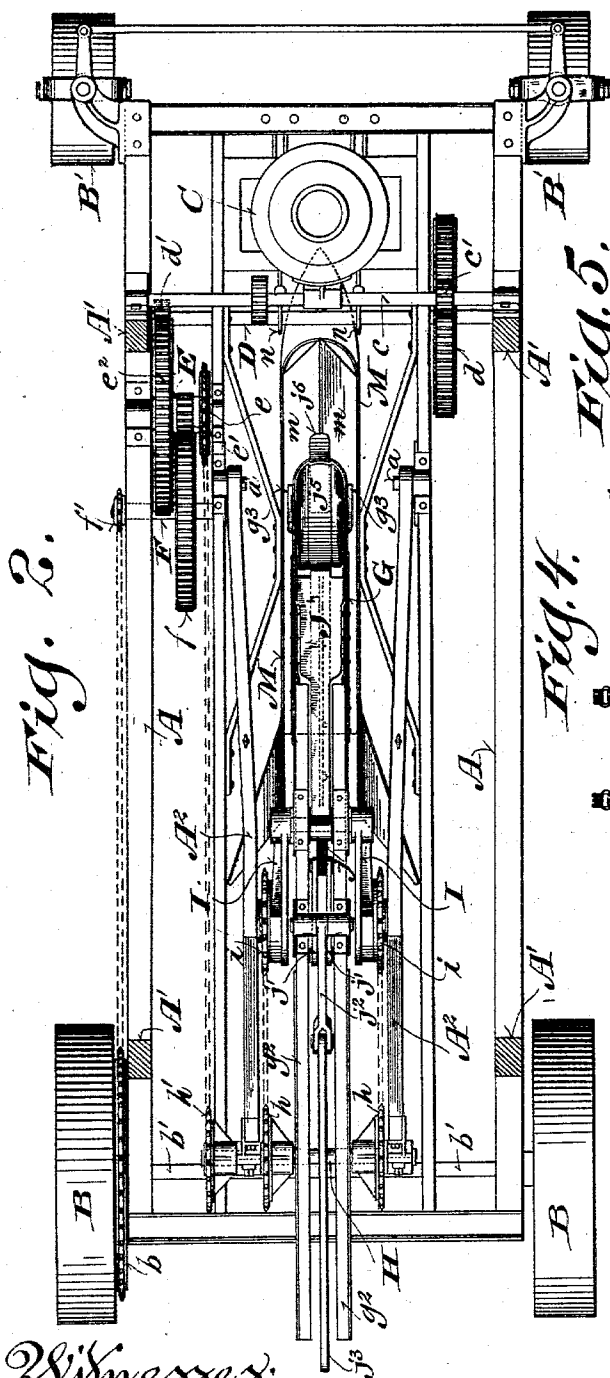
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2 Sheets—Sheet 2.

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DITCHING MACHINE.

No. 561,939.

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UNITED STATES PATENT OFFICE.

OLAF HETLESAETER, OF MILWAUKEE, WISCONSIN.

DITCHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 561,939, dated June 9, 1896.

Application filed May 3, 1895. Serial No. 547,957. (No model.)

To all whom it may concern:

Be it known that I, OLAF HETLESAETER, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Ditching-Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The object of my invention is to facilitate digging ditches or trenches for drain-tile or other purposes, particularly in clay or sticky ground.

It consists of certain peculiarities in the construction and arrangement of the component parts of the machine, as hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in the several figures.

Figure 1 is a vertical longitudinal section of a machine embodying my improvements. Fig. 2 is a plan view of the same, a portion of the frame and the elevating mechanism being removed to more clearly disclose underlying parts of the machine; and Figs. 3 to 6, inclusive, are detail views, Fig. 3 being a vertical cross-section of the track-clearer or guards, Fig. 4 a like section of the dipper-bucket, Fig. 5 a horizontal section of the front end of the bucket, and Fig. 6 a vertical cross-section of a ditch or trench designed to be made by the machine.

The machine comprises a carriage, a dipper-bucket having supporting, guiding, and actuating connections with the carriage-frame, a motor connected by suitable mechanism with the bucket and the driving-wheels of the carriage, a track-clearer or guards for preventing the excavated dirt from falling back into the ditch or trench made by the bucket, and of certain other parts hereinafter described.

The carriage consists of a main frame A, supported at the rear end by driving-wheels B B and at the front end by steering-wheels B' B', which have caster or swivel connec-

tions with the frame and a connection with each other for simultaneously turning them in either direction and holding them in parallel planes; an elevated frame A', rising from the main frame and carrying the mechanism for hoisting and adjusting the bucket vertically, and an auxiliary frame A², which carries the bucket and its guiding and actuating connections and is pivoted at its front end to the main frame A.

C designates a steam-engine or other suitable motor mounted upon the main frame, and c a main driving-shaft provided with a pinion c', which meshes with a gear d, mounted on a parallel cross-shaft D.

E is a short parallel shaft on the opposite side of the machine from gear d. It is provided with a sprocket-wheel e, a pinion e', and a gear e², which meshes with a pinion d' on shaft D. Upon a short parallel shaft F on the same side of the machine is mounted a gear f, which meshes with the pinion e' on the shaft E, and a sprocket-wheel f', which is connected by a link belt with a larger sprocket-wheel b on the main axle b', to the ends of which the driving-wheels B B are fixed. Through this train of gearing the motor turns said driving-wheels and propels the machine.

G is a scoop or bucket, usually called a "dipper-bucket." It consists of sheet-metal sides g g and front end g', which may be formed integrally with the sides and is preferably made of semicircular or curved form in cross-section and inclined forwardly toward its upper working edge, as shown in Figs. 1 and 5. The sides of the bucket are riveted or otherwise rigidly secured to a double rearwardly-projecting handle or supporting and operating bar g². This handle or operating-bar is longitudinally slotted to pass loosely over a cross-shaft H, which is supported horizontally by suitable bearings in the rear upper portion of the auxiliary frame A². Upon this shaft are mounted the sprocket-wheels h h and h'. The sprocket-wheel h' is connected by a link belt with and driven by the sprocket-wheel e, and the sprocket-wheels h h are connected by link belts with sprocket-wheels i i on the trunnions of the double crank I, which is supported by suitable bearings on the lower side of frame A². The

crank-pin of the crank I is pivotally connected with the bucket-bar g^2 by boxes attached to its under side near the bucket.

J is the bottom of the bucket, adapted to close the otherwise open space between its sides and front end. It is mounted upon a bell-crank lever or angular arm j , which is pivoted near its elbow and the rear end of the bucket upon the pin of crank I between the members of the double bucket-bar. The lower end of the shorter arm of this lever is connected by a double link j' with a lever j^2 , which is fulcrumed at its upper end to the bucket-bar g^2 and is pivoted at its opposite end to a dumping-rod j^3 , loosely mounted to slide endwise upon the cross-shaft H between the members of the bucket-bar. The dumping-rod is formed or provided with stops j^4 , by which its longitudinal movement upon the shaft H is limited at the proper points to hold the bottom J in its proper working position while the bucket is describing the lower part of its circuit and to raise it flush, or nearly so, with the edges of the bucket when the latter is elevated and in discharging position. The bottom is provided at its front end with an extension j^5 , which is hinged thereto and rests loosely against the front end of the bucket when the bottom is in normal position, but drops into line with the bottom when it is elevated into dumping position, as indicated by dotted lines in Fig. 1. The front end of the bucket is provided with a detachable tooth j^6 , which reinforces its cutting edge and is shaped to make the bottom of the ditch or trench of any desired form, as shown in Fig. 6, corresponding with the size and shape of the tile to be laid therein. The sides $g g$ of the bucket are preferably made slightly diverging toward their upper edges, so as to afford proper clearance when the bucket is digging.

K is a scraper attached to an angular arm k , which is pivoted at its front end to the frame A' and is normally suspended therefrom by a chain or cable k' . It is constructed and arranged to drag over the upper face of the bottom J when it is elevated into discharging position, as shown by full and dotted lines in Fig. 1. The suspending cable or chain k' prevents it from dropping too far out of range with the bucket when the latter is describing the lower part of its circuit.

L is a hoisting-drum supported horizontally in suitable bearings in the upper part of frame A'.

l is a worm meshing with a worm-gear l' , fixed on the drum-shaft. It is mounted upon a shaft provided with a hand-wheel l^2 . This drum is connected by cables or chains with the auxiliary frame A², carrying the bucket and its guiding and driving connections.

M is a track-clearer consisting of two metallic guards or plates shaped similarly to the moldboard of a plow, and arranged on opposite sides of the upward path of the bucket, with their lower edges slightly above the sur-

face of the ground and joined at their front ends in an acute angle. They are rigidly secured to the main frame A by suitable braces or otherwise, and are provided at their upper edges with doors $m m$, hinged thereto and adapted to be opened by the upward passage of the bucket and to close automatically when the bucket clears them. When they are closed, they form a roof-shaped cover over the space between the guards and prevent any dirt discharged thereon from the bucket from falling back into the ditch or trench, as shown in Fig. 3.

The machine is provided at or near its front end with two turf-cutters N, which are located approximately in the same planes with the sides of the bucket and are connected with screw-rods n provided with hand-wheels n for adjusting them vertically. These turf-cutters, which are shown in the form of rotary disks, may have yielding connections with the screw-rods or frame of the machine, whereby they may yield upwardly to pass obstructions and avoid injury thereto. It will be observed that the doors $m m$ of the track-clearer or guards M M are hinged to the upper edges of said guards in such a manner as to form a roof-like cover when closed and to be arrested when opened by the upward passage of the bucket in planes slightly inclined toward each other, as indicated by dotted lines in Fig. 3, so as to cause them to close automatically by their own weight as soon as the bucket clears them. The lever or other steering mechanism (not shown) may be connected in any suitable manner with the cross-rod between the crank-arms on the spindles of the caster-frames of wheels B' B' to facilitate guiding the machine. To insure sufficient and proper clearance of the bucket, it may be provided on the sides, at or near their front ends, with laterally-projecting cutters or wings $g^3 g^3$.

My improved machine operates as follows: The driving-shaft c being rotated turns the main driving-wheels B B through the gearing hereinbefore described, and thereby slowly propels the machine. The crank I is also turned through its connections hereinbefore described with the same motor in the direction indicated by the arrow in Fig. 1, causing the bucket G to describe a circular or curved circuit descending on the rear side of the crank into the position indicated by dotted lines in Fig. 1, from which position it advances on an upward curve, making a cut in the earth. During the lower part of the circuit of the bucket, while it is passing through the ditch or trench and is making a cut, the bottom J is held by its connections with the crank I and shaft H in normal position. At each revolution the bucket scoops out a portion of the earth in the front end of the ditch or trench and carries it upwardly between the sides of the track-clearer or guards M M, opening the doors $m m$ in its passage into the position in which it is shown

by full lines in Fig. 1. As soon as it clears said doors they close automatically, covering the opening into the trench immediately below the bucket. As the bucket rises from between said guards it engages near its rear end with the scraper K, which drags over the bottom J as it is elevated and drawn rearwardly by the continued movement of crank I into the upper position, (indicated by dotted lines in Fig. 1,) thereby removing the dirt which may stick to the bottom. While the bucket is moving from its position shown by full lines into its upper position (shown by dotted lines in Fig. 1) the front stop j^4 of the dumping-rod j^3 , engaging with the shaft H, raises and straightens the bottom J and its extension j^5 into or near the plane of the upper edges of the bucket, thus loosening any dirt which may adhere to the sides of the bucket and ejecting its contents, a portion of which falls upon the inclined doors $m m$ and is directed thereby outwardly on opposite sides of the trench or ditch, as indicated in Fig. 3, the sides or guards M M preventing the dirt thus discharged from falling back into the ditch. Any loose dirt or obstructions which may be in the path of the machine is removed from the path of the bucket by the track-cleaver or guards. The turf-cutters or colters N N, making incisions in the surface of the ground on either side of the ditch to be dug, enable the bucket to make a smooth even cut at the surface. Any dirt which may stick to the upper sides of the doors M M is loosened and removed by the bucket striking them in its next passage.

In starting the machine the bucket and its guiding and actuating connections may be elevated by the hoisting-drum L and gradually lowered until a cut of the desired depth is made. By the same means the bucket and its connections may be adjusted to dig a ditch of any desired depth or of varying depth, or they may be raised, if necessary, to pass obstructions.

Various changes in the details of the machine may be made within the spirit and intended scope of my invention.

I claim—

1. In a ditching-machine the combination with a suitable carriage provided with a cross-shaft, of a bucket provided with a handle-bar which has a sliding pivot connection with said cross-shaft and an actuating-crank pivoted to said handle-bar between said bucket and cross-shaft, substantially as and for the purposes set forth.

2. In a ditching-machine the combination with a suitable carriage of a bucket provided with a movable bottom and a handle or bar which has a guiding connection with a suitable part of the machine, an actuating-crank connected with said bucket, and automatic dumping mechanism connected with said movable bottom, substantially as and for the purposes set forth.

3. In a ditching-machine the combination

with a suitable carriage of a bucket provided with a movable bottom and a handle or bar which has a guiding connection with a part of the machine, an actuating-crank connected with said bucket, dumping mechanism connected with said movable bottom, and a scraper arranged to remove the dirt from said bucket as it is elevated and carried backward, substantially as and for the purposes set forth.

4. In a ditching-machine the combination with a suitable carriage of a bucket having supporting and guiding connections therewith, an actuating-crank connected with said bucket, and a track-cleaver consisting of two vertically-disposed guards arranged on opposite sides of the upward path of said bucket converging at their front ends which are joined together at an angle, and diverging or inclined outwardly and upwardly at their rear ends, substantially as and for the purposes set forth.

5. In a ditching-machine the combination with a suitable carriage of a dipper-bucket having supporting and guiding connections therewith, an actuating-crank connected with said bucket, and guards arranged on opposite sides of the upward path of the bucket and provided with upwardly-opening and automatically-closing doors, substantially as and for the purposes set forth.

6. In a ditching-machine the combination with a suitable carriage comprising a main frame, of an auxiliary frame pivoted thereto at or near its front end and provided at or near its rear end with a cross-shaft, adjusting mechanism for raising and lowering said auxiliary frame by swinging it on its pivot connections with the main frame, a dipper-bucket provided with a handle-bar which has a sliding pivot connection with said cross-shaft, a crank pivoted to said handle-bar and having bearings in said adjustable frame and driving connections with said cross-shaft, and a motor mounted upon said carriage and connected with said cross-shaft, substantially as and for the purposes set forth.

7. In a ditching-machine the combination with a suitable carriage comprising a main frame, of an auxiliary frame hinged thereto at or near its front end and movable vertically at its rear end, mechanism for adjusting said auxiliary frame vertically, a cross-shaft mounted in the rear part of said auxiliary frame, a crank-shaft also mounted in said auxiliary frame and having a driving connection with said cross-shaft, and a dipper-bucket provided with a bar which is pivoted to the crank of said crank-shaft and has a sliding pivot connection with said cross-shaft, substantially as and for the purposes set forth.

8. In a ditching-machine the combination with a suitable carriage, of a dipper-bucket provided with a movable bottom adapted to be raised therein for discharging the contents of the bucket, and with a handle-bar having a sliding pivot connection with a suitable part

of the machine, an actuating-crank having concentric pivot connections with said bucket and its movable bottom, and a connection between said bottom and a part of the machine
 5 whereby it is raised to eject the contents of the bucket when the latter is elevated from the ground, substantially as and for the purposes set forth.

9. In a ditching-machine the combination
 10 with a suitable carriage, of a dipper-bucket provided with a handle or bar having a movable bottom and a guiding connection with a part of the machine, an actuating-crank pivoted to said bar, and its movable bottom, a
 15 lever fulcrumed to said bar and linked to an arm of said movable bottom, and a dumping-rod pivoted to said lever and having a sliding connection with a relatively-fixed part of the machine, whereby a limited longitudinal
 20 movement of said dumping-rod is permitted, and the movable bottom is held in normal position while the bucket is filled and raised from the ditch but is elevated to discharge the contents of the bucket when it is in proper
 25 position therefor, substantially as and for the purposes set forth.

10. In a ditching-machine the combination with a suitable carriage, of a dipper-bucket provided with a bar and a movable jointed
 30 bottom, a crank pivoted to said bar and bottom, which have guiding connections with relatively-fixed parts of the machine, substantially as and for the purposes set forth.

11. In a ditching-machine the combination
 35 with a suitable carriage of a dipper-bucket provided with a bar which has a guiding connection with a relatively-fixed part of the machine, an actuating-crank connected with said bucket, a movable bottom to the bucket,
 40 an automatic dumping device for raising the bottom in the bucket when it is elevated and a scraper loosely suspended from the frame of the machine so as to drag over the bottom when it is raised and moved rearwardly, sub-
 45 stantially as and for the purposes set forth.

12. In a ditching-machine the combination with a suitable carriage provided with a motor and propelling mechanism connected there-
 50 with, of a dipper-bucket provided with a movable bottom and a bar which has a guiding connection with the frame, an actuating-crank connected with said motor and bucket, an automatic dumping connection with said bot-
 55 tom for raising it and discharging the contents of the bucket, a scraper for removing the dirt from said bottom, and a track-clearer consisting of guards arranged on opposite sides of the upward path of the bucket, and self-closing
 60 doors forming a cover or shield between them, substantially as and for the purposes set forth.

13. In a ditching-machine the combination with a suitable carriage, of a dipper-bucket having supporting and guiding connections therewith, driving mechanism connected with said bucket, guards provided with self-closing
 65 doors and turf-cutters arranged on opposite sides of the path of the bucket, substantially as and for the purposes set forth.

14. In a ditching-machine the combination with a suitable carriage of a dipper-bucket
 70 comprising closed sides and end, and a supporting and operating bar which has a guiding connection with a relatively-fixed part of the machine, an actuating-crank connected by a box with said bar between its guiding
 75 connection and the bucket, a bottom plate adapted to close the space between the sides and ends of the bucket and pivoted to the crank, and automatic dumping mechanism connected with the bottom and arranged to
 80 elevate it toward the top of the bucket when the latter is raised into proper position for discharging its contents, substantially as and for the purposes set forth.

15. In a ditching-machine the combination
 85 with a suitable carriage comprising a main frame, an auxiliary frame hinged thereto, hoisting mechanism mounted upon the main frame and connected with the auxiliary frame, a dipper-bucket comprising closed sides and
 90 end, and a supporting and operating bar which has a guiding connection with the auxiliary frame, an actuating-crank carried by the auxiliary frame and pivoted to said bar between its guiding connection and the bucket,
 95 a bottom plate adapted to fill the opening between the sides and end of the bucket and pivotally connected at or near one end with the crank-pin of said crank, and dumping mechanism connected with said bottom plate
 100 and adapted to automatically elevate the same toward the top of the bucket when the latter is raised into discharging position, substantially as and for the purposes set forth.

16. In a ditching-machine the combination
 105 with a suitable carriage of a dipper-bucket having suitable guiding and actuating connections, and a movable bottom provided with an extension hinged thereto and fitting normally into the working end of the bucket,
 110 and mechanism for operating said bottom and discharging the contents of the bucket, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of
 115 two witnesses.

OLAF HETLESAETER.

Witnesses:

CHAS. L. GOSS,
 D. A. KELLEY.