(No Model.)

3 Sheets—Sheet 1.

I. B. HAMMOND.

DITCHING AND GRADING MACHINE.

No. 251,046. Patented Dec. 20, 1881.

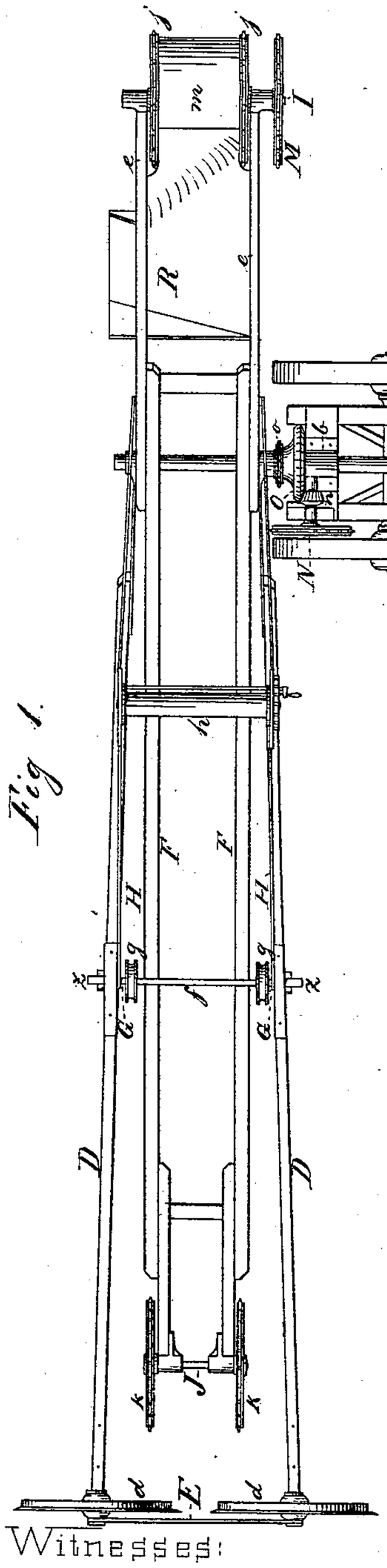

Fig. 1.

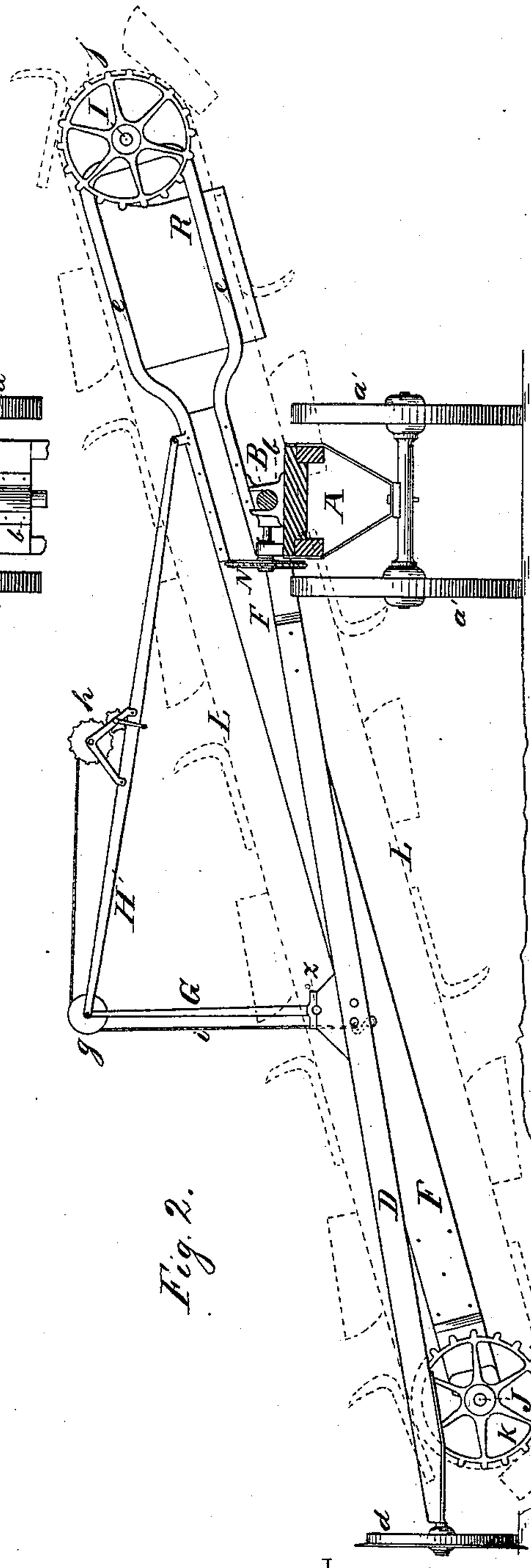

Fig. 2.

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

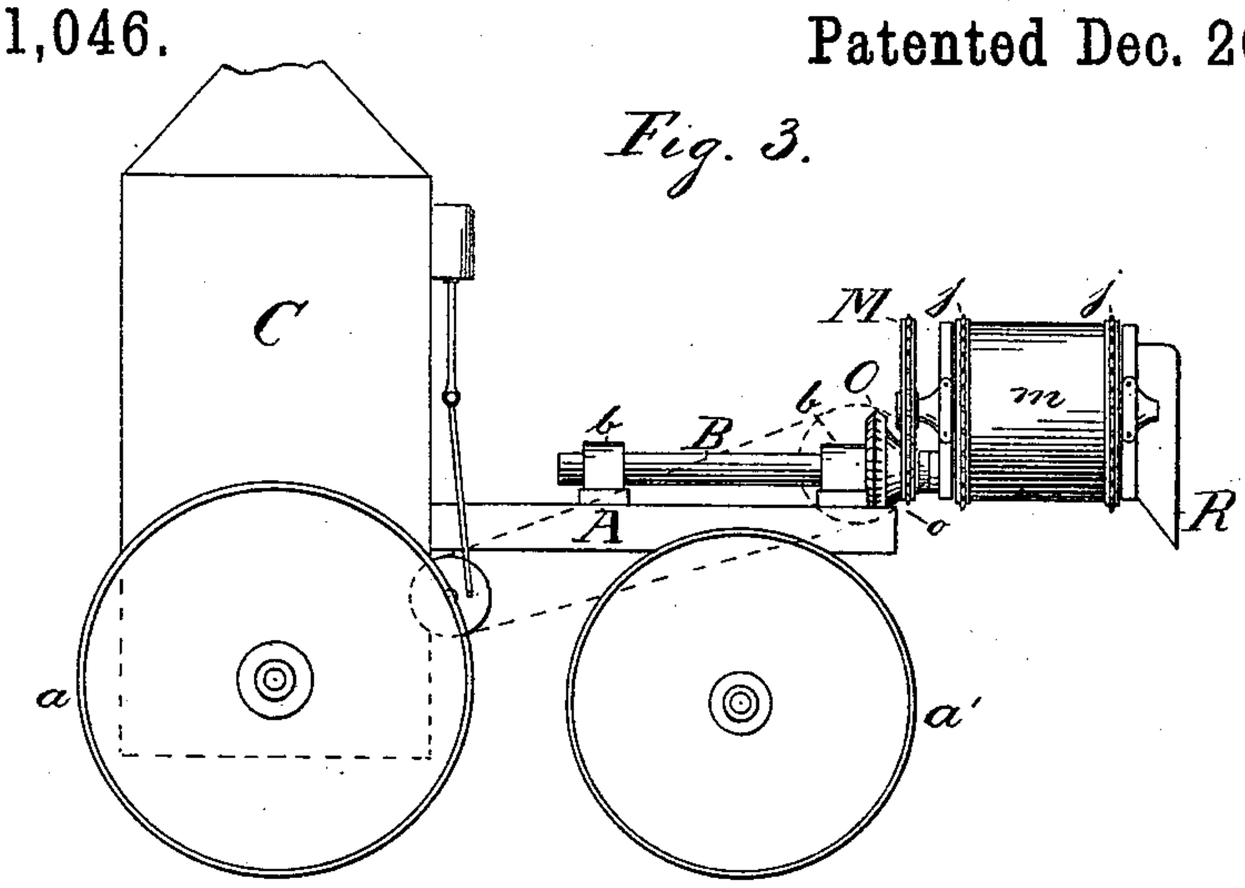


Fig. 4.

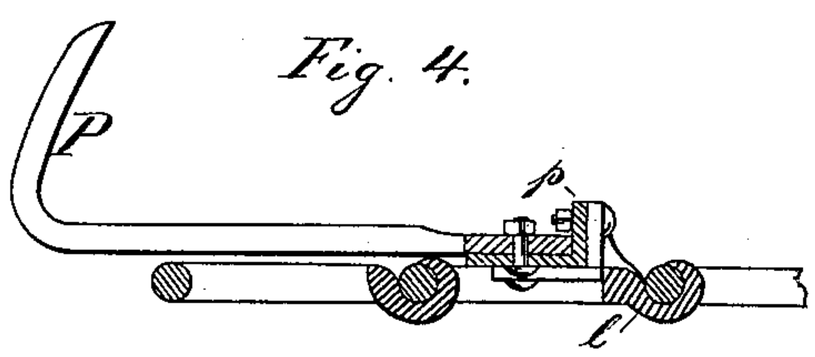
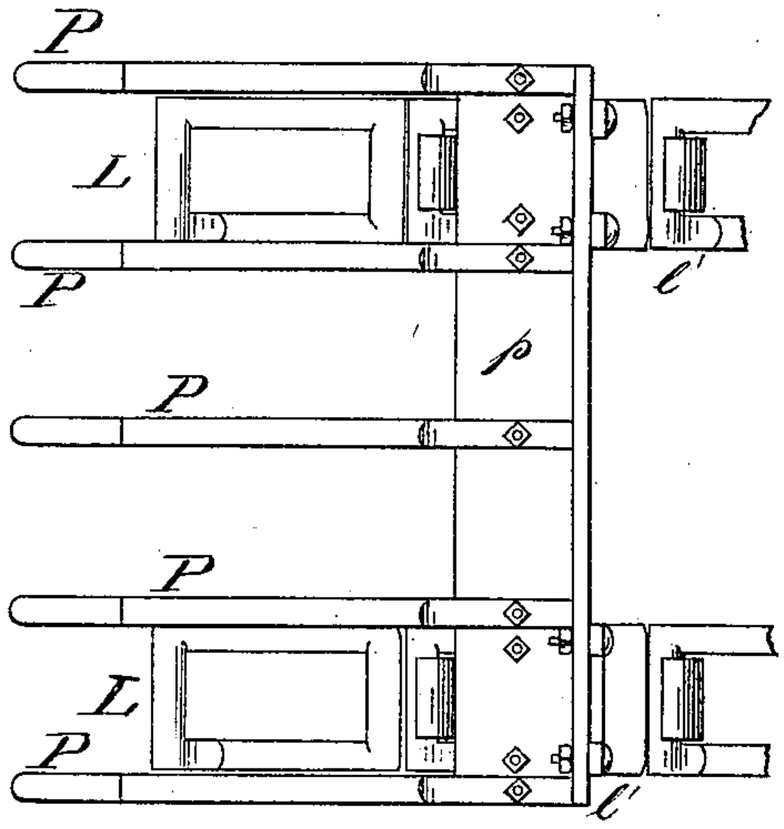


Fig. 5.



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3 Sheets—Sheet 3.

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DITCHING AND GRADING MACHINE.

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Fig. 6

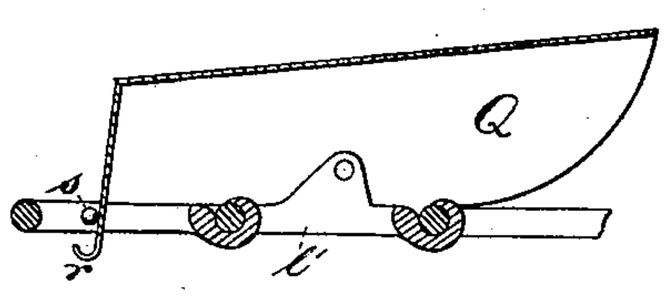


Fig. 8

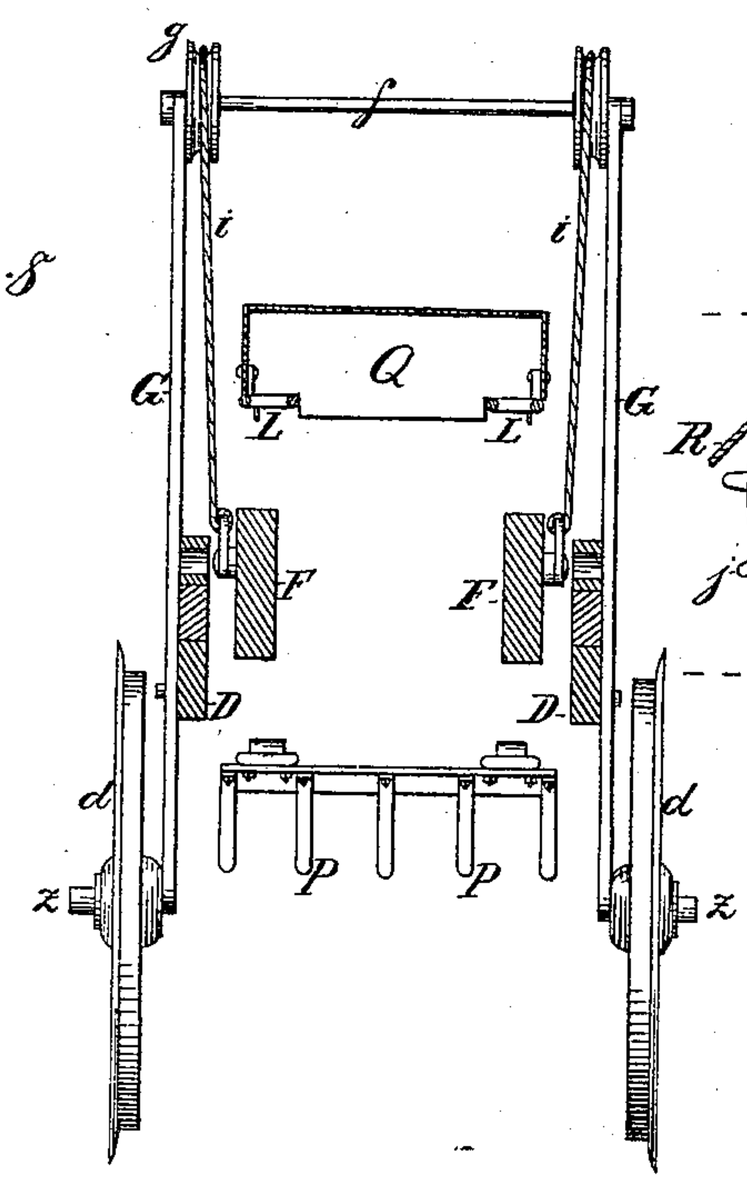
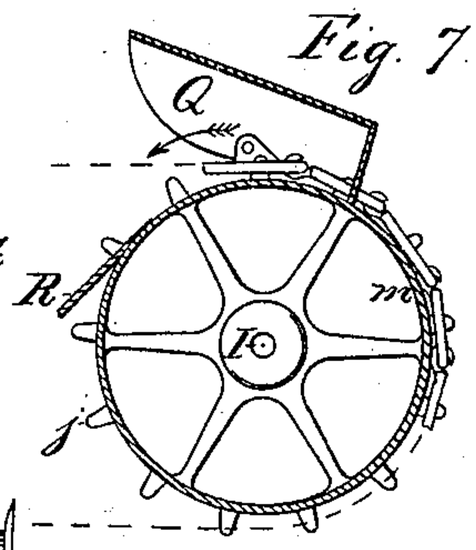


Fig. 7



Witnesses:

Frank Thomason
F. W. Kasehagen.

Inventor:

Isaac B. Hammond
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UNITED STATES PATENT OFFICE.

ISAAC B. HAMMOND, OF CHICAGO, ILLINOIS.

DITCHING AND GRADING MACHINE.

SPECIFICATION forming part of Letters Patent No. 251,046, dated December 20, 1881.

Application filed August 25, 1881. (No model.)

To all whom it may concern:

Be it known that I, ISAAC B. HAMMOND, of Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Ditching and Grading Machines, of which the following is a specification.

This invention relates to machines for digging earth and removing it, and more particularly relates to machines adapted for the grading of railroad-beds; and it is the object of my invention to construct a machine that is mounted on wheels which will travel upon the intact ground, and that will consecutively, cut after cut, break up the soil and scoop it uphill until the proper ditch and slope for the railway-bed is formed, and that will deport the earth thus removed, and will either dump it for fillings or deliver it into transport-wagons, the whole being arranged to be driven and propelled by steam-power.

For this purpose my invention consists in the construction and arrangement of the elements that will perform the designed functions, as hereinafter described and specifically claimed.

In the accompanying drawings, forming part hereof, Figure 1 represents a plan, and Fig. 2 a sectional side elevation, of the machine; Fig. 3, an end elevation of the same; Figs. 4 and 5, a sectional elevation and plan view of a portion of the chain and the plow-hook attachment; Fig. 6, a sectional elevation of a portion of the chain with one of the scoops attached; Fig. 7, a sectional elevation of one of the upper chain-wheels, the intermediate drum, the chain in dotted lines, and one of the scoops in position to discharge its contents into the spout; and Fig. 8, a cross-section of the machine and an elevation of the hoist-yoke, all in condition to transport the machine to or from its work.

Like letters designate corresponding parts in all the figures.

A denotes the frame for a truck, supported upon two hind wheels, *a a*, Fig. 3, and two front wheels, *a' a'*, the axle of the latter being pivotally connected by a fifth-wheel to adapt themselves for turning a curve whenever such becomes desirable. Longitudinally upon this truck-frame, in proper bearings, *b*, is secured a shaft, B, the end of which is projecting for forming the pivotal support for the upper end of the ditching and grading machine.

About perpendicularly above the axle of the hind wheels, *a a*, upon and between the frame A, is mounted a steam-boiler, C, with a steam-engine attached. (See Fig. 3.) This engine is not only intended for driving the ditching and grading machinery, but is also to be connected by any suitable mechanism with the hind-wheels, *a*, of the truck, for propelling the same in the manner of a traction-engine, and to push it forward as the work progresses. The axle of the front wheels, by a segmental worm-wheel and a worm rotated by hand-power, is to enable the steering of the machine. Neither mechanism for propelling or steering have I illustrated in the drawings, since any well-known device may be adapted and arranged with my machine.

D D are two long beams, which at one end are pivotally connected with the projecting end of shaft B, while their opposite ends have skeins for wheels *d*, and exteriorly of the hubs of the wheels *d* these skeins are connected by a cross-bar, E. These wheels *d* will travel parallel with the wheels *a* of the truck, and will assist in supporting the ditching and grading mechanism. The wheels *d* also have flanges, which will cut into the ground like the colter of a plow, and will give longitudinal resistance to the machinery-frame against the force of the plow-hooks and scoops during the practical performance of the machine. Both the wheels *a* of the truck and the side wheels, *d*, will move upon the ground that will not be disturbed during the operation of excavating, only the soil between the truck and side wheels being dug out.

Two timbers, F F, having extensions *e e* of of angle-iron, form the frame proper for the excavating mechanism. These timbers F F are rigidly connected by cross-bars, and at their junction with the iron extension-frames *e e* they are pivoted upon the projecting end of shaft B, between the beams D D. Two standards, G G, having rectangularly-projecting trunnions *z* to their bottom ends, which are pivotally secured in boxes upon timbers D D, and being connected at their upper extremities by a cross-rod, *f*, that is the fulcrum for two sheaves, *g*, form the yoke by which the frame F is adjustably suspended. Two brace-bars,

H, for this purpose pivotally connect the upper ends of the standards G with the upper end of frame F, for sustaining these standards in an upright position, and upon these brace-bars H is journaled, in suitable boxes, a hoist-gear, *h*, with a suitable locking device, which hoist-gear may be operated either by hand-cranks, or it may be connected with the engine in any well-known manner, to be rotated by steam-power. Ropes or chains *i*, which are secured to the frame F, are passed over the sheaves *g*, and thence are wound upon the spool of the hoist-gear *h*, for elevating or lowering the lower end of frame F.

Against the extreme ends of the frame F and its extension *e* are journaled two shafts, I and J, and upon each of these axles are mounted two sprocket-wheels, *j j* and *k k*, over which two endless chains, L L, are stretched, so as to move parallel with each other and at a uniform speed.

Between the upper two sprocket-wheels upon shaft I is mounted a drum, *m*, and upon the extreme end of said shaft is mounted a sprocket-wheel, M.

Upon the truck-frame A, in suitable boxes, is journaled a shaft carrying a sprocket-wheel, N, that is connected by an endless chain with a sprocket-wheel on the engine-shaft and a bevel-pinion, *n*, that matches a bevel-wheel, O. This wheel O is sleeved upon a shaft, B, and carries a small sprocket-wheel, *o*, which, by an endless chain, transmits motion to the sprocket-wheel M and shaft I.

The gearing for driving the excavating-chains from the engine may be arranged in many different ways from the one above described, and I do not wish to be held to the construction shown and specified, since I may prefer to arrange the gearing on a pivotal principle that will permit the swinging of the truck around so as to be parallel with the frame F when the machine is to be used for ditching only.

The endless chains L L carry plow-hooks P and scoops Q, which are arranged alternately in a manner that the earth broken up by a set of plow-hooks is scooped up by the scoop next following.

The plow-hooks P for each set I secure in a row upon an angle-plate, *p*, at equal distances apart, each by a bolt passed through the flattened end of the plow-hook shank, and through the angle-iron, that in case one of these hooks should be broken it can be quickly replaced by another; and the ends of the angle-iron I bolt upon proper flanges formed to the links *l* of chains L.

The scoops Q, I make of steel-plate, in the shape of an earth-scraper, and I pivot them between lugs, that form parts of the chain-links *l'* in a manner that each scoop has a chance to rock thereon and to accommodate itself to the several positions while passing over the chain, wheels, &c. This rocking movement of the scoops is limited by a hook, *r*, to each end of a scoop, which will butt against a stud, *s*, projecting from the side of one of the chain-links.

The scoops Q, when carried by the chains L over the sprocket-wheels *j*, are held with their open sides in close contact with the drum *m*, which drum will form one side of the scoop during the semi-revolution, when the scoops are carried over. In this manner the earth that is carried by the scoop cannot drop out until said scoop has passed the drum in its reversed position, as shown in Fig. 7, when it will drop its contents upon an inclined spout, R, that extends between the endless chain, and will discharge either upon the road-bed or into a transport-wagon. The advantage obtained by this construction is the ready and complete discharge of the earth from the scoops at a higher elevation than where the scoops or scrapers are arranged to empty before passing over the chain-wheels.

The operation of the machine will be readily understood by reference to Fig. 2 of the drawings.

The truck that carries the engine and boiler and supports the upper end of the machine will travel upon and in a line with the road-bed, and the flanged wheels *d* will travel on a parallel line therewith beyond or exteriorly of the ditch and slope that are to be dug. The truck is to remain stationary while the excavating is carried on, and vice versa. The machine being in position, the digging mechanism is set in motion and the frame F is lowered by the hoist-gear *h* until the plow-hooks and scoops will touch the ground while passing over wheels K, when the digging will commence, and will be continued until the ditch has been cut to the proper depth or the slope of the road-bed has been brought to the proper angle. The furrow thus cut will be of a width equal to the width of the scoops. Now, by means of the hoist-gear *h*, the frame F is lifted again until the scoops will clear the ground, when the machine will be moved forward just the width of a furrow, and another cut will be made, and so on in succession, cut after cut. The machine, after having thus completed the ditch and slope at one side of the road-bed, may be turned for commencing the other side, when the operation will be carried on in the opposite direction; or two machines—one right and one left—may follow each other, for digging and grading the road-bed.

For moving the machine over a road greater distances, the bar E at the extreme ends of beams D and the wheels *d* are removed and the caps from the trunnions *z* of the standards G are removed. Next the beams D are pushed closer to frame F, so as to pass between the standards G, upon the trunnions *z* of which the wheels *d* are mounted to support the rear end of the machine, all as shown by Fig. 8. Then the truck that carries the engine and boiler is uncoupled from the side of the machine and is moved to the front end, where, by a hook or chain, that end of the machine is suspended to the rear of the truck-frame A, which operation

can be readily accomplished, as the overhanging shaft B always remains with the truck, and is also uncoupled from the ditching-machine. Thus rigged, the machine can be moved over narrow roads and bridges, and after reaching its destination the machine can be replaced into working order in a very short time.

What I claim as my invention is—

1. In a ditching and grading machine, the endless chains L L, connected by angle-plates *p*, that carry plow-hooks P, all constructed and arranged as described and shown.

2. In a ditching and grading machine, the frame F, sprocket-wheels *jj*, with the intermediate drum, *m*, in combination with the endless chains L L, that carry scoops Q, all substantially as and for the purpose specified.

3. In a ditching and grading machine, the frame F, sprocket-wheels *jj*, with intermediate drum, *m*, and spout R, in combination with the endless chains L L, that carry scoops Q, all constructed and arranged substantially as and for the purpose set forth.

4. In a ditching and grading machine, the swinging frame F, sprocket-wheels *jj*, with interposed drum *m*, spout R, and sprocket-wheels K K, in combination with the endless chains L L, that carry plow-hooks P and scoops Q in alternate succession, the same being arranged to operate substantially in the manner set forth.

5. In a ditching and grading machine, the supporting-frame composed of truck A, that carries the motor and has overhanging shaft B, and of the beams D, connected at one end with shaft B and supported at their opposite ends upon flanged or colter wheels *d*, all of which being constructed, combined, and arranged substantially in the manner described and shown.

6. In a ditching and grading machine, the truck A, that carries the motor and has an overhanging shaft, B, the beams D, supported on shaft B and wheels *d*, and the frame F, pivotally connected to shaft B and adjustably suspended between beams D, all substantially as and for the purpose set forth.

7. In a ditching and grading machine, the truck A, carrying the motor and having projecting shaft B, the beams D, supported on shaft B and wheels *d*, and the frame F, pivotally connected to shaft B and adjustably suspended between the beams D by ropes or chains *i*, sheaves *g*, hoist-gear *h* from yoke-standards G, and braces H, all substantially in the manner set forth.

8. In a ditching and grading machine, the truck A, carrying the motor and having projecting shaft B, that forms a support for beams D, having end wheels, *d*, and for the frame F, in combination with the sprocket-wheel *o*, sleeved upon shaft B and rotated by the motor, and with the sprocket-wheel M, mounted upon shaft I, that carries the scoop-chain driving-wheels, all of which being constructed and arranged to operate substantially in the manner specified.

9. In combination with the truck A, shaft B, beams D, and wheels *d*, the standards G, having trunnions *z*, and hoist-gear *h*, all of which being constructed and arranged to support frame F, substantially in the manner set forth.

In testimony whereof I have signed the above specification in presence of two witnesses.

ISAAC B. HAMMOND.

Witnesses:
WM. H. LOTZ,
F. W. KASEHAGEN.