(No Model.) 5 Sheets—Sheet 1.

F. S. HOYT.

EXCAVATING MACHINE.

No. 566,318. Patented Aug. 25, 1896.

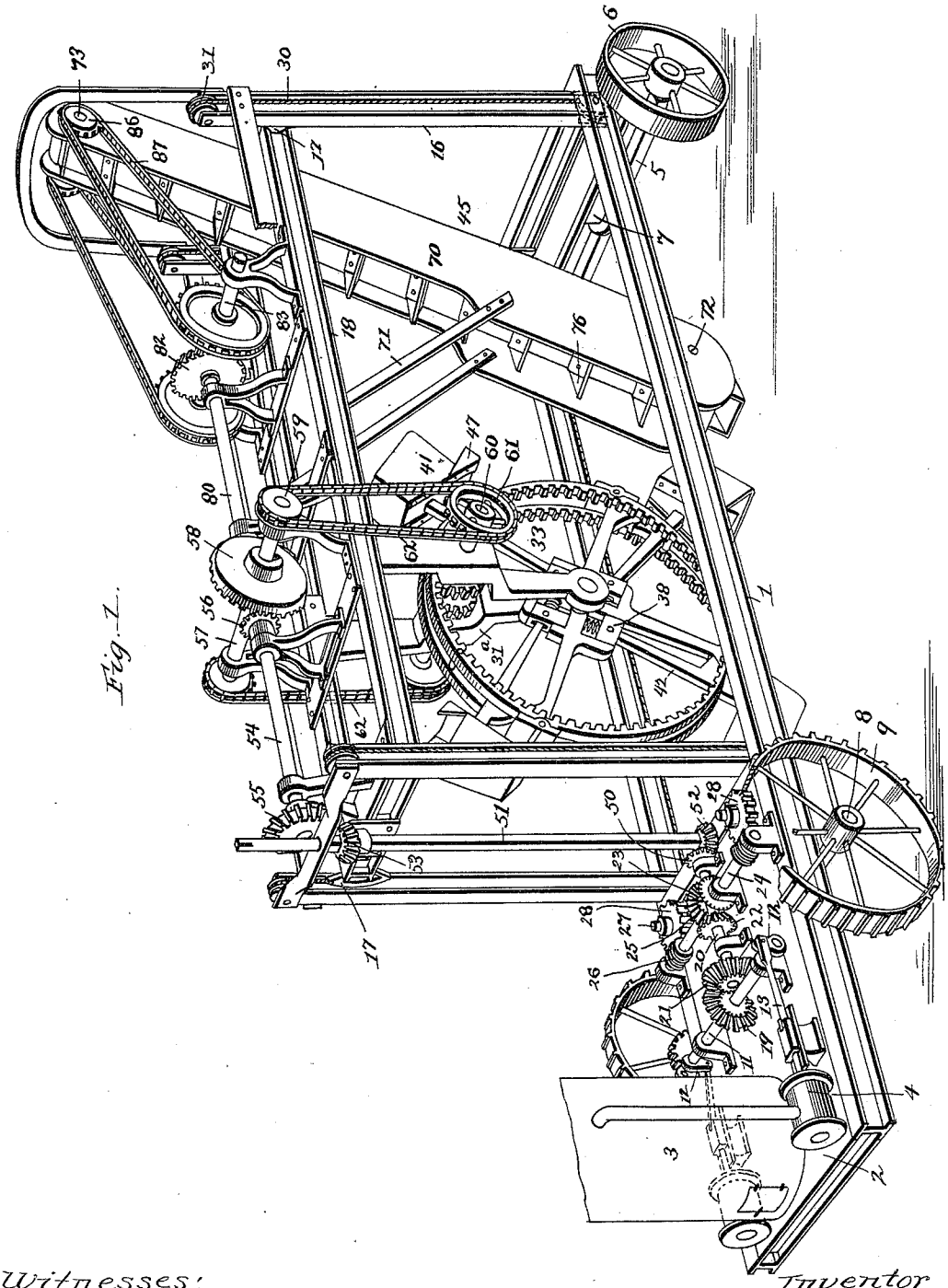


Fig. 1.

Witnesses:
C. H. Raeder
J. H. Griffin

Inventor
F. S. Hoyt
By James J. Sheehy
Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 5 Sheets—Sheet 2.

F. S. HOYT.

EXCAVATING MACHINE.

No. 566,318. Patented Aug. 25, 1896

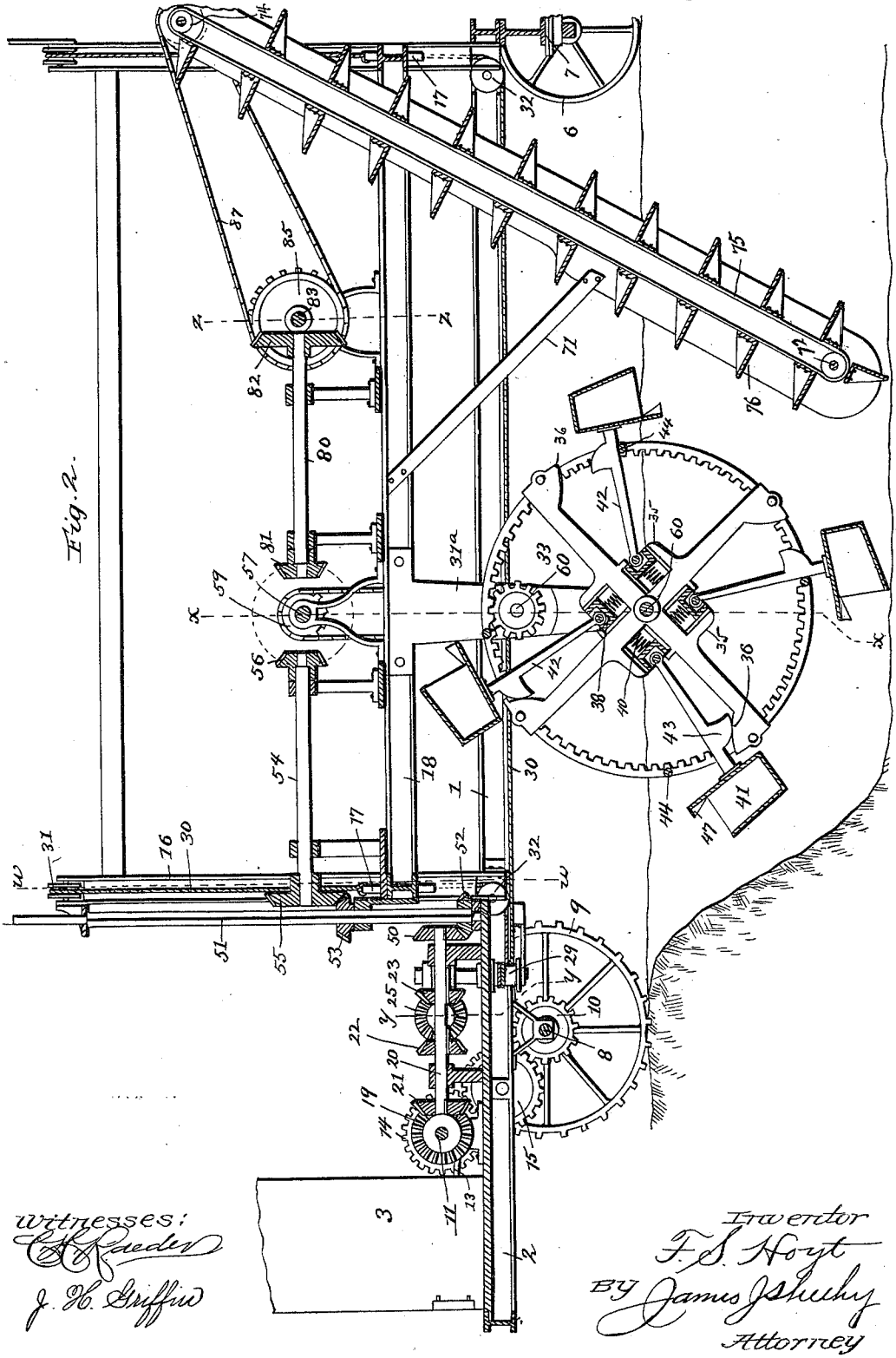


Fig. 2.

Witnesses:
C. F. Kraeder
J. H. Griffin

Inventor
F. S. Hoyt
By James J. Shuchy
Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 5 Sheets—Sheet 3.

F. S. HOYT.

EXCAVATING MACHINE.

No. 566,318. Patented Aug. 25, 1896.

Fig. 3.

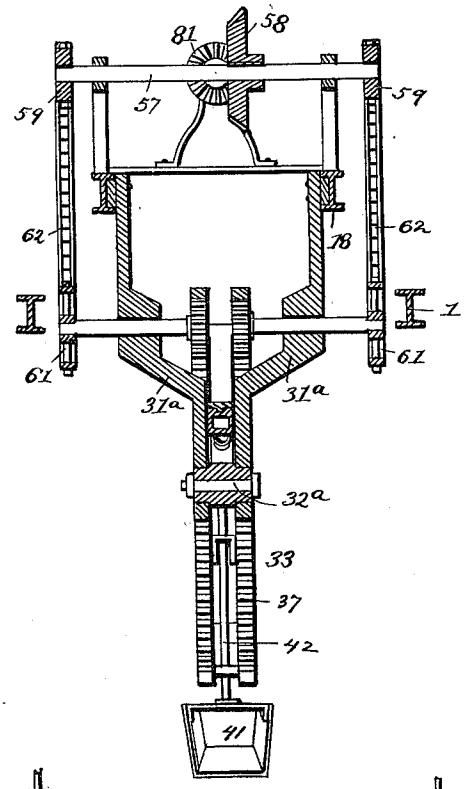
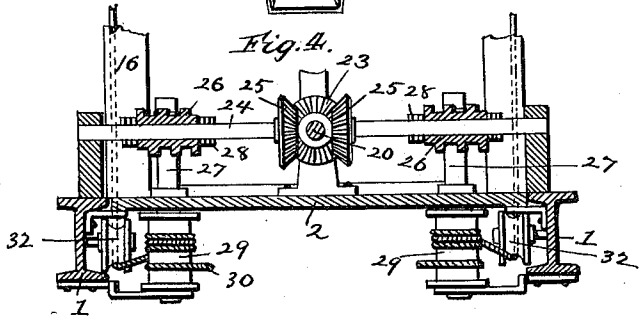


Fig. 4.



Witnesses:
C. H. Raeder
J. W. Griffin.

Inventor
F. S. Hoyt
By James J. Shuhy
Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.)

5 Sheets—Sheet 4.

F. S. HOYT.

EXCAVATING MACHINE.

No. 566,318. Patented Aug. 25, 1896.

Fig. 5.

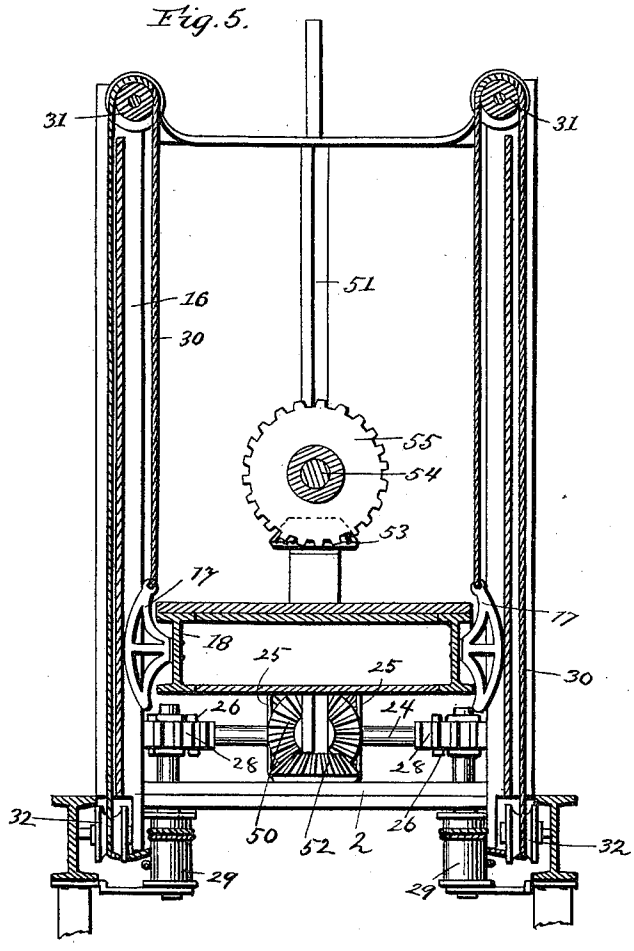
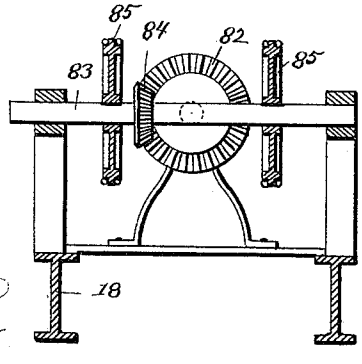


Fig. 6.



Witnesses
E. Hauder
J. H. Griffin

Inventor
F. S. Hoyt
By James J. Shechy
Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.)

5 Sheets—Sheet 5.

F. S. HOYT.

EXCAVATING MACHINE.

No. 566,318. Patented Aug. 25, 1896.

Fig. 7.

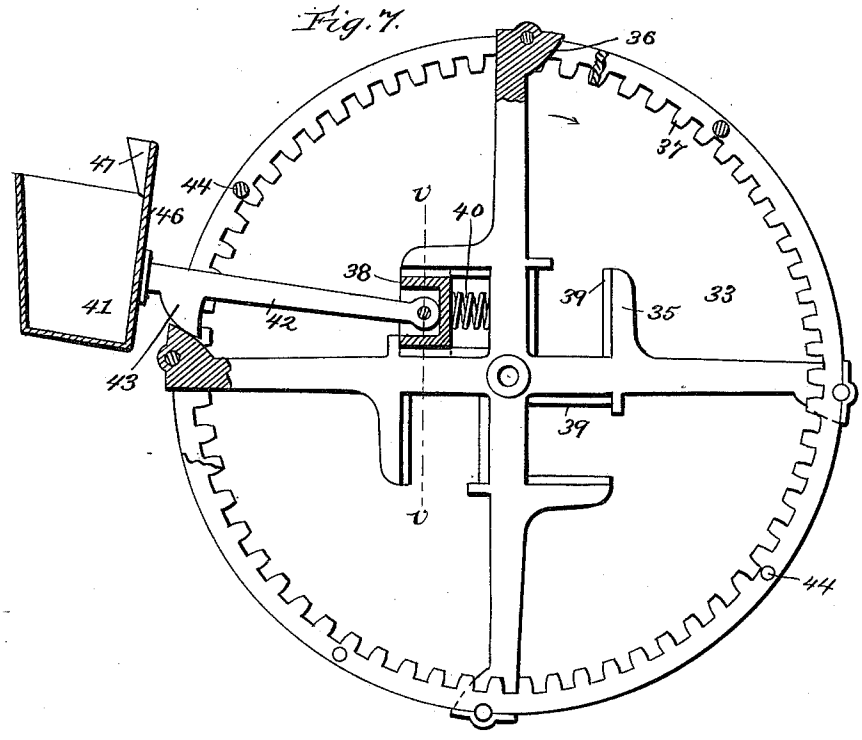


Fig. 8.

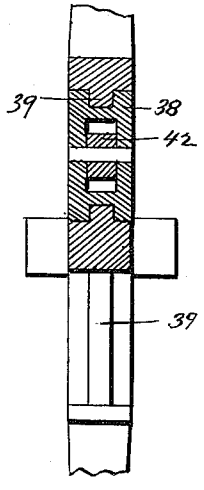
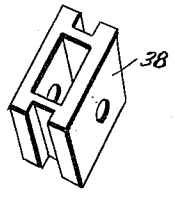


Fig. 9.



Witnesses
C. H. Raeder
J. H. Giffin.

Inventor
F. S. Hoyt
By James J. Shelby
Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FRED S. HOYT, OF FORT DODGE, IOWA.

EXCAVATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 566,318, dated August 25, 1896.

Application filed April 25, 1896. Serial No. 589,031. (No model.)

To all whom it may concern:

Be it known that I, FRED S. HOYT, a citizen of the United States, residing at Fort Dodge, in the county of Webster and State of Iowa, have invented certain new and useful Improvements in Excavating-Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in that class of excavating-machines which are designed more especially for digging ditches and the like; and it has for its general object to provide such a machine of a simple, practical, and efficient construction and one embodying means for digging the ditch, means for raising the loose earth from the ditch and conveying it to and depositing it at the side of the ditch, and means for moving the machine along as the digging progresses until the ditch is completed.

Another object of the invention is to provide an excavating-machine embodying such a construction that it may be readily adapted for making excavations or digging ditches of various depths, and still another object is to provide an excavating-machine embodying such a construction that its scoops are adapted to avoid and pass over rocks and other obstructions in their path without injury and then resume and be normally held in their operative positions.

Other objects and advantages of the invention will be fully understood from the following description and claims, when taken in conjunction with the accompanying drawings, in which—

Figure 1 is a perspective view of my improved machine complete with a portion of one of the drive traveling wheels broken away. Fig. 2 is a longitudinal central sectional view of the same in an operative position. Fig. 3 is a transverse section taken in the plane indicated by the line *x x* of Fig. 2. Fig. 4 is a detail section taken in the plane indicated by the line *y y* of Fig. 2. Fig. 5 is a transverse section taken in the plane indicated by the line *w w* of Fig. 2. Fig. 6 is a detail transverse section taken in the plane indicated by the line *z z* of Fig. 2. Fig. 7 is a side elevation, partly in section, of the digging or excavating wheel with all but one of the scoops and its appurtenances removed. Fig. 8 is a detail section taken in the plane indicated by the line *v v* of Fig. 7, and Fig. 9 is a perspective view of one of the spring-backed plungers with which the scoops are connected.

In the said drawings similar numerals designate corresponding parts in all of the views, referring to which—

1 indicates the main frame of the machine, which is preferably of a general rectangular form and may be built of any material suitable to the purposes of my invention. This frame is provided at its forward end with the platform 2 to support the boiler 3 and piston-cylinders 4 of a steam-engine which may be of any suitable construction, and it is mounted at its rear end on the axle 5, which carries wheels 6, and is pivotally connected with the machine at 7 to permit of the machine being turned, and adjacent to its forward end is mounted on the axle 8, which carries traction-wheels 9 at its ends, and is also provided with a gear-wheel 10, as shown.

A shaft 11, which has cranks 12 at its ends connected to the piston-rods 13 of the engine, is journaled in suitable bearings on the platform 2 and is connected by the gear-wheels 14 15 with the gear-wheel 10 on the axle 8. (See Fig. 2.) In virtue of this it will be seen that when the engine is actuated the machine will be caused to slowly travel forward, its speed being regulated in conformity to the speed of the excavating or digging devices hereinafter described.

The main frame 1 is provided with four fixed uprights 16, which are preferably grooved on their inner sides to receive the shoes 17 (see Fig. 5) of the frame 18, which carries the excavating or digging machinery as well as the machinery for hoisting the dirt from the excavation, and is therefore adjustable vertically and designed to be adjustably fixed at various elevations, in order to enable the before-mentioned machinery to dig ditches of various depths and remove the loosened earth therefrom. The said frame 18 is raised and lowered by the steam-engine on the platform 2 through the medium of the shaft 11, the beveled gear 19 thereon, the shaft 20, having

the beveled gear 21, meshing with gear 19, the beveled gears 22 23, splined on the shaft 20 and designed to be used alternately, the shafts 24, having pinions 25 at their inner ends and worm-screws 26 at their outer ends, the shafts 27, having gears 28 engaging the worm-screws, and also provided with drums 29 and the cables 30, connected to the frame 18 and taking over sheaves 31 on the uprights 16 and under sheaves 32 on the frame 1 and wound upon the drums 29. In virtue of this construction it will be observed that when the shaft 11 is rotated in the proper direction and the gear 22 is in mesh with the pinions 25 of shafts 24 the cables 30 will be wound upon said drums 29, and in consequence the frame 18 and the machinery carried thereby will be raised. It will also be observed that when the gear 22 is moved out of engagement with the pinions 25 and the gear 23 is moved in engagement therewith the drums 29 will be rotated in the opposite direction and paying off the cables 30 will lower the frame 18, while when both gears 22 and 23 are moved out of engagement with the pinions 25 the drums 29 will be locked against casual rotation and the frame 18 will be fixed in its adjusted position. The gear-wheels 22 23 may be moved by hand or through the medium of any suitable devices, which I have not deemed it necessary to illustrate.

Fixedly connected to and depending from the frame 18, as better illustrated in Figs. 2 and 3, are hangers 31^a, in which is arranged the shaft 32^a of the excavating or digging wheel 33, better illustrated in Figs. 1, 2, 3, 7, 8, and 9. This wheel 33 comprises spokes 34, which have angularly-disposed arms 35 at intermediate points of their length and inclined planes 36 at their outer ends, the internal gears 37, which are arranged upon and fixedly secured to opposite sides of the spokes at the outer ends thereof, the plungers 38, which are arranged between the arms 35 of the spokes and the spokes, as shown, and are grooved to receive the guide-tongues 39 of said arms and spokes, the springs 40, which are interposed between the rear ends of the plungers 38 and the spokes 40, the scoops 41, the shanks 42 of the scoops, which are connected to the scoops and are pivotally or loosely connected to the plungers 38 and are provided with inclined planes 43, designed to engage the inclined planes 36 of the spokes 34, and the stops 44, which, like the shanks 42, are arranged between the internal gears 37 and are designed to limit the movement of said shanks in one direction, as will be presently described.

The excavating-wheel 33 is rotated by the engine on platform 2, through the medium of mechanism presently described, and as it rotates the scoops 41 will take up the earth from the ditch and carry the same upwardly until they reach a position past the vertical center of the wheel, when they will fall in the direction indicated by arrow in Fig. 7, and, their shanks 42 striking violently against the preceding stops 44, they will discharge their contents into the elevating-carrier 45, presently described.

Should a scoop encounter a rock or other hard substance which it is not capable of penetrating, the spring 40, in rear of the plunger 38, to which the shank 42 of such scoop is connected, will give, and the inclined plane 43, riding down the inclined plane 36, will enable the scoop to pass over the rock without injury, and when the rock is passed the scoop will, by reason of the spring and the inclined planes 36 43, be caused to reassume and will be held in the normal operative position shown in Fig. 7.

The scoops 41 are of a peculiar construction in that they have their inner walls 46 extended forwardly beyond their other walls and provided with side flanges 47. These extended and flanged walls are designed and adapted, as will be readily appreciated, to prevent the earth from leaving the scoops until said scoops reach the position where they discharge into the carrier 45. The scoops 41 are of a width corresponding to the width of the ditch to be dug, and my invention contemplates detachably connecting the scoops to their shanks, so that they may be removed and replaced by scoops of greater or less width as desired, or, if desired, the scoops and their shanks may be removed from the wheel and replaced by scoops of another size having shanks of their own.

The excavating-wheel 33 is driven by the engine on the platform 2, through the medium of the shafts 11 and 20, before described, the gear-wheel 50 on shaft 20, the shaft 51, the gear-wheel 52, fixed thereon and meshing with the wheel 50, the gear-wheel 53, which is connected and movable with the vertically-movable frame 18, and is mounted on the shaft 51, so as to slide thereon and turn therewith, the shaft 54 on the frame 18, the gear-wheel 55, fixed on the shaft 54 and meshing with the wheel 53, the pinion 56, also fixed on the shaft 54, the shaft 57, the gear-wheel 58, fixed thereon and meshing with the pinion 56, the sprocket-wheels 59, also fixed on the shaft 57, the shafts 60, journaled in the hangers 31 and having the sprocket-wheels 61 at their outer ends, the sprocket-chains 62, connecting the wheels 59 and 61, and the pinions on the inner ends of the shafts 60, meshing with the internal gears 37 of the excavating-wheel 33. From this it will be seen that when the engine is actuated and the shaft 11 is rotated in the proper direction motion will be transmitted to the wheel 33, and said wheel will be rotated in the direction indicated by arrow in Fig. 2, and this regardless of the height to which the vertically-movable frame 18 has been adjusted. It will also be observed that when it is desirable the vertically-movable frame 18 may be raised or lowered and the wheel 33 rotated in concert.

The elevating-carrier 45 is arranged in the

relation better illustrated in Fig. 2 to the wheel 33, and it preferably comprises the frame sides 70, which are connected to the frame 18 and are braced by the straps 71, the shafts 72 and 73, journaled in the frame sides 70, adjacent to the lower and upper ends thereof, the rollers 74, fixed thereon, and the belt 75, taking around the rollers 74 and provided with buckets 76. Said carrier is designed and adapted at its upper end to discharge into a laterally-extending trough, (not illustrated,) and it is driven from the shaft 57, before described, through the medium of the gear-wheel 58, the shaft 80, having the pinion 81, meshing with the wheel 58, the beveled gear 82 on shaft 80, the transverse shaft 83, the pinion 84 on said shaft meshing with the gear-wheel 82, the sprocket-wheels 85, fixed on shaft 83, the sprocket-wheels 86, fixed on the shaft 73, and the sprocket-chains 87, taking around the wheels 85 86.

In the practice of the invention the traction-wheels 9 travel along in advance of the ditch, and the wheels 6 travel on opposite sides of the ditch, and the movements of the parts are preferably so timed that the machine will travel a distance of four feet while the wheel 33 is completing one revolution, and the speed is preferably such that the revolution of said excavating-wheel will be completed in one minute. Consequently each scoop will excavate one lineal foot at every stroke, and the wheel, having four scoops, will therefore excavate four lineal feet per minute.

It will be observed that my improved machine is very simple, practical, and efficient, and it will also be observed that it may easily operate by one or two hands, which is an important advantage and a desideratum in this class of devices.

I have in some respects specifically described the construction and relative arrangement of the parts of my improved machine in order to impart a full, clear, and exact understanding of the same. I do not desire, however, to be understood as confining myself to such specific construction and arrangement of parts nor to the specific gearing described, as such changes or modifications may be made in practice as fairly fall within the scope of my invention.

Having described my invention, what I claim is—

1. In an excavating-machine, the combination of the main frame having guide-uprights, an engine carried thereby, a vertically-movable frame also carried by the main frame and arranged between the uprights, shafts journaled in the main frame and provided with drums and gears, worm-screws engaging said gears, a connection intermediate of the engine and the worm-screws for rotating said screws; the said connection being adapted to be interrupted, cables connected to the vertically-movable frame, taking over sheaves on the guide-uprights of the main frame and adapted to be wound on the drums, an excavating-wheel carried by the vertically-movable frame, a carrier also carried by the vertically-movable frame and arranged to receive from the excavating-wheel, a shaft journaled on the vertically-movable frame and provided with a gear-wheel and connected by intermediate mechanism with the excavating-wheel and carrier, a vertical shaft rising from the main frame, mechanism intermediate of the engine and said shaft, and a gear-wheel mounted on said shaft so as to turn therewith and slide thereon and carried by the vertically-movable frame and meshing with the gear-wheel of the shaft thereon, substantially as specified.

2. In an excavating-machine, the combination of the main frame having guide-uprights, an engine carried thereby, a vertically-movable frame also carried by the main frame and arranged between the uprights, shafts journaled in the main frame and provided with drums and gears, worm-screws engaging said gears, a connection intermediate of the engine and the worm-screws for rotating said screws; the said connection being adapted to be interrupted, cables connected to the vertically-movable frame, taking over sheaves on the guide-uprights of the main frame and adapted to be wound on the drums, hangers connected to the vertically-movable frame, an excavating-wheel arranged on a shaft and between the hangers and comprising internal gears, spokes arranged between the same and scoops arranged without the internal gears and having shanks extending between the same and connected to the wheel, shafts journaled in the hangers on opposite sides of the wheel and having gears at their inner ends meshing with the teeth of the internal gears, and sprocket-wheels at their outer ends, a shaft 57, journaled on the vertically-movable frame and having sprocket-wheels, chains connecting the sprocket-wheels on said shaft and the sprocket-wheels on the shafts in the hangers, a shaft 54, also arranged on the vertically-movable frame and connected by gearing with the shaft 57, and having a gear-wheel 55, a vertically-disposed shaft rising from the main frame, a gear-wheel mounted to slide on and turn with said vertical shaft and carried by the vertically-movable frame and meshing with the gear-wheel 55, and mechanism intermediate of the engine and said vertical shaft, substantially as specified.

3. In an excavating-machine, the combination of the main frame having guide-uprights, an engine carried thereby, a vertically-movable frame also carried by the main frame and arranged between the uprights, shafts journaled in the main frame and provided with drums and gears, worm-screws engaging said gears, a connection intermediate of the engine and the worm-screws for rotating said screws; the said connection being adapted to be interrupted, cables connected to the vertically-movable frame, taking over sheaves on the guide-uprights of the main frame and adapted

to be wound on the drums, hangers connected to the vertically-movable frame, an excavating-wheel arranged on a shaft and between the hangers and comprising internal gears, spokes arranged between the same and scoops arranged without the internal gears and having shanks extending between the same and connected to the wheel, shafts journaled in the hangers on opposite sides of the wheel and having gears at their inner ends meshing with the teeth of the internal gears, and sprocket-wheels at their outer ends, a shaft 57, journaled on the vertically-movable frame and having sprocket-wheels, chains connecting the sprocket-wheels on said shaft and the sprocket-wheels on the shafts in the hangers, a shaft 54, also arranged on the vertically-movable frame and connected by gearing with the shaft 57, and having a gear-wheel 55, a vertically-disposed shaft rising from the main frame, a gear-wheel mounted to slide on and turn with said vertical shaft and carried by the vertically-movable frame and meshing with the gear-wheel 55, a shaft 80, arranged on the vertically-movable frame and connected by gearing with the shaft 57, a shaft 83, carrying sprocket-wheels and connected by gearing with the shaft 80, a shaft 73, having sprocket-wheels, an endless elevator carried by the vertically-movable frame and taking around said shaft 73, and arranged to receive from the excavating-wheel, sprocket-chains connecting the sprocket-wheels on the shafts 83, 73, mechanism intermediate of the engine and the vertical shaft rising from the main frame, traction-wheels supporting the main frame and mechanism intermediate of the engine and said traction-wheels, substantially as specified.

4. In an excavating-machine, the combination of a main frame, an engine carried thereby, a vertically-movable frame also carried by the main frame, mechanism intermediate of the engine and vertically-movable frame for raising and lowering said frame, an excavating-wheel carried by the vertically-movable frame, a carrier also carried by the vertically-movable frame and arranged to receive from the excavating-wheel, a shaft journaled on the vertically-movable frame and provided with a gear-wheel and connected by intermediate mechanism with the excavating-wheel and the carrier, a vertical shaft rising from the main frame, mechanism intermediate of the engine and said shaft, and a gear-wheel mounted on said shaft so as to turn therewith and slide thereon and carried by the vertically-movable frame and meshing with the gear-wheel of the shaft thereon, substantially as specified.

5. In an excavating-machine, the combination of a rotary excavating or digging wheel having internal gears and also having scoops; the shanks of which extend between the internal gears, gear-wheels meshing with the teeth of the internal gears, and means for rotating said gear-wheels, substantially as specified.

6. In an excavating or digging machine, an excavating or digging wheel comprising an annular rim, scoops arranged without the rim and having shanks extending inwardly beside the rim and pivotally connected with the wheel, and stops arranged on the rim in advance of the shanks of the scoops, substantially as and for the purpose set forth.

7. In an excavating-machine, the combination of a rotary excavating or digging wheel comprising parallel internal gears, scoops arranged without the internal gears and having shanks extending inwardly between the internal gears and pivotally connected with the wheel, and stops arranged between the internal gears in advance of the shanks of the scoops, gear-wheels meshing with the teeth of the internal gears, and means for rotating said gearing wheels, substantially as and for the purpose set forth.

8. In an excavating-machine, an excavating or digging wheel comprising spokes having inclined planes, spring-backed plungers or slides, scoops, and shanks connected to the scoops and loosely connected to the plungers or slides and having inclined planes engaging the inclined planes of the spokes, substantially as specified.

9. In an excavating-machine, an excavating or digging wheel comprising spokes having inclined planes, and also having angular arms at an intermediate point of their length, spring-backed plungers or slides arranged between the spokes and the angular arms thereof, scoops, and shanks connected to the scoops and loosely connected to the plungers or slides and having inclined planes engaging the inclined planes of the spokes, substantially as specified.

10. In an excavating-machine, an excavating-wheel comprising spokes having inclined planes and also having angular arms at an intermediate point of their length; the said spokes and angular arms having guide-tongues, plungers or slides arranged between the spokes and the angular arms and grooved to receive the tongues thereof, springs interposed between the plungers or slides and the spokes, scoops, and shanks connected to the scoops and loosely connected to the plungers or slides and having inclined planes engaging the inclined planes of the spokes, substantially as specified.

11. In an excavating-machine, the combination of an excavating or digging wheel comprising spokes having inclined planes, spring-backed plungers, internal gears arranged upon and connected to opposite sides of the spokes, scoops, shanks connected to the scoops and extending between the internal gears and loosely connected to the plungers or slides and having inclined planes engaging the inclined planes of the spokes and stops ar-

ranged between the internal gears in advance of the shanks, gear-wheels meshing with the teeth of the internal gears, and means for rotating said gear-wheels, substantially as specified.

12. In an excavating-machine, the combination of an excavating or digging wheel comprising spokes having inclined planes and also having angular arms at an intermediate point of their length; the said spokes and angular arms having guide-tongues, internal gears arranged upon opposite sides of and connected to the spokes, plungers or slides arranged between the spokes and the angular arms and grooved to receive the tongues thereof, springs interposed between the plungers or slides and the spokes, scoops, shanks connected to the scoops and extending between the internal gears and loosely connected to the plungers or slides and having inclined planes engaging the inclined planes of the spokes, and stops arranged between the internal gears in advance of the scoop-shanks, gear-wheels meshing with the teeth of the internal gears, and means for rotating said gears, substantially as specified.

13. In an excavating-machine, a rotary excavating or digging wheel comprising parallel rims, the scoops arranged without the annular rims and having their inner walls extended forwardly and provided with side flanges and also having shanks extending inwardly between the annular rims and pivotally or loosely connected with the wheel, and stops arranged between the annular rims in advance of the shanks of the scoops, substantially as specified.

14. In an excavating-machine, the combination of a main frame, an engine thereon, a vertically-movable frame carried by the main frame, mechanism intermediate of the engine and the vertically-movable frame for raising and lowering the latter, hangers connected to the vertically-movable frame, an excavating-wheel arranged on a shaft and between the hangers and comprising internal gears, spokes arranged between the same and scoops arranged without the internal gears and having shanks extending between the same and connected to the wheel, shafts journaled in the hangers on opposite sides of the wheel and having gears at their inner ends meshing with the teeth of the internal gears, and sprocket-wheels at their outer ends, a shaft 57, journaled on the vertically-movable frame and having sprocket-wheels, chains connecting the sprocket-wheels on said shaft and the sprocket-wheels on the shafts in the hangers, a shaft 54, also arranged on the vertically-movable frame and connected by gearing with the shaft 57, and having a gear-wheel 55, a vertically-disposed shaft rising from the main frame, a gear-wheel mounted to slide on and turn with said vertical shaft and carried by the vertically-movable frame, and meshing with the gear-wheel 55, and mechanism intermediate of the engine and said vertical shaft substantially as specified.

15. In an excavating or digging machine, the combination of an excavating or digging wheel comprising an annular rim, scoops arranged without the rim and having shanks extending inwardly beside the rim and pivotally connected with the wheel, and stops arranged on the rim in advance of the shanks of the scoops, and an elevator arranged in rear of the wheel so as to receive from the scoops when the shanks thereof engage the stop on the annular rim, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

FRED S. HOYT.

Witnesses:
T. A. CUNNINGHAM,
J. F. FORD.