W. W. BILLINGTON & W. BURNETT.

DITCH DREDGING MACHINE.

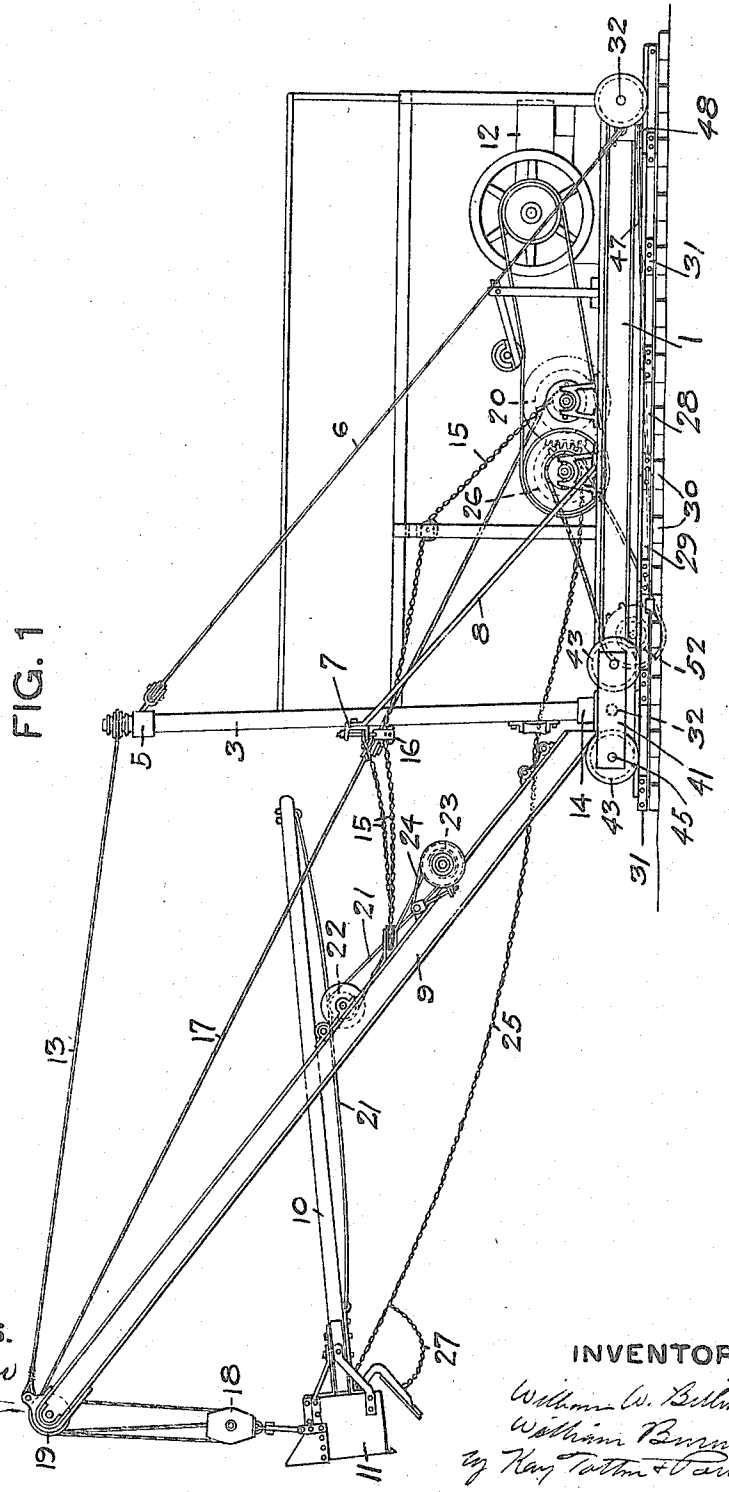
APPLICATION FILED SEPT. 25, 1913.

1,271,010.

Patented July 2, 1918.

4 SHEETS—SHEET 1.

FIG. 1



WITNESSES.

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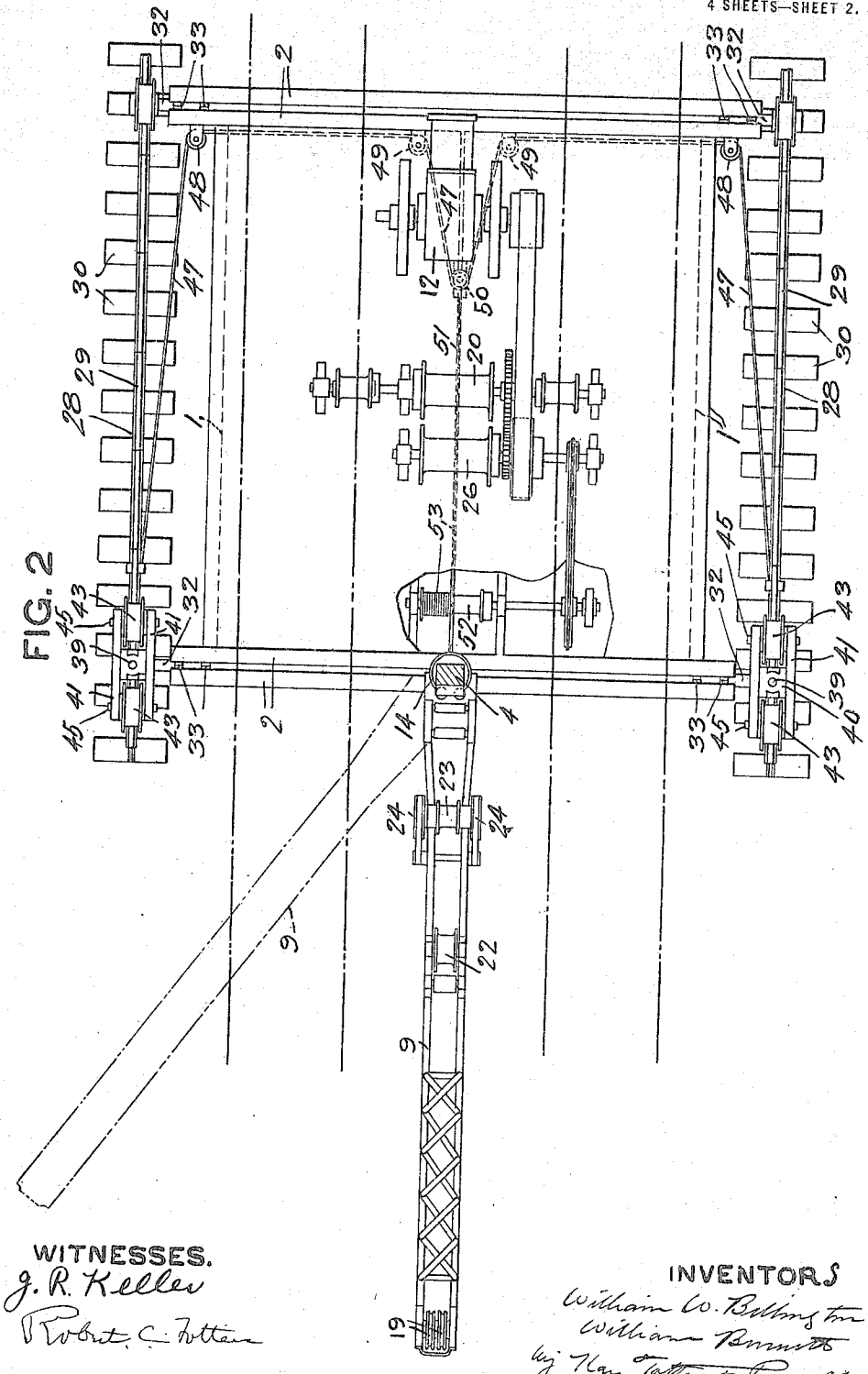


FIG. 2

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4 SHEETS—SHEET 3.

FIG. 3

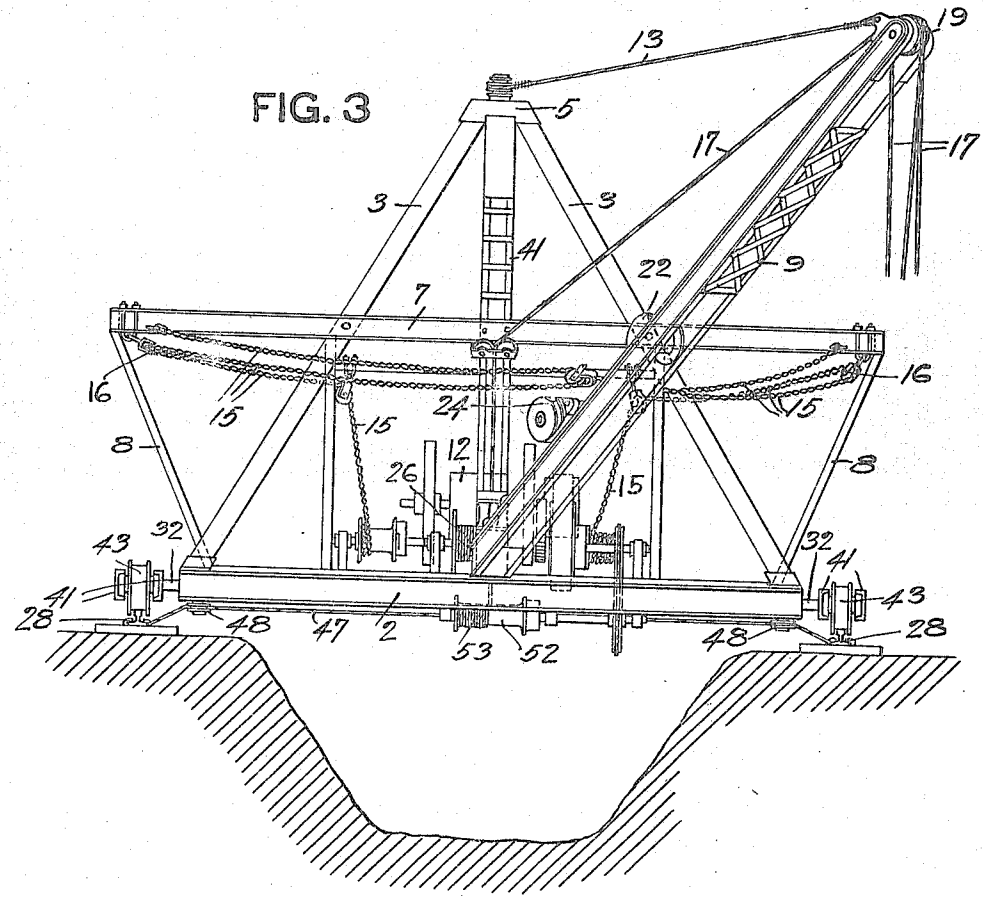


FIG. 9

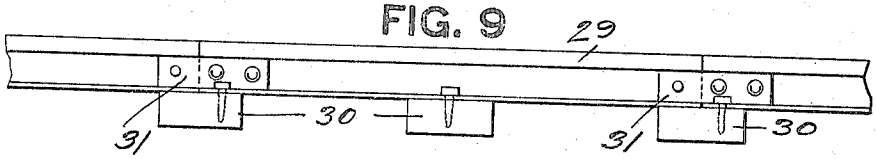
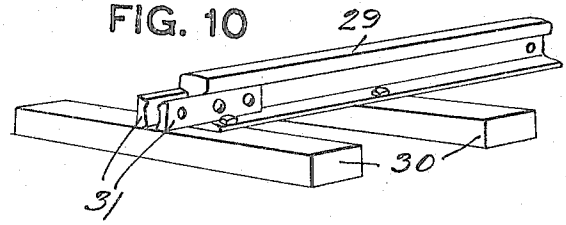


FIG. 10



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DITCH DREDGING MACHINE.

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4 SHEETS—SHEET 4.

FIG. 4

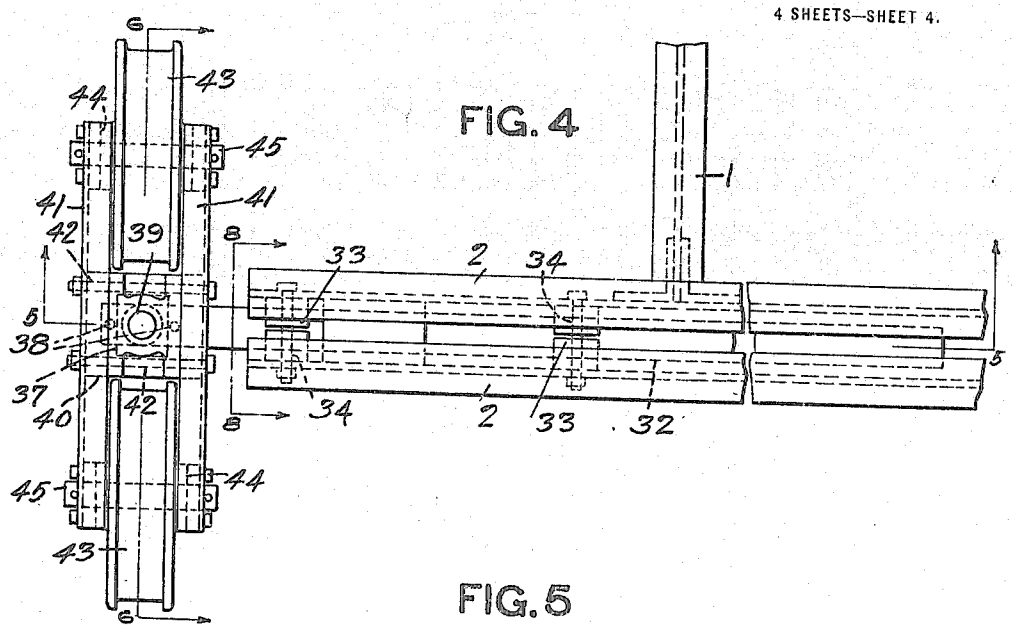


FIG. 5

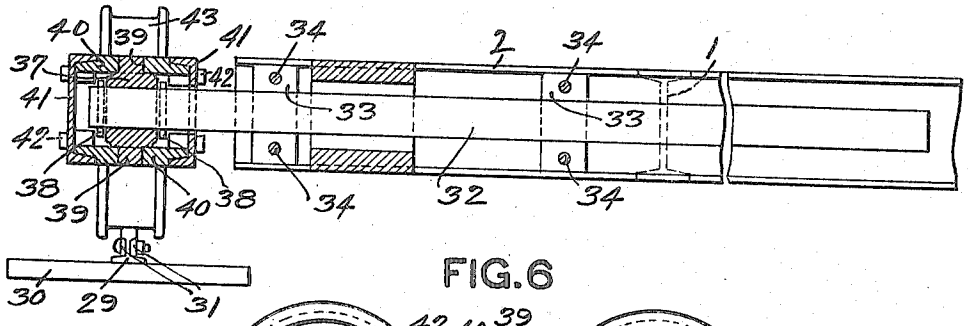


FIG. 6

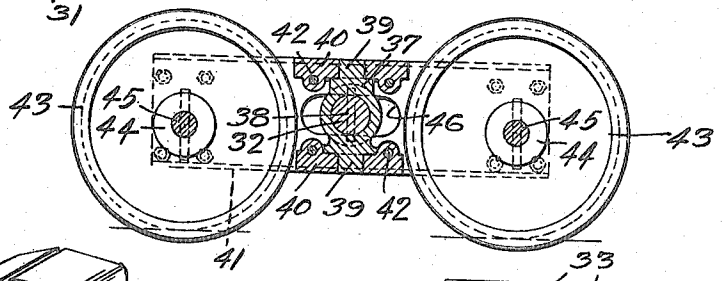


FIG. 7

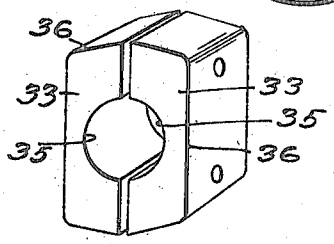
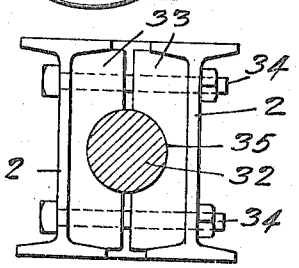


FIG. 8



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UNITED STATES PATENT OFFICE.

WILLIAM W. BILLINGTON AND WILLIAM BURNETT, OF BAY CITY, MICHIGAN, ASSIGNORS TO BAY CITY DREDGE WORKS, A CORPORATION OF MICHIGAN.

DITCH-DREDGING MACHINE.

1,271,010. Specification of Letters Patent. Patented July 2, 1918.

Application filed September 25, 1913. Serial No. 791,728.

To all whom it may concern:

Be it known that we, WILLIAM W. BILLINGTON and WILLIAM BURNETT, citizens of the United States, and residents of Bay City, in the county of Bay and State of Michigan, have invented a new and useful Improvement in Ditch-Dredging Machines; and we do hereby declare the following to be a full, clear, and exact description thereof.

Our invention relates to ditch dredging machines, the object being to provide a machine for dredging ditches which is supported above the ditch, and adapted to span the portion of the ditch already dug, and to work along the ditch in such way as to provide for the rapid digging of the same, and for the disposition of the earth removed on either side of the ditch.

The usual custom in the digging of these ditches with power driven machines, has been either to place the ditch machine in the ditch and work along the bottom of the ditch, or to place the machine on the solid ground to one side or ahead of the ditch, and work with a scoop bucket to one side or behind the machine. Both these methods have been found to be objectionable and slow and costly in their operation. By the present invention we are enabled to operate more rapidly, accurately, and to do the work much more cheaply, and also are able to obtain a better control of the machine in the manner of operating upon the earth to remove the same, and also in the manner of moving the dredging machine, and also in the handling of the machine itself and in making the same extensible, so as to suit the different widths of ditch, and to go around curves, bends or angles, or over small obstructions, and by reason of our machine's lightness, over softer or marshy earth.

It comprises, generally stated, a ditching machine having a frame adapted to span the portion of the ditch already dug, and ditching mechanism mounted at the forward end of the frame and operating in its digging stroke on a level below the ditch and forward thereof, so the strokes in the digging operation are either horizontal or at an upward incline and it is not required to carry the dirt to any great height above the body of the frame. It comprises also the combination with the frame of portable tracks therefor on opposite sides of the ditch being dug, of connections to said tracks for the moving of the machine frame as the work progresses, of means for extending the axles transversely of the machine, to provide for wider or narrower tracks, and trucks for mounting the frame on the track to allow of its following an irregular track both as to width and height. It also comprises other improvements as hereinafter fully set forth.

In the accompanying drawings Figure 1 is a side view of the ditching machine; Fig. 2 is a plan view thereof; Fig. 3 is a front view of the machine, these views showing the position of the machine in spanning the ditch. Fig. 4 is a detail view of the truck and extensible axles and their support; Fig. 5 is a sectional view on line 5—5 Fig. 4; Fig. 6 is a section on line 6—6 Fig. 4; Fig. 7 is a detail of the axle frame; Fig. 8 is a view on line 8—8 Fig. 4; and Figs. 9 and 10 are detail views of the track.

The dredge is mounted on a suitable machine frame which is preferably rectangular in shape and is built of suitable structural beams. As illustrated in the drawing the frame has the longitudinal beams 1 connected to the cross beams 2, two such cross beams being placed at the front of the machine and two at the rear thereof. These cross beams sustain and carry the machine and contain the extensible axles, which can be adjusted according to the width of the ditch to be dug, as hereafter described. Rising from the front of the machine frame is the A-frame 3—3 and midway of the same is the vertical mast 4 which is connected to the machine frame in a suitable manner and is also connected to the A-frame through the casting 5. This A-frame is properly braced by means of the equalizing and stay cable 6 extending back to the rear of the machine frame which allows for the warping of frame when going over uneven ground. Extending across the A-frame above midway of its height is the cross beam 7 which is connected both to the A-frame and to the mast, and has its end portions connected to the machine frame by the braces 8—8. Mounted in a suitable casting secured to the main frame midway of the front thereof, at the base of the mast 4, is the boom 9 which is illustrated as formed of structural beams suitably braced and passing through the same is the dipper handle 10 carrying the dipper 11 at

its outer end. On the machine frame are a suitable number of drums which are driven by connections from the engine 12 mounted on said frame, the engine as illustrated being of the oil and gas explosion type. Suitable connections are made from the said engine by suitable pulleys, shaftings, belts and the like, and through suitable friction clutches and drums for the driving of the parts of the dredging machine by cables and chains. For example, the upper end of the boom 9 being supported by the holding cable 13 extending to the casting 5 at the upper end of the A-frame, said boom is caused to swing on the casting mounted on its pivot casting 14 by means of the cables or chains 15 extending around the sheave pulleys 16 mounted at the ends of the cross beam 7 and thence through suitable guide sheaves to the drums. The mast and A-frame lean slightly forward so the boom and dipper always swing back to their central position. In like manner the dipper or bucket is raised and lowered by means of the cables 17 operating around the pulley 18 connected to the dipper and passing around sheaves 19 at the outer end of the boom and thence over a sheave on the A-frame to the drum 20. The dipper and handle are controlled by means of a cable 21 connected to each end of the handle and passing around an idler roller 22 on boom to drum 23 on boom controlled by brake band 24. The lower end of the dipper is connected by the chain 25 extending through the base of the boom and mast to the drum 26 which chain is to pull the dipper back in place to dig, and by short connecting chain 27 is to pull the latch and open bottom of dipper so contents drop out and are deposited where wanted. The machine frame is mounted to travel upon tracks 28 on each side of the ditch, these tracks resting on the edges of the bank, which are known as berms. The berms do not need to be specially level, the only requirement being that the tracks on either side of the ditch be approximately the same distance apart, though as the wheels have double flanges and have wide bearing faces, the bearing faces of the wheels being, say, 6 inches, while the rail heads are, say, 2 inches, allowance is thus made for the machine following the tracks even though the tracks are inaccurately spaced apart. The tracks are made in short sections of a few feet and each section 29, Fig. 10, has one or more cross ties or planks 30 bolted thereto to rest on the berm. As shown in Fig. 10 each such section of track has at one end thereof the fish plates 31 bolted thereto, and extending out in front thereof, so that the next adjoining section can be fitted between these fish plates 31 and bolted thereto, say, by a single pin or bolt, thus allowing for the track sections to follow the surface of the ground, even though it may be irregular. It is the duty of the men on each side of the ditch to take up these track sections after the machine has passed off them, and carry them forward and make them ready for the further travel of the machine, which usually pulls itself ahead 8 feet or more at a shift.

These ditches are made of different widths and it is often desired that the same ditch shall be of different widths, for example, being gradually increased in width from its head down to its mouth, or vice versa, according as the machine is operated. It is also very desirable that the machine shall not be too wide in order to overcome the necessity of carrying and dumping the dirt farther than necessary or to prevent the same from interfering with the track. To provide for this, we employ a laterally extensible solid or hollow axle adapted for the mounting, spreading and contracting of the wheels supporting the frame to any desired distance from the center of the ditch, and thus provide for the tracks to correspond in width to the ditch being dug. This can be accomplished in any suitable way. As illustrated in Figs. 4 to 8, we employ to that end extensible axles for wheel extensions mounted in the cross beams 2—2 of the main frame at the front and the rear of the machine. Such mounting is illustrated and arranged as follows:

Referring to the means for mounting the rear wheels, said wheels are mounted on the ends of axles 32 which extend transversely of the machine body, and between the cross beams 2—2 thereof, and are fitted within axle chair castings 33. These castings are secured in place by bolts 34 above and below the axles. The frame itself is intended to be quite wide, say, from 12 to 40 feet, and these extensible axles or wheel extensions may be 1 to 8 feet in length, and they extend through several such chairs so that as found desirable, the axles can be drawn out to extend the width of the track. The axle chair castings are made in two sections, one fitting on either side of the axle, and having semi-circular seats 35 therefor, while their outer edges 36 conform in shape to the inner faces of the web of each I-beam 2 against which such sections are to fit. The chair castings do not entirely envelop the axles, spaces being left between them so that by tightening up of the bolts 34, the chair castings can be made to grip the axles and hold them firmly to place and width desired. The cross beams 2 of the main frame have a limited adjustment in the frame to permit this clamping action. The extensible axles or wheel extensions can, of course, be extended out a considerable distance by being drawn out through the loosened inner chair castings 33 when a very wide track is desired,

and pushed in or closed to width of machine or length of cross beams 2 when a narrow track is required.

In practice we find it very desirable to mount at least the forward supporting wheels in trucks capable of both vertical and horizontal swing to conform to the irregularities of the track, and to provide for the guiding of the machine frame around curves, angles and corners, such as where there are bends or the like in the ditch. We find the machine operates well with such trucks only at the forward end of the machine frame, through, of course, they may be employed at both ends. Such truck mounting is illustrated in Figs. 4 to 6, and its object is to provide for both the vertical swinging of the trucks and their wheels thereby adapting the frame to vertical irregularities in the track, and for the lateral swing of the same as indicated above, or to enable the truck to conform to lateral irregularities in the track or for guiding purposes as above stated, and any suitable mounting to this end may be employed.

We will now describe that illustrated in the drawing.

Mounted at the outer end of the extension shaft or axle 32 of the machine frame is a cast steel hub 37 fitting loosely around the axle shaft, which has collars or pins 38 on either side thereof to hold it in place. This hub has at the upper and lower edges thereof the two cylindrical journals 39 which fit in holes or seat in the top and bottom swivel plates 40, respectively. Such swivel plates are illustrated in Figs. 4 to 6. These swivel plates conform to and fit within and are bolted to the truck side frames 41 centrally of the length thereof. The bolts 42 extend through the bolt holes in the swivel plates and through the web portions of the channels. The side frames form the bodies of the swivel trucks and extend out on both sides of the swivel plates a sufficient distance for the mounting of the two wheels 43 between them. At the ends of the channels are bearing blocks 44 bolted between the flanges and against the web of the beams and through these bearing blocks and the wheels 43 extend the axles 45 which are held at the end by suitable cotter pins. Thus the two wheels are supported in the truck frame on both sides of the extensible axle 32 and the truck is free to swing on horizontal planes, that is, to the right or left according as the flanges of the wheels 43 may contact with the head of the rail forming the track, thus overcoming the necessity of providing perfect alinement of the track on opposite sides of the ditch as above referred to. The trucks can also move vertically as the hub piece 37 may roll around the shaft or axle 32 and this enables the trucks to follow the track though it may be of varying height or width or on account of the irregularity of the surface of the berms along the sides of the ditch.

To provide for the lateral swing of the trucks on the extensible shafts or axles the inner side frame 41 has the oblong slot 46 extending through the web thereof. This slot may be made of any desired length and its end portions may act as stops limiting the swing of the truck.

In order to move the machine bodily along the tracks I provide the wire cable or chain 47, Fig. 2 carrying hooks at its ends which engage directly with the base of track sections, or may be looped around the rails of the track sections. These connections are usually made close up to the forward wheels or trucks and the cable or chain extends back to the sheave pulleys 48 mounted near the inner ends of rear cross beam, thence to sheave pulleys 49 hung near center of rear cross beam, thence to equalizing sheave pulley 50 which runs on trolley or track 51. This equalizing pulley is connected to drum 52 by cable 53 which when wound up pulls the machine ahead. It will be noted that in so providing for the forward movement of the machine, the connection is made between the wheels supporting the frame on the track and near the two front trucks, so that the track portion to which connection is made is held in place by the considerable weight of the machine, and liability of movement of the track under the strain of drawing the machine forward is overcome. Thus by the winding of the rope upon the drum 52 the machine can be moved forward step by step as desired through the operation of a controlling lever, and a mechanism of sufficient strength for this purpose is provided, even though the track may be of irregular height or width as above referred to or one or both the rear wheels should be off the track. The machine may be blocked in position in any suitable way to sustain the strain in operating the dipper, though we find that this may be easily accomplished by the laying of chains in front and behind and close to the wheels on the tracks so that if the double flange wheels are forced back against the chains they clamp the same around the rail head, this being found sufficient to resist the heavy strain for the operation of the dipper in its regular digging or ditching strokes.

As so constructed, the operation is as follows:

The tracks being laid and the machine erected thereon, the first operation is the digging of the pit. When this is accomplished the machine is operated with one man on each side of the ditch and one man operating the dipper, boom and pull ahead device. The men on each side of the ditch unfasten the track sections from which the

machine has passed, and carry them forward and fasten them in front of the front section of the track, and if necessary make some rough leveling of the berm to receive the ties and blocking carrying the rail and see that they have as solid a support as possible. They also from time to time arrange the pulling ahead cable or chain 47 disconnecting its ends from the rails when the machine has traveled close up to the points of connection thereto, carrying them forward and connecting them to other rail sections close to the front wheels. The main operator proceeds with the ditching by the operation of the boom and dipper. The operation differing, however, in the fact that all the digging is below the machine frame, and the strokes of the dipper or bucket are either horizontal along the base and sides of the portion of the ditch close to the machine, or at an upward incline where the ditch is being extended, while it is only necessary for the dipper to be lifted to a height sufficient to swing it over to the sides and deliver the dirt to the embankments or roadway along the berms, no great lifting of the dipper or bucket above the frame of the machine is usually required and this allows the boom to be supported at a lower incline, and, therefore, have a much longer range for the ditching operation, and to reach farther forward in the strokes extending the length of the ditch and for a longer sweep in extending the side walls thereof and dumping the dirt farther away. The operator can also dig the ditch to a fairly accurate depth as he has only to lower the dipper to the proper position for horizontal travel over the bottom of the ditch, and thus is enabled to regulate its depth, or its incline or fall as desired. As these strokes of the dipper are either horizontal or at an upward incline, the digging is made much easier and the work can proceed rapidly. The operator from time to time moves the machine forward by the connections with the rails, and the work proceeds more accurately and rapidly than in the ordinary ditching operation where the work is done within the ditch itself and the dirt lifted so high, or where the machine is located ahead or to one side of the ditch being dug and the scoop bucket dragged by cable, or over a guided boom as is now customary. Practical use has shown that the operations can be carried on with our dredge even where a large portion of the ditch is under water, and the proper depth of ditch is attained according to the surveyors' stakes usually driven along the edges of ditch to be dug, by operator occasionally measuring depth with a pole and watching the marks on the dipper handle.

No special care is necessary in laying of the tracks, the only requirement is that the berm or edge portion of the ditch shall be sufficiently solid to support and permit the travel of the machine along the same, and in swampy places grass and brush is cut and employed with good results in carrying the tracks.

What we claim is:

1. In a ditching machine, the combination of a machine frame adapted to span the ditch, chairs supported in cross beams of said machine frame and axles clamped in said chairs and longitudinally adjustable to vary the width of the machine, said axles carrying the supporting wheels at the ends thereof.

2. In a ditching machine, the combination of a machine frame having transverse beams set close to each other, chairs fitting between said beams, and axles fitting within and adapted to be clamped by said chairs to provide for the lateral extension of the axles to conform to different widths of track.

3. In a ditching machine, the combination of a machine frame having the cross beams set close to each other, axle chair castings fitting within said beams and having axle seats formed on their inner faces, an axle fitting within said chairs and means for clamping the chairs around said axles, and supporting wheels at the ends of the axle, substantially as and for the purpose set forth.

In testimony whereof, we the said WILLIAM W. BILLINGTON and WILLIAM BURNETT, have hereunto set our hands.

WILLIAM W. BILLINGTON.
WILLIAM BURNETT.

Witnesses:
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."