April 26, 1927. 1,625,912

B. M. ROLPH

EXCAVATING MACHINE

Filed Aug. 2, 1924 5 Sheets-Sheet 1

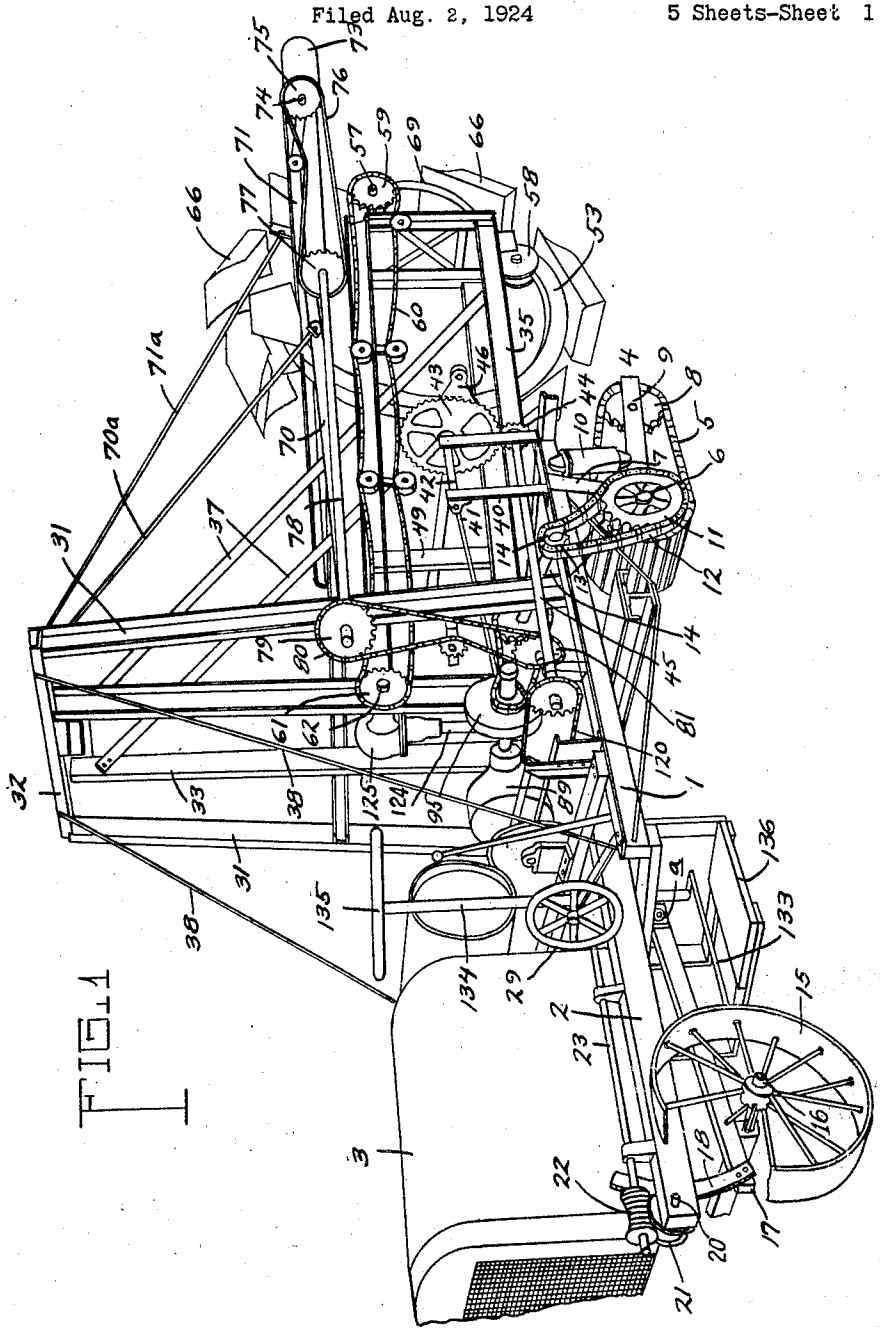


FIG. 1

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April 26, 1927. 1,625,912

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EXCAVATING MACHINE

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FIG. 2

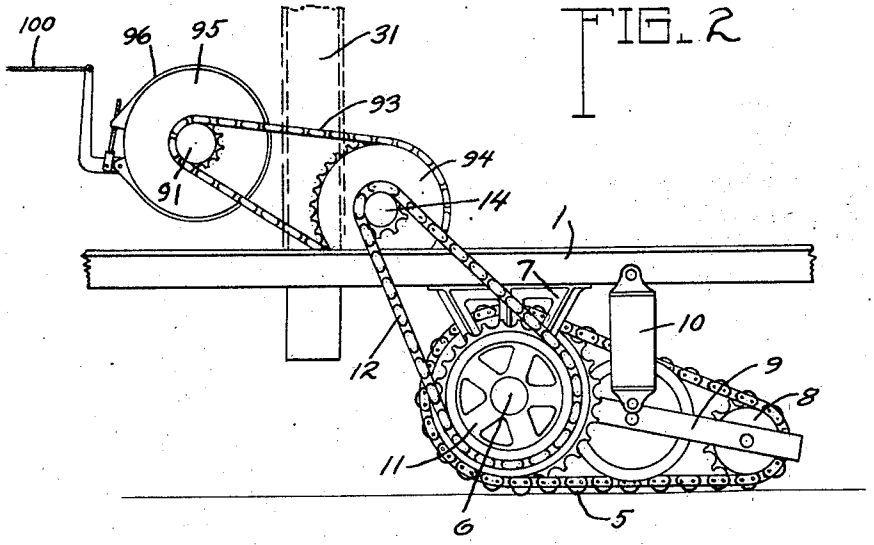
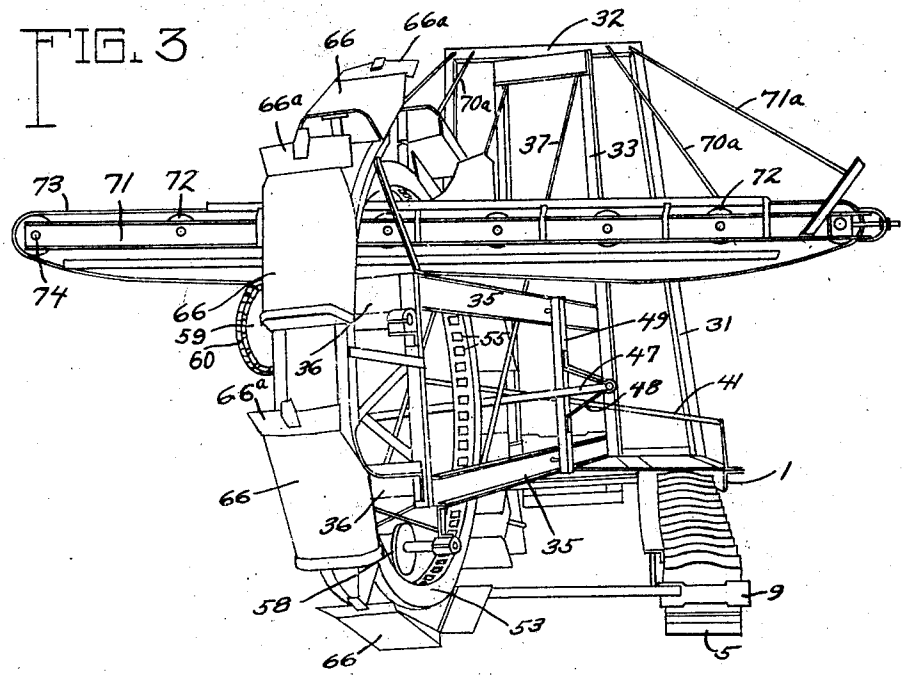


FIG. 3



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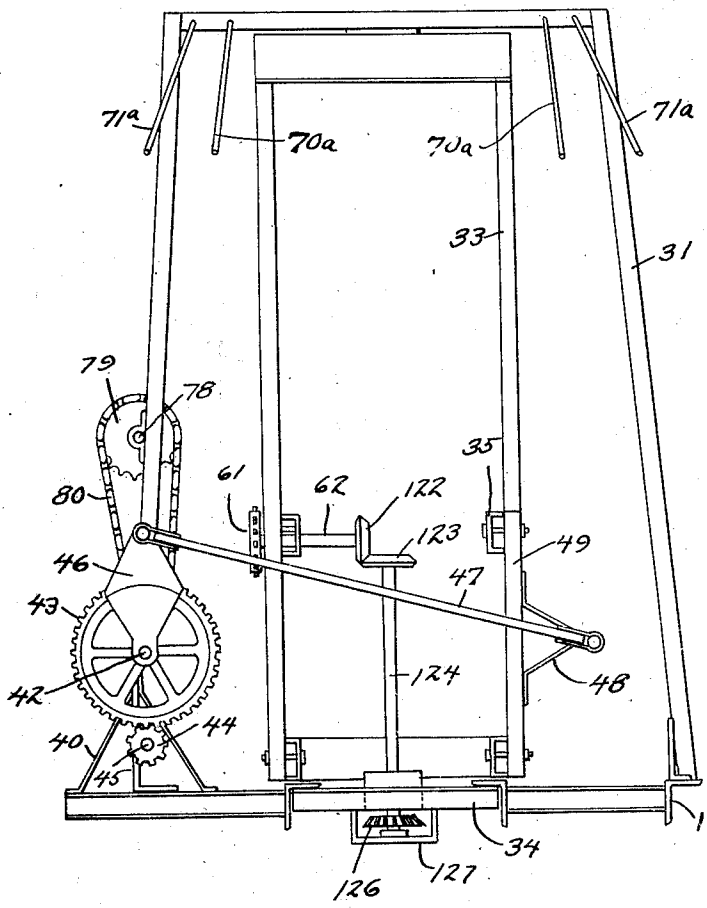
April 26, 1927. 1,625,912

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EXCAVATING MACHINE

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FIG. 4.



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April 26, 1927. 1,625,912

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EXCAVATING MACHINE

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FIG. 5

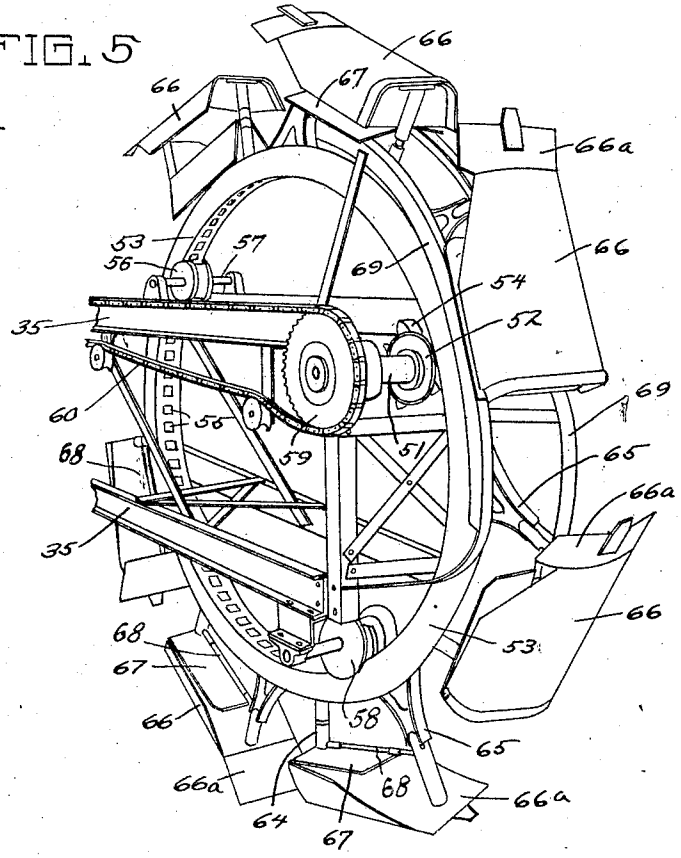
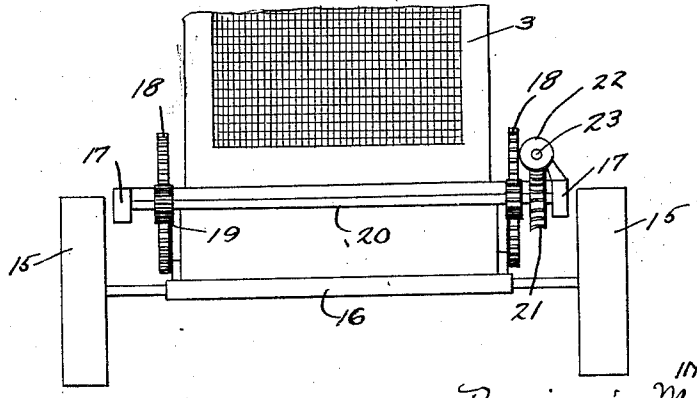


FIG. 6



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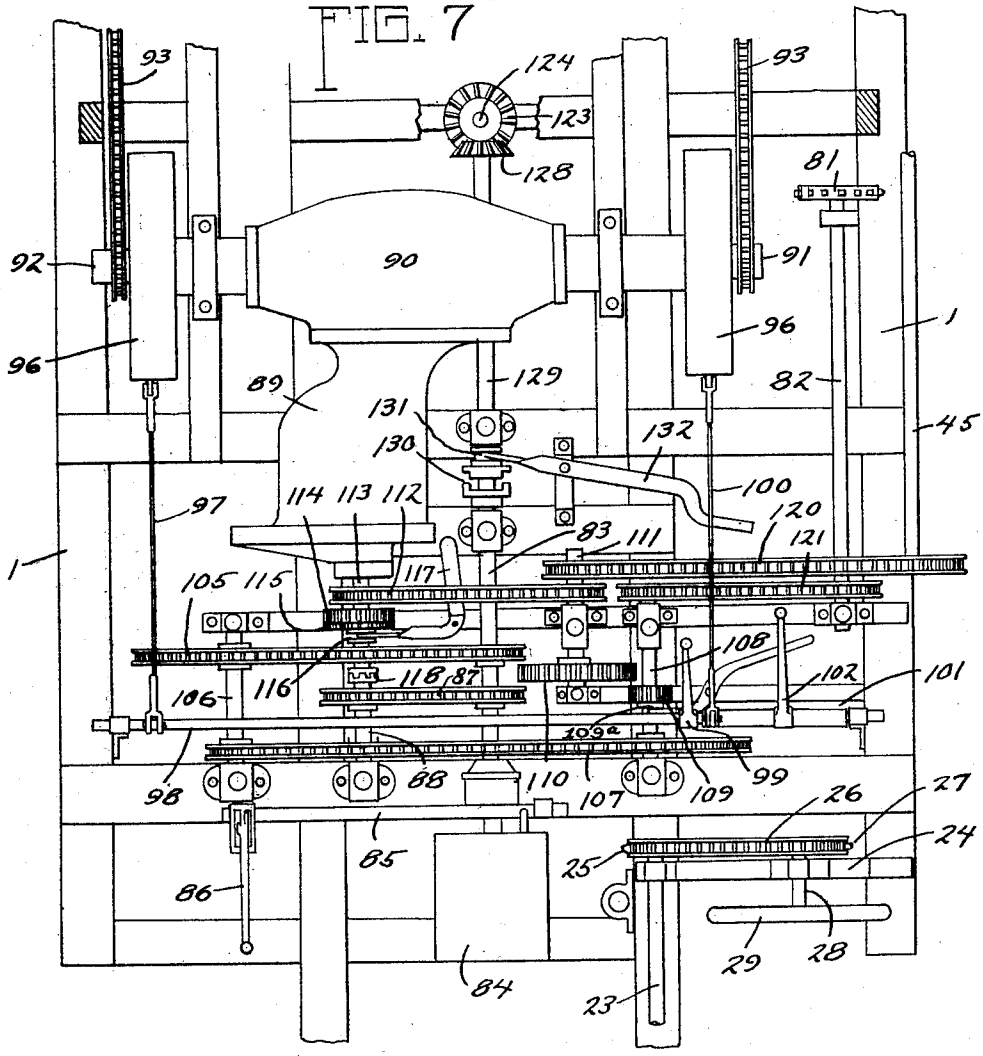
April 26, 1927. 1,625,912

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EXCAVATING MACHINE

Filed Aug. 2, 1924 5 Sheets-Sheet 5

FIG. 7



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Patented Apr. 26, 1927. 1,625,912

UNITED STATES PATENT OFFICE.

BENJAMIN M. ROLPH, OF DIXON, ILLINOIS.

EXCAVATING MACHINE.

Application filed August 2, 1924. Serial No. 729,840.

My invention has reference to excavating machines, the chief purpose of which is to provide means for the removal of a quantity of earth from a street, road, or other place in an expeditious manner, and without having to resort to the slow and tedious method of loading the dirt into wagons by means of hand-shovels as is the present practice. It also displaces to a large extent the present steam shovel, being of much lighter build, and capable of being operated more rapidly and to greater advantage than with one of said steam shovels.

The machine is self-propelled, and is capable of cutting a trench or excavation of several feet in width, in one movement of the machine. To accomplish this the machine has a gradual forward movement, accompanied by an oscillating lateral movement of the excavating devices.

The excavating devices consist of a large wheel rotatably mounted in the front of the machine, and provided with a plurality of buckets for successive engagement with the earth. These buckets are also of a special construction, to permit the delivery of the contents thereof to a conveyor provided for that purpose.

When the machine is in action there are several sub-operations, each under the control of a separate group of mechanism, and all deriving their movement from a central source of power carried by the machine. One of these groups moves the machine forward, or the reverse, if required, another group imparts rotation to the ditching wheel, still another group of devices operates to swing the ditching wheel from side to side within predetermined limits simultaneously with the forward movement of the machine, while another group provides means for carrying the excavated material to one side of the line of travel of the machine. Associated with said various groups of mechanisms are devices for reducing and otherwise varying the speed of the various parts, and means for disabling the various mechanisms, independently of each other.

The foregoing, and other features and advantages of the invention will be more fully understood from the following specification, reference being had to the drawings accompanying the same, in which:—

Fig. 1 is a perspective view of a machine embodying the invention, with some portions thereof broken away.

Fig. 2 is a detail of one of the tread devices and power transmission mechanism therefor.

Fig. 3 is a forward end elevation of the machine.

Fig. 4 is an elevation of the ditching wheel supporting frame, and operating devices therefor, from the front thereof.

Fig. 5 is a detail of the ditching wheel, and appurtenant devices.

Fig. 6 is a front end view of the frame structure.

Fig. 7 is a plan view, showing various power transmission mechanism.

The reference number 1 indicates a main frame, provided with a rearward extension 2, upon which is supported an internal combustion engine, under the casing shown at 3. The frame 1 is supported by a pair of caterpillar devices, each comprising a continuous tread 5, passing round a drum supported on a shaft 6, pivoted in a frame 7, secured to the frame 1. By this means the frame 1 is capable of a rocking movement on the shafts 6. The apron 5 passes round wheels 8 rotatably supported in the forward end of a frame 9, having a pivotal mounting on the shaft 6. The frame 9 is connected with the frame 1, so as to have a limited yieldable movement with relation thereto, by means of a tension device, shown at 10. Fixed on the shaft 6 is a sprocket-wheel 11, connected by a sprocket-chain 12 with a sprocket pinion 13 on the end of a shaft 14, journalled on the frame 1. Each side of the machine is provided with one of the shafts 14, for independent operation of the caterpillar devices, in the manner hereinafter set forth.

The rear end of the machine is fitted with a pair of carrying-wheels 15, carried on the ends of an axle 16, supported from a pair of arms 17, pivoted at their forward ends to the frame 1, as at *a*. Fixed to the rear ends of the arms 17 are arc-shaped gear-racks 18, in engagement with gear wheels 19 on a shaft 20, rotatably mounted in the rear end of the frame 2. Fixed to said shaft at one side of the frame is a worm drive wheel 21, engaged by a worm 22 on the end of a shaft 23, rotatably supported on the frame 2. The forward end of the shaft 23 is journalled in a bearing in a support 24, and is provided with a sprocket wheel 25, connected by a sprocket-chain 26 with a similar wheel 27 on a shaft 28, rotatably mounted in the sup-

port 24, and provided with a hand-wheel 29, by means of which the same may be rotated. By a proper rotation of the shaft 28 the gear wheels 19 are caused to move upwardly on the racks 18, elevating the rear part of the main frame, and correspondingly depressing the forward part, for the purpose hereinafter set forth.

Supported on the frame 1 is an arch frame 31, having a top piece 32, and within said frame is a frame 33, pivoted at a central point to the top-piece 32, at its upper end, and similarly pivoted at its lower end on a cross-piece 34, forming the lower part of the arch-frame 31. To the side-pieces of the frame 33 are attached a pair of rectangular frames 35, projected forwardly, and united at their forward ends by cross-bars 36. Said last-named frames are further secured to the frame 33 by braces 37, extending upwardly to the upper part of the frame 33. Rods 38 connect the frame 31 with the rear end of the frame 1, whereby the first-named frame is enabled to carry the weight of the frame 35, and the mechanism supported thereby.

The frame 35 is capable of receiving a lateral swinging movement by means of the following mechanism, shown more specially in Figures 1 and 4. Mounted on the forward part of the frame 1 at one side thereof is a vertical frame 40, braced by a rod 41, extending to the opposite side of the frame 1, and secured thereto. Rotatably supported on the upper part of the frame 40 is a shaft 42, to which is fixed a gear-wheel 43, in mesh with a gear-pinion 44 on a shaft 45, rotatably mounted on the side of the frame 1. Movement is imparted to the shaft 45, in the manner hereinafter shown, for giving rotation to the pinion 44 and wheel 43. Projected from one side of the wheel 43 is a crank-member 46, connected by a pitman 47 with a frame 48, attached to a vertical piece 49 uniting the longitudinal pieces of the frame 35 at the side of the machine farthest from the wheel 43, at a point in advance of the frame 31. A rotation of the wheel 43 imparts a swinging movement to the frame 33 on its pivots, carrying the frame 35 from one side to the other of the line of movement of the machine, and the reverse.

In the forward end of the frames 35 is journalled a shaft 51, on which is a roller 52 in engagement with the inner face of a rim 53. The central part of the periphery of said roller is fitted with teeth 54, for engagement with a plurality of openings 55 in the rim 53. At the opposite side said rim is supported by a roller 56 on a shaft 57 journaled on the frames 35. The inner face of the rim is also engaged by a roller 58, rotatably mounted on the lower side of said frames 35. On one end of the shaft 51 is a sprocket-wheel 59, connected by a sprocket-chain 60 with a similar wheel 61, fixed on a shaft 62, journaled in one of the frame pieces 33. Movement is imparted to the shaft 62 in a manner hereinafter set forth, to drive the wheels 61 and 59, causing a rotation of the rim 53. Projected from said rim are pairs of supports 64 and 65, to which are attached scoops 66, having cutters 66[a] at their forward edges. The bottoms of said scoops are formed of pairs of plates 67, hinged at a central point of the scoop to a rod 68, extending longitudinally thereof. Each scoop receives a load of dirt at the lowermost point in the movement of the wheel, and carries it to the uppermost point, where it is discharged upon a carrier, as hereinafter set forth. In the passage of the scoops upwardly the outer edges of the plates 67 travel on tracks 69, supported from the frames 35, and following the curve of the rim 53. Said tracks terminate at the top of the rim, permitting the bottom plates of the chutes to drop open.

The mechanism for conveying the contents of the scoops to one side of the machine, shown chiefly in Figures 1 and 3, is as follows:—

Attached to the side pieces of the frame 31, and projected forwardly therefrom, is a pair of arms 70, the forward ends of which are supported from the upper part of said frame by rods 70[a]. Secured to the forward ends of the arms 70 is a frame 71, disposed transversely of the machine, and passing through the rim 53, near the upper part thereof. Said frame is also braced from the upper part of the frame 31 by means of rods 71[a], the spread of said rods and of the rods 70[a] being sufficient to permit the oscillating movement of the ditching-wheel between the same. The frame 71 is provided at intervals with rollers 72, which carry an endless apron 73, adapted to receive the loads of earth as they are discharged from the scoops 66. At one end of the frame said apron passes over a drum on a shaft 74, fixed on which is a sprocket-wheel 75, connected by a chain 76 with a similar wheel 77, on the end of a shaft 78, journaled at one end in the frame 71 and at its other end on the frame 31. Fixed to the rear end of said shaft is a sprocket-wheel 79, connected by a sprocket-chain 80 with a similar wheel 81, on a shaft 82, journaled on the frame 1. (Fig. 7.) Said last-named shaft is driven in the manner hereinafter described, causing a movement of the apron 73 at such times as the ditching wheel is in operation. The earth and other matter received on said apron is carried to one end thereof, and dumped upon the ground at one side of the machine, or into wagons positioned beneath the end of the apron, by means of which it is carted away.

The main portion of the transmission devices, by means of which movement is imparted to the various mechanisms, is illustrated in Fig. 7, in which the main drive-shaft of the machine is shown at a central point at 83. 84 is a transmission casing just ahead of the motor, containing devices of a well-known type by means of which the shaft 83 may be given two or more speeds ahead, and a reverse movement. Said devices are under the control of a rod 85 and hand-lever 86, and would be employed chiefly when the machine is in movement on the road, with the ditching mechanism out of operation.

The shaft 83 is connected by sprocket transmission gearing at 87 with a shaft 88, rotatably supported and connected with transmission gearing in a casing 89, of a speed-reducing character. This last-named gearing is connected with a differential gear mechanism in a casing 90, from the opposite ends of which project shafts 91 and 92, carrying sprocket-pinions on their ends which are connected by chains 93 with sprocket-wheels 94 on the shafts 14. The power of the motor can be thereby applied independently to the tractor devices upon which the machine is carried. The shafts 91 and 92 also carry brake-drums 95, encircled by bands 96, one of which bands is controlled by a rod 97, connected with a short arm on a shaft 98, rockingly mounted on the frame 1, and provided with a hand-lever 99. The other band 96 is connected by a rod 100 with an arm on a sleeve 101, rockingly mounted on the shaft 98, independently thereof, said sleeve being fitted with a hand-lever 102 for operation. When either of the brake-bands is caused to embrace its correlated brake drum, the shaft on which such drum is fixed will be held from operation, and the tractor devices on that side of the machine will be interrupted from action. The continued movement of such devices at the opposite side of the machine will result in a movement of such machine out of a straight line. In the same manner the disabling of the tractor mechanism at the opposite side of the machine will cause a divergence of the machine in that direction.

The transmission of power through the gear devices 87 is intended chiefly for use when the machine is being transported from one point to another, or is being backed up, the active operation of the machine calling for a considerable reduction of speed of the tractor mechanism and other parts of the machine. This is accomplished in part by imparting the movement of the shaft 83 through a transmission gear mechanism shown at 105 to a shaft 106, rotatably mounted on the frame 1, and from this shaft through transmission gear devices 107 to a shaft 108, also rotatably mounted on the frame 1. In both of the last-named transmission devices the movement is communicated from a relatively small wheel to a larger one, with a corresponding reduction of speed. Slidable on the shaft 108, and rotatable therewith, is a gear pinion 109, subject to the control of clutch devices 109a, by means of which it may be brought into mesh with a gear wheel 110 on a shaft 111, mounted on a part of the main frame. The shaft 111 is connected by a transmission gearing 112 with a shaft 113, rotatably mounted just above the shaft 88. Fixed on the shaft 113 is a gear-wheel 114, adapted for engagement with a similar wheel 115, feathered on the shaft 88, and capable of being shifted into and out of mesh with the wheel 114 by means of clutch devices 116, controlled by a lever 117, fulcrumed on the frame. When the wheel 115 is shifted into engagement with the wheel 114, the transmission devices are disabled by means of a clutch mechanism at 118 connected therewith.

There is not only a reduction of movement through the transmission devices shown at 105 and 107, but the wheel 110 is of greater diameter than the wheel 109, resulting in a greater reduction of speed when said devices are in operation. As a result the machine is moved forward at a very moderate rate of speed.

The shaft 111 is also connected by a gear transmission shown at 120 with the shaft 45, for swinging the frames 35 from one side to the other. This is also done at a moderate rate of speed, on account of being affected by the various reductions of speed hereinbefore referred to. It will also be noted that the frame 35 will not be in movement when there is a direct connection with the traction devices through the shaft 88, as first described.

The shaft 108 is connected by a gear transmission 121 with the rear end of the shaft 82, associated with the conveyor devices, and after the wheels 109 and 110 are disengaged, the apron 73 will continue to travel, discharging any substance that may be thereon.

On the inner end of the shaft 62, is a bevel-gear wheel 122, (Fig. 4,) in engagement with a similar wheel 123 on the upper end of a vertical shaft 124 supported at a central point in the frame 31. Said wheels are held in a supporting casing 125, as shown in Fig. 1. On the lower end of the shaft 124 is a bevel-gear wheel 126, supported on a frame 127, secured to the cross-piece 34. The gear-wheel 126 is engaged by a similar wheel 128, on the end of a shaft 129, in line with the main drive-shaft 83, and adapted to be connected therewith by a clutch coupling 130, provided with a collar 131 for engagement by an operator's lever 132. By

this means the scoop wheel mechanism can be operated independently of the other devices, and thrown out of operation when it is desired to run some of the other groups of mechanism independently thereof.

In addition to the method hereinbefore set forth for turning the machine out of a straight line, the carrying wheels at the rear end thereof may be of the usual automobile construction and arrangement, the shifting devices thereof being connected by a rod 133 with the lower end of a steering-post 134, provided with a steering-wheel 135. In proximity thereto is supported from the frame of the machine a small platform 136, for the convenience of the operator, in running the machine.

It is believed that the complete operation of the machine will be readily understood. With all of the various mechanisms in operation the ditching wheel, while in rotation, swings gradually from one side to the other, cutting a path several feet in width, in which the machine travels. In order to cause the scoops to function properly the rear end of the machine is elevated a little, giving a corresponding depression to the forward end, and causing the scoops to engage the earth. When a desired depth has been attained the position of the machine is adjusted again. The machine is of special advantage for road grading, cutting away the side of a hill, and the like.

What I claim, and desire to secure by Letters Patent, is:

1. A device of the class described, comprising an automotive vehicle, a frame pivotally mounted in said vehicle so as to swing, in a horizontal plane; an excavating wheel rotatably mounted in the free end of said swinging frame, means for imparting the force of the motive element of said vehicle to said frame, to give an oscillating movement thereto; and means for imparting the force of said motive element to said ditching wheel, to cause a rotatory movement thereof, coincidently with the oscillating movement of said frame.

2. A device of the class described, comprising a portable frame, and motor supported thereon, and capable of propelling the same; an arch frame supported on said portable frame; a frame supported from said arch frame, so as to be capable of swinging in a horizontal plane; an excavating wheel rotatably mounted in the free end of said swinging frame; an endless carrier supported from said arch frame, transversely of the machine, and extending through said excavating wheel, so as to receive material therefrom in any position that said wheel is in; means for imparting the movement of said motor to said excavating wheel, to give rotation thereto; means for imparting movement from said motor to said swinging frame, to cause an oscillation thereof, coincidently with the rotation of said wheel; and means for imparting the movement of said motor to said endless carrier, to cause the operation thereof, also coincidently with the rotation of said wheel.

3. In a device of the class described, a portable frame; a horizontally swinging frame supported therefrom; an excavating wheel supported in the free end of said swinging frame, provided with a plurality of scoops having hinged bottoms adapted to open downwardly when said scoops are at the upper part of said wheel; tracks for holding said bottoms closed in the upward movement of said scoops; and a conveyor mechanism, supported within said wheel, and capable of receiving material from said scoops upon the same being discharged therefrom, in any position which said wheel may be in.

4. In a device of the class described, a portable frame, and motor carried thereon, and adapted for the propulsion thereof; an arch frame supported on said portable frame; a frame pivotally mounted in said arch frame, so as to be movable on a vertical axis; a frame supported from said last-named frame, so as to project forwardly from said portable frame; an excavating wheel rotatably mounted in the free end of said forwardly projecting frame; transmission devices connecting said last-named frame with said motor, so as to impart a moderate oscillating movement to said frame; and means for imparting the movement of said motor to said wheel, to operate the same coincidently with the movement of said oscillating frame.

5. In a device of the class described, a main frame and tractor devices supporting the same, so as to permit a rocking movement of said frame thereon; a motor carried by said frame, and operatively connected with said tractor devices, to cause a propulsion of said frame; a frame pivotally mounted in said main frame, so as to be capable of oscillation in a horizintal plane; an excavating wheel carried by said oscillating frame; means for tilting said main frame, so as to depress or elevate said excavating wheel, as desired; means for imparting to said oscillating frame a gradual swinging movement; and means for operating said excavating wheel coincidently therewith.

6. In a device of the class described, a main frame and pair of tractor devices supporting the same near the forward end thereof; a motor carried by said frame; auxiliary carrying wheels at the rear end of said frame; a horizontally swinging frame supported from said main frame, so as to project forwardly therefrom; an excavating wheel rotatably mounted in the free end of said swinging frame; a conveyor mechanism pass-

ing through said excavating wheel, and supported from said main frame, adapted to receive material from said excavating wheel; transmission devices connecting said motor with said tractor devices, so as to operate the same independently of each other; means for arresting the movement of either of said tractor devices, independently of the other; transmission devices connecting said motor with said swinging frame, to impart a moderate oscillating movement thereto; means connecting said motor with said excavating wheel coincidently with the oscillation of said frame; and transmission devices connecting said motor with said conveyor, to actuate the same coincidently with the movement of said frame and excavating wheel.

7. In a device of the class described, a main frame, and pair of tractor devices supporting the forward end thereof; auxiliary carrying devices at the rear end of said frame; a frame supported from said main frame so as to be capable of a horizontal swinging movement thereon; an excavating wheel rotatably carried by said swinging frame; transmission devices connecting said motor with said tractor devices at a reduced rate of speed; auxiliary transmission devices connecting said tractor devices with said motor, so as to actuate said tractor devices at a relatively greater rate of speed, independently of said first-named transmission devices; means connecting said motor with said swinging frame, to cause a moderate swinging movement thereof, coincidently with the reduced operation of said tractors; and transmission devices connecting said motor with said excavating wheel, to cause a rotation thereof, coincidently with the movement of said machine and swinging frame.

8. In a device of the class described, a portable frame, a motor mounted thereon, and main drive-shaft thereof, a pair of traction devices supporting said frame near the forward end thereof; transmission devices connecting said shaft with said traction devices, so as to impart independent movement thereto; an arch frame supported on said main frame; a frame supported in said arch frame, so as to be capable of swinging on a vertical axis; a frame supported from said swinging frame; an excavating wheel carried by said last-named frame; gearing supported in said swinging frame operatively connected with said main drive shaft; and transmission devices connecting said gearing with said excavating wheel, and carried on the supporting frame therefor.

In testimony whereof I affix my signature.

BENJAMIN M. ROLPH.