Oct. 20, 1931. H. R. MILLER 1,827,897

ROAD BUILDING MACHINE

Filed June 14, 1928 3 Sheets-Sheet 1

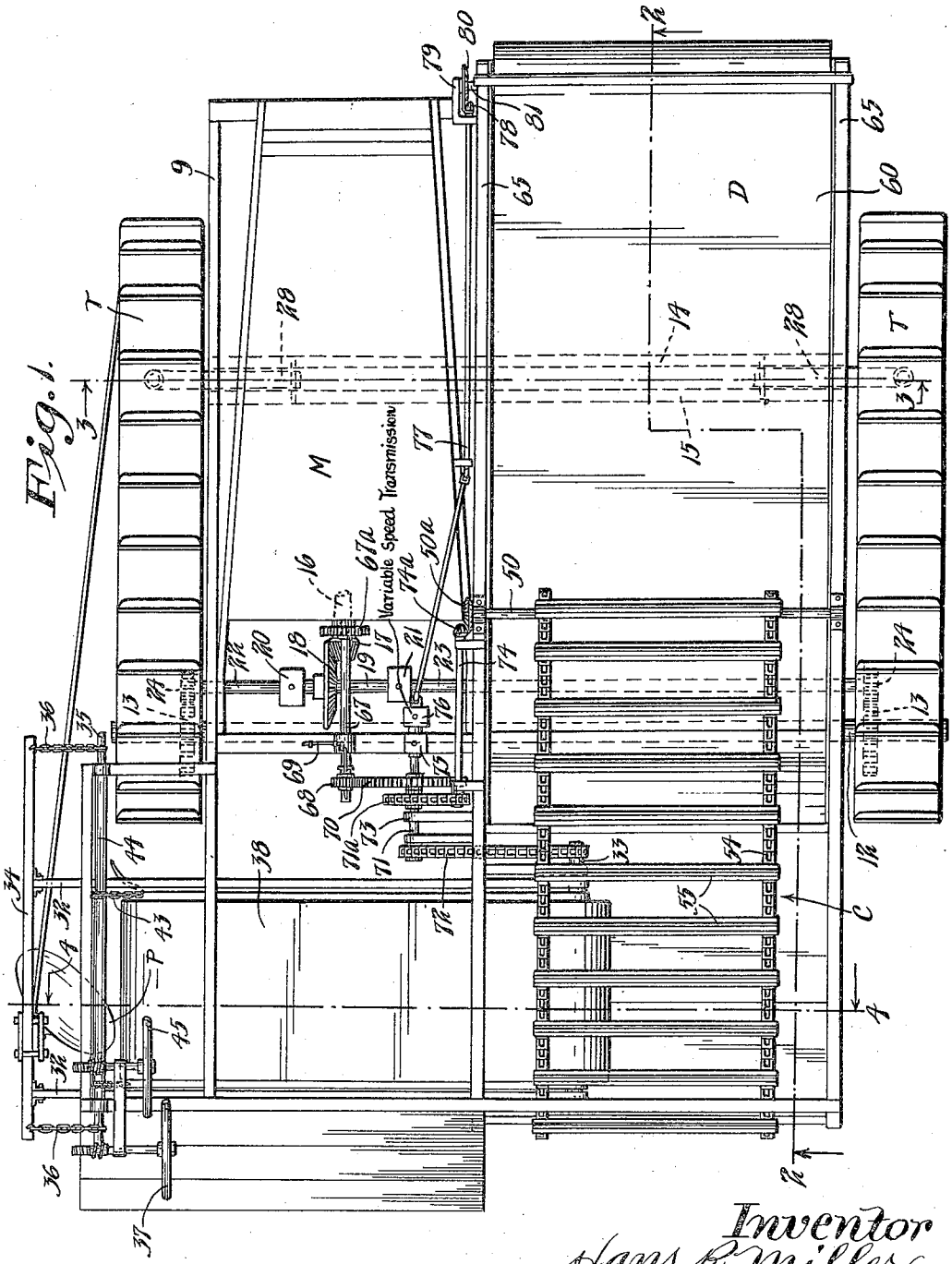


Fig. 1.

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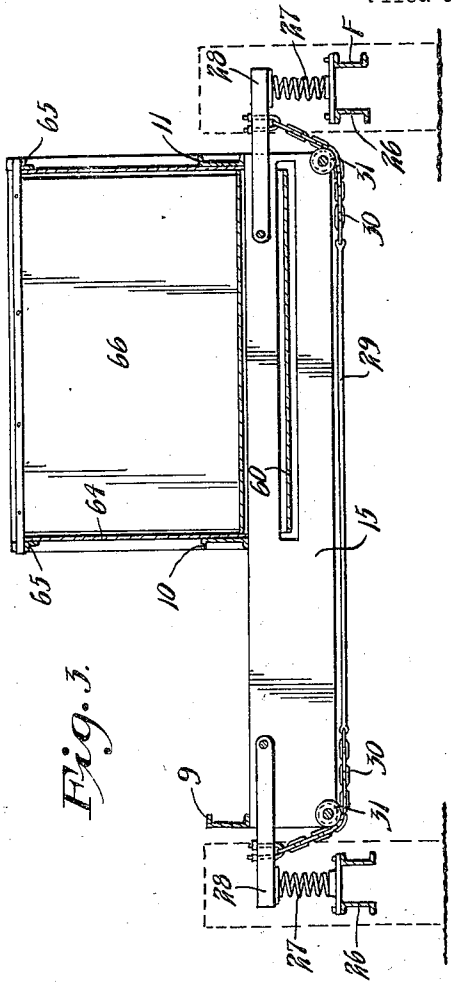

Fig. 3.

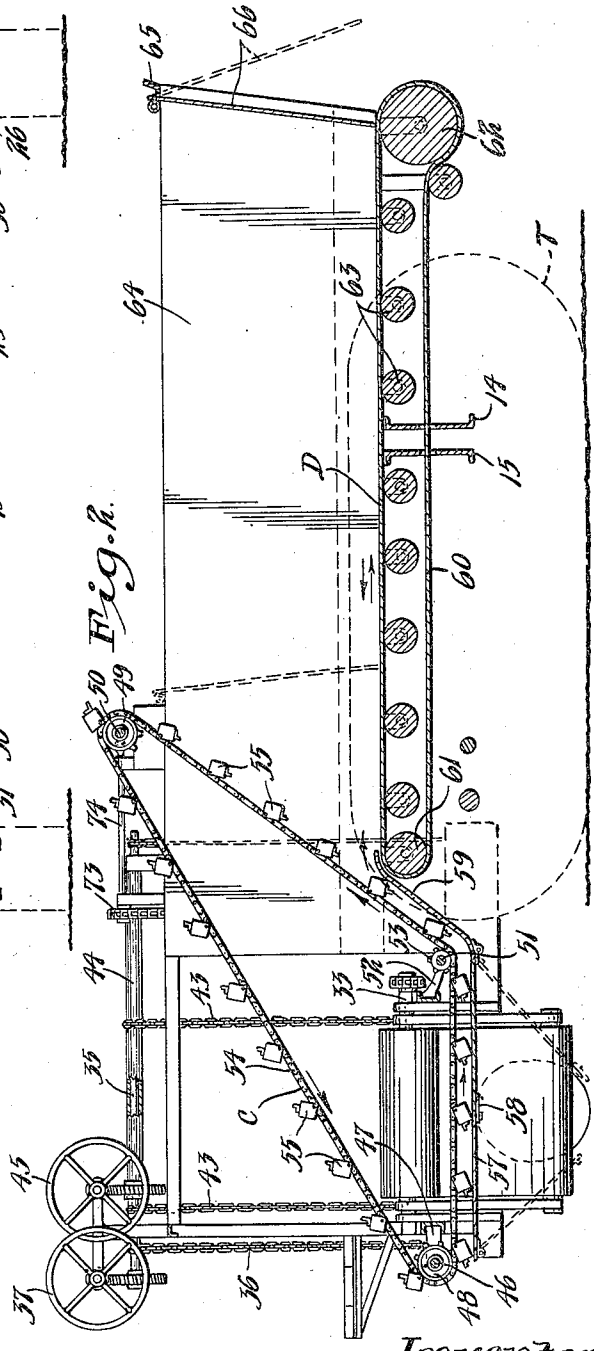

Fig. 2.

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Filed June 14, 1928 3 Sheets-Sheet 3

Fig. 4.

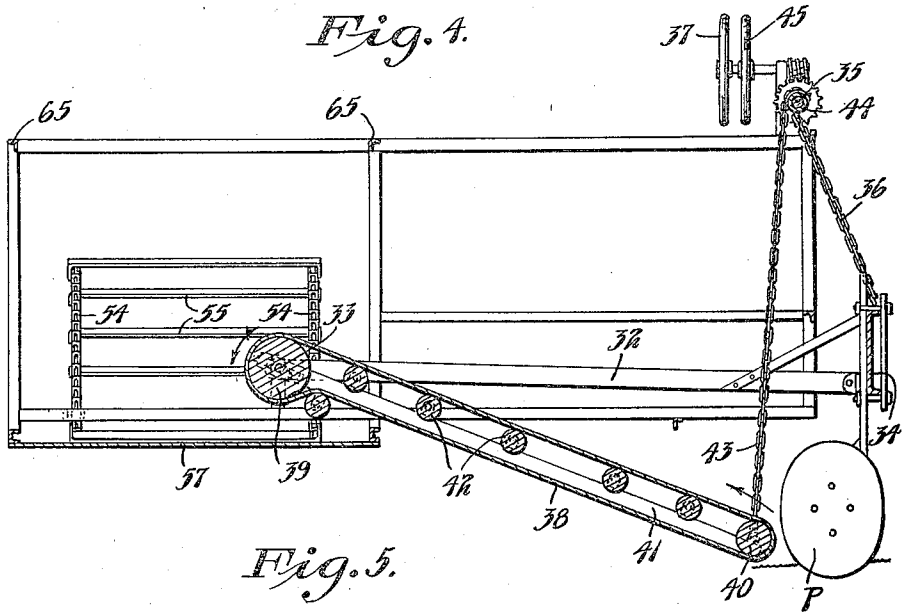



Fig. 5.

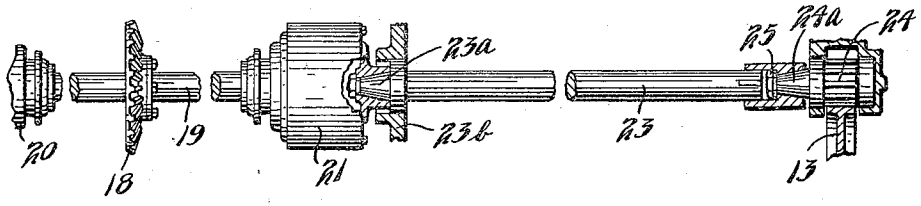



Fig. 6.

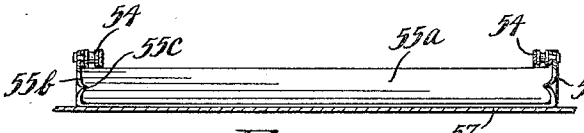



Fig. 7.

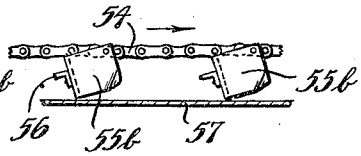
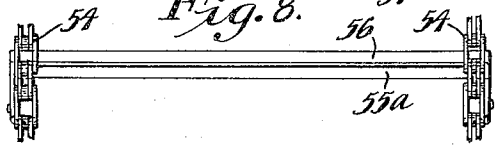



Fig. 8.

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# UNITED STATES PATENT OFFICE

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## ROAD BUILDING MACHINE

Application filed June 14, 1928. Serial No. 285,388.

This invention relates to road building machinery and especially to machinery for levelling grades, filling cuts and in general preparing and levelling the road bed.

At the present time in road construction it is the practice to dig or scoop up the soil and dirt with steam or power shovels or elevator graders and load the same into trucks or dump wagons which transport the loaded material and dump the same into cuts or low portions of the road bed. After the material is dumped it must be distributed, requiring considerable manual labor and the use of bulldozers where soft spots have to be filled. Such procedure requires the outlay of a large amount of machinery and equipment as well as the employment of much labor and the maintenance expense of several motors for propelling and operating the several machines.

It is an object of my invention to provide a single piece of machinery which will do the work of the several machines above referred to, all working parts of which may be driven by a single motor and controlled by one or two men.

A further object is to provide an efficient road building machine which will plow and remove dirt or other material, which will collect the plowed material and pile the same in a large hopper and which will transport and distribute the collected material at a desired rate of speed and in a desired quantity from the front end of the machine, thereby permitting material to be dumped in soft spots where the supporting wheels or treads for the machine would sink.

Another object is to provide a self-propelling road building machine, which will travel over the ground, removing soil at one side of the machine and collecting soil as it travels and which will deliver the collected material when desired from the opposite side and front end of the machine.

These and other objects and advantages of the invention will be apparent from the following description made in connection with the accompanying drawings in which like reference characters refer to similar parts throughout the several views and in which,

Fig. 1 is a plan view of an embodiment of the machine for heavy road work;

Fig. 2 is a vertical section taken longitudinally through the machine, on the line 2—2 of Fig. 1, illustrating the variable speed dumping mechanism and the collecting or piling conveyor;

Fig. 3 is a cross section taken on the line 3—3 of Fig. 1, illustrating an equalizing mechanism for preventing torsional strain on the body and frame of the device due to uneven ground surfaces;

Fig. 4 is a cross section taken on the line 4—4 of Fig. 1, illustrating the elevating conveyor and the means for regulating the depth of the plow and receiving end of said conveyor;

Fig. 5 is a detail view illustrating the structure and connection of the extension driving shaft connected with the driving shaft of a standard tractor; and

Figs. 6, 7 and 8 are front elevation, side elevation and top plan views respectively of one of the conveying elements of my collecting or piling conveyor.

The embodiment of the invention illustrated in the drawings is mounted upon a tractor having a pair of tracks of the endless belt or commercially known caterpillar type, the axles and frame members of the tractor being extended and the several conveying and dumping units being driven from the power of the tractor motor.

A suitable substantially rectangular frame is provided of heavy material, comprising spaced horizontal channels or beams 9, 10 and 11, (see Fig. 3) extending longitudinally of the machine and supported at their rearward portions by connection with a heavy fixed axle 12 on which the driving sprockets 13 for the driving tracks are revolubly mounted. Frame members 9, 10 and 11 are supported at their forward portions on heavy transverse channels 14 and 15 secured to the under sides of said elongated frame members and yieldingly connected at their ends with the front trucks of the driving tracks T by means of suitable equalizing mechanism to be later decribed. The tractor motor M is suitably supported from the frame members 9 and 10

and as shown is positioned at the left side of the frame having its power shaft 16 suitably connected to a bevel pinion 17 which meshes with a beveled gear 18 fixed to a driving shaft 19, which extends transversely of the frame. Driving shaft 19 is connectible by separate clutch mechanisms 20 and 21 for independently or co-operatively driving the driving tracks T, shafts 22 and 23 outwardly extending from clutch mechanisms 20 and 21 in alinement with driving shaft 19 and carrying driving pinions 24 at their outer ends in mesh with the driving sprockets or gears 13 for operating tracks T. As illustrated, the pinion 24 for driving the right hand track T is connected with clutch mechanism 21 by means of the extension shaft 23, said extension shaft having a tapered inner end 23*a* rigidly secured to one of the members of clutch 21 by suitable means, such as a nut threadedly engaging the extremity of the tapered end, shaft 23 being journaled in a bearing 23*b*.

The outer end of shaft 23 is keyed or splined at its outer end to a short sleeve or socket 25, to which a tapered shank 24*a* carried by the pinion 24 is rigidly secured.

The front trucks for the driving tracks indicated as an entirety by the letters F are supported on idler wheels (not shown) about which the tracks are trained, said idler wheels being pivotally secured to short channels 26, said channels supporting through coiled spring 27, the heavy outwardly projecting equalizing arms 28, which are pivotally connected at their inner ends to the transverse channel members 15, supporting the forward portion of the machine frame. Equalizing arms 28 are connected together by suitable means, such as the rod 29 having its extremities connected by flexible members, such as chains 30 to the outer portions of arms 28, said chains 30 passing over suitable sheaves or pulleys 31 loosely mounted on the lower corners of channels 15. It will be obvious that if one of the tracks T passes through a low spot on the surface of the ground, the right arm 28 will swing downwardly permitting the left equalizing arm 28 to swing upwardly a corresponding distance and thereby preventing twisting of the frame and supporting channels 15.

At the left hand side of my frame, and at the rear thereof, I adjustably support a heavy plow P, as shown, of the non-rotative disc type, plow P being mounted at the outer ends of plow arms 32, said plow arms being pivoted at their inner ends to a suitable shaft 33, which shaft extends longitudinally of the frame and which also acts as a driving shaft for an elevating conveyor belt to be later described. Plow arms 32 are connected at their outer ends by a plow beam 34 and said beam is adjustably supported from a winding shaft 35 by means of flexible members, such as chains 36 which may be wound upon shaft 35, the winding of said shaft being controlled by a worm wheel 37.

An elevating conveyor, of the endless belt type is mounted with its delivery end adjustably positioned adjacent plow P in position to receive therefrom, said conveyor extending transversely of the frame of my machine and comprising an endless belt 38 trained over a relatively large roll 39 at its inner end, said roll being fixed to shaft 33 and trained over a smaller roll 40 at its outer end. A suitable rectangular conveyor frame 41 is provided which pivots on shaft 33 and which loosely carries at its outer end the smaller conveyor roll 40. A plurality of spaced idler rolls 42 are also loosely carried by the upper edges of frame 41 over which the upper leaf of conveyor belt 38 is trained. The free or outer end of frame 41 is adjustably supported by means of a pair of flexible members, such as the chains 43, the upper ends of said chains being fixed to a horizontal winding shaft 44, said winding shaft, as shown, being telescoped over the winding shaft 35 for supporting the plow beam and being controlled by means of a suitable worm wheel 45. The elevating conveyor above described, as shown, is disposed transversely at the rear of the machine, delivering to the right hand side of the machine and to the interior of a so-called piling conveyor designated as an entirety by the letter C.

Piling conveyor C extends longitudinally of the machine at the right side thereof and is trained over sprockets mounted on three shafts which are arranged triangularly, the rear shaft numbered 46, being suitably supported from brackets 47 secured to the machine frame and carrying sprockets 48 at either end thereof. The forward end of endless conveyor C is trained over driving sprockets 49 fixed to the ends of a driving shaft 50, said driving shaft being disposed considerably forward of shaft 46 and at a considerably greater height than shaft 46. A third shaft 51 over which conveyor C is trained is an idler shaft supported from suitable brackets 52 secured to the machine frame and disposed in substantial horizontal alinement with the rear shaft 46 and considerably forward of said rear shaft. Shaft 51 carries a pair of idler sprockets 53 at either end thereof. As shown, my piling conveyor comprises a pair of spaced sprocket chains 54 each trained about the appropriate three sprockets and connected at intervals by swingable conveying elements, designated as entireties by the numerals 55, said conveying elements being in the form of slats 55*a* as shown in Figs. 6, 7 and 8, having turned extremities 55*b* of rectangular shape, said extremities being pivotally secured to links of the chains 54 at their upper and forward corners. Slats 55*a* are reinforced at their

rear sides by suitable elements, such as the angle bars 56 extending longitudinally thereof. The lower forward corners of the rectangular turned ends 55*b* are pressed inwardly forming stop lugs 55*c* which are adapted to abut against the chains 54 to limit upward swinging movement of the conveyor elements during their travel in the triangular path.

A horizontal apron underlies the lower horizontal leaf of conveyor C, and may comprise a pair of oppositely hinged sections 57 provided with suitable means, such as the latch 58 for securing said sections in horizontal position and having an upwardly inclined forward portion 59 extending substantially parallel with the upwardly inclined run of conveyor C. Said apron is spaced a sufficient distance below the under side of conveyor C to permit the conveying elements 55 to scrape the upper surface thereof, moving material deposited on said apron by the transverse elevating conveyor 38 and delivering said material to a so-called horizontal dumping conveyor D. Dumping conveyor D extends longitudinally of the machine frame on the right hand side thereof and, as shown, comprises an endless belt 60 trained over a rear conveyor roll 61 and a relatively large forward conveyor roll 62, said conveyor rolls being journaled in depending brackets affixed to the under side of the machine frame. The upper run of endless belt 60 engages a plurality of horizontally alined transverse supporting rollers 63 also journaled in suitable depending brackets. A large hopper 64 is formed about the sides of conveyor D supported on a suitable framework 65, which may be constructed of angle bars, as shown in Figs. 1, 2 and 3. The forward end of hopper 64 is provided with a swingable end gate 66, which may be hinged at its upper end to the forward piece of the hopper frame 65, and which may be mounted for horizontal sliding movement on the frame 65 for variable positions relative to the delivery end of piling conveyor C.

Elevating conveyor 38, piling conveyor C and dumping conveyor D are all driven from the power take off of the tractor motor M. As shown, a short countershaft 67 is journaled above the rear end of the motor driving shaft 16 (see Fig. 1), said countershaft being connected to driving shaft 16 by suitable means, such as by the gear 67*a* in mesh with a pinion adjacent and forward of the bevel driving pinion 17. Countershaft 67 carries a slidable driving pinion 68 splined to the rear end thereof, said driving pinion being controlled by a lever 69 to mesh with a relatively large gear 70, which is fixed by a second countershaft 71. The elevating conveyor 38 is directly driven from the rear end of countershaft 71 by suitable means, such as the chain 72 trained over sprockets fixed to the rear end of countershaft 71 and to the forward extension of the shaft 33 to which the inner and larger conveyor roll 39 is attached. As previously stated, shaft 33 may act as a pivot for the arms 32, which support the plow beam 34 at their outer ends.

Said last named countershaft 71 carries a relatively large sprocket 71*a* at its medial portion, said sprocket being suitably connected by a chain 73 to drive a shaft 74, which may be journaled in upstanding brackets supported from the left side of the hopper frame 65. Shaft 74 terminates at its forward end in a beveled pinion 74*a* which is meshed with the beveled pinion 50*a* of the driving shaft 50 at the forward and upper end of piling conveyor C. The forward end of countershaft 71 is connected with a clutch mechanism 75, which, as shown, is supported on one of the transverse channels of the machine frame and the driven element of said clutch mechanism is connected with a variable speed transmission mechanism 76 mounted forwardly thereof. The driven element of transmission mechanism 76 is connected by a flexible shaft 77 to a small driving pinion 78 mounted in a suitable bracket 79 at the forward end and medial portion of the machine. Driving pinion 78 is in mesh with a beveled driving gear 80 fixed to shaft 81 to which the forward and larger conveyor roll 62 is attached for driving dumping conveyor D. Transmission mechanism 76 for drivably connecting the dumping roller is provided with a plurality of forward speed gears and a reverse speed gear thereby enabling the dumping conveyor to be driven at slow or high speed for distributing material piled thereon or to be reversed for piling up material at the rear thereof.

*Operation*

The operation of my road building machine may be briefly described as follows:—

The machine is propelled by its driving tracks T over the surface desired to be graded and plow P is set at the proper position to penetrate the ground and throw material upon the lower end of elevating conveyor 38. Elevating conveyor 38 moves the material transversely of the machine, delivering the same above the lower and horizontal leaf of the piling conveyor C. The operation of elevating conveyor 38 as well as the piling conveyor is controlled by means of the shift lever 69, which moves driving pinion 68 in and out of mesh with gear 70. The material delivered to the piling conveyor falls upon apron 57 and is moved forwardly of the machine and upwardly by means of the several conveyor elements 55. Conveyor elements 55 dump the material upon the dumping conveyor D at the rear end thereof and because of the construction of said conveyor cause material to be piled at the rear end of dump-

ing conveyor D. If considerable material is being collected the dumping conveyor D may be slowly moved in forward direction, the transmission mechanism 76 being set for low speed driving and in this manner hopper 64 may be substantially filled with material before the same is dumped. The machine may be driven, when loaded, to a low point or cut desired to be filled; the forward end gate 66 may be swung open and the dumping conveyor D may be operated at high or intermediate speed to distribute material ahead of the machine at the rate of speed and in the quantity desired. It will be seen that the distribution of material may take place while the machine is in movement and in this manner considerable area may be covered with material without the necessity for a crew of men levelling and distributing the same after the material is dumped. It will also be noticed that where soft spots exist in a road bed and it is desired to fill the same, the machine may be driven up to the edge of the soft spot and material may be dumped from the forward end.

Due to the means provided for driving the dumping conveyor D in forward and rearward directions, including the clutch mechanism 75 and transmission mechanism 76, the dumping conveyor and dumping hopper may be filled to capacity. Thus if a quantity of material has been dumped and some material is disposed at the forward end of the dumping conveyor spaced a considerable distance from the delivery end of conveyor C, the belt 60 of the dumping conveyor may be reversed to bring the remaining material in such relation to conveyor C that the accumulation or collection of material in the dumping hopper will be practically continuous.

It will be noticed that the driving of the machine, including the independent or joint driving of the tracks T as well as the operation of elevating conveyor, piling conveyor and the dumping conveyor may all be controlled from the driver's seat (not shown) disposed to the rear of the motor. The device, therefore, can be operated entirely by one man, although it is usually preferable to have an assistant driver or helper to regulate the depth of the plow and the dumping of material.

On smaller machines for lighter work and even in a larger machine, the piling conveyor may be eliminated and the elevating conveyor may deliver to the rear of the dumping conveyor. I prefer, however, to use the piling conveyor inasmuch as the hopper 64 may be more efficiently loaded and the flux of material through the machine will be steadier.

Attention is called to the fact that with my device the plow P is mounted for wide vertical adjustment. Thus, it may be disposed considerably below the level of the tracks to cut a ditch and the conveyor 38 may be adjusted accordingly to properly receive material from the ditch and this material may be distributed in the middle of the road. It will also be obvious that by raising the plow bar 32 considerably the plow may be disposed above the bottom of the frame of the machine to cut a bank and the conveyor 38 may be adjusted properly to receive material.

In actual practice the machine has shown a high efficiency for work and has clearly demonstrated a great economy in the building of roads, in the saving of labor, equipment and time.

It will, of couse, be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of applicant's invention.

What is claimed is:

1. In road building machinery, a frame, means for supporting said frame for movement over the ground, a plow carried at one of the longitudinal sides of said frame, and projecting outwardly beyond the frame supporting means, a conveyor adapted to receive material from said plow, a hopper mounted on the frame at the side thereof opposite from the plow and a dumping conveyor at the bottom of said hopper, and means for controlling the driving of said dumping conveyor.

2. In road building machinery, a frame, a pair of tracks for supporting said frame for movement over the ground, a source of power carried by said frame for driving said tracks, a plow carried by said frame, a conveyor receiving from said plow, a dumping conveyor extending longitudinally of said frame, an apron disposed behind said dumping conveyor and adapted to receive material from said first mentioned conveyor, and said apron including a door whereby material may be dropped therethrough without collection thereof.

3. In road building machinery, a frame, means for supporting said frame for movement over the ground, a plow disposed at one of the longitudinal sides of said frame, a dumping hopper extending longitudinally of said frame, means for receiving material from said plow and delivering the same to said dumping hopper, and a horizontal dumping conveyor at the bottom of said hopper, and means for controlling the driving of said conveyor.

4. In road building machinery, a frame, means for supporting said frame for movement over the ground, a plow disposed outwardly of said supporting means, means for connecting said plow with said frame with freedom for positioning said plow considerably above the lower edges of the supporting means and considerably below the lower edges of the supporting means, a hopper extending longitudinally of said frame, means adapted to receive material from said plow

and to deliver the same to said hopper, and means for controlling the dumping of material from said hopper.

5. In road building machinery, a frame, a pair of tracks for supporting said frame for movement over the ground, a source of power carried by said frame for driving said tracks, a plow carried by said frame, and positioned at one of the longitudinal sides thereof, a dumping conveyor extending longitudinally of said frame, means receiving from said plow and delivering to said dumping conveyor at a point some distance above said conveyor, and driving connections between said source of power and said dumping conveyor.

In testimony whereof I affix my signature.

HANS R. MILLER.