July 27, 1926. 1,593,948

D. S. MONROE.

ROAD EXCAVATING MACHINE

Filed July 17, 1922 3 Sheets-Sheet 1

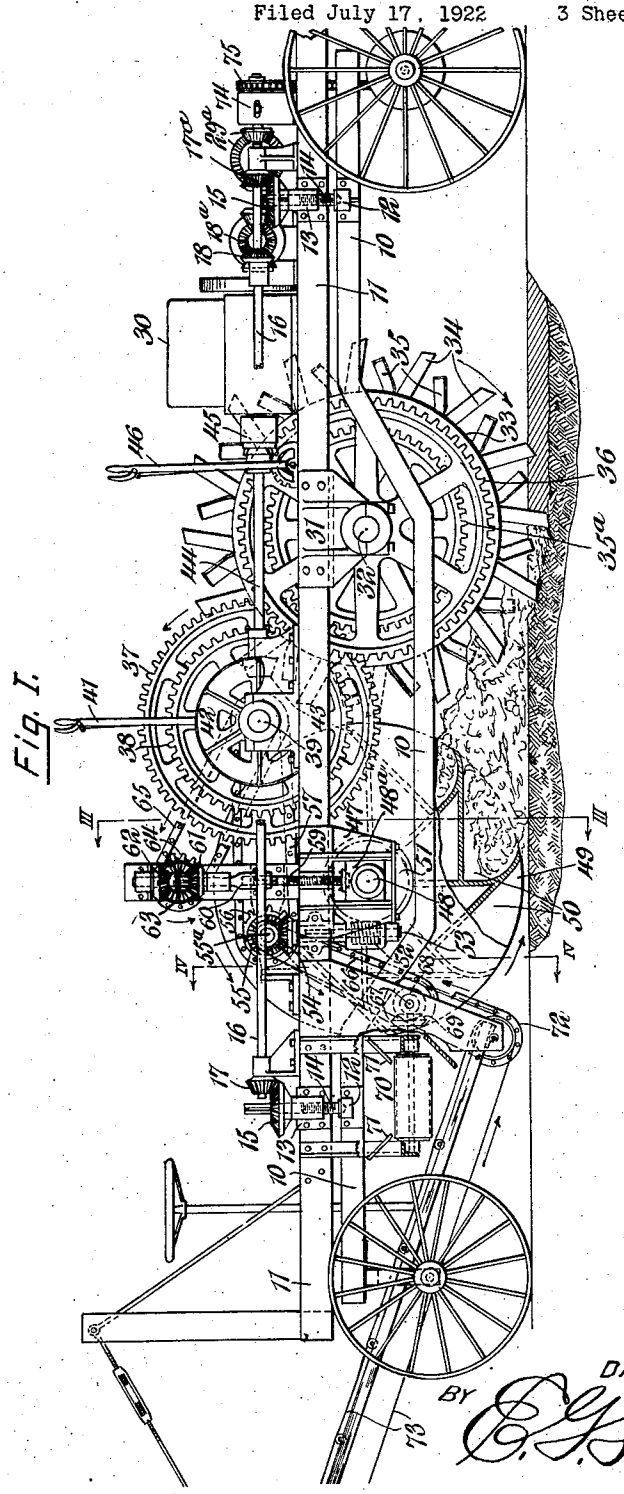


Fig. I.

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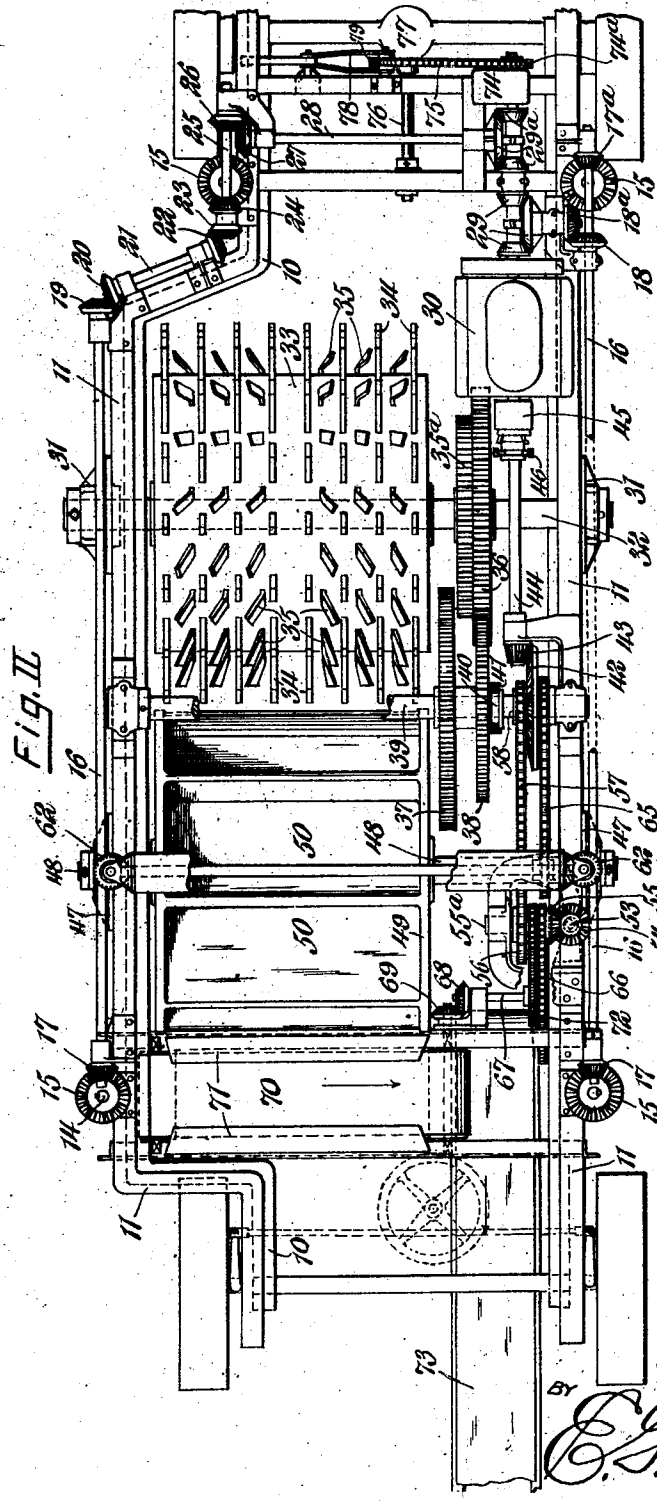


Fig. II

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Fig. III.

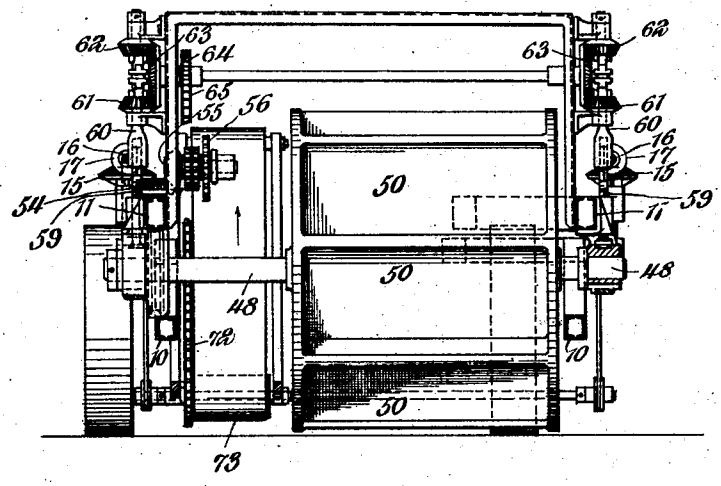


Fig. IV.

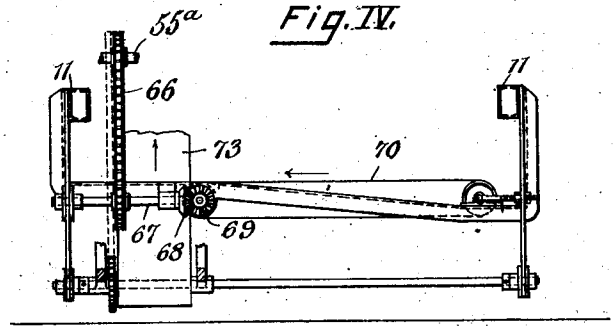
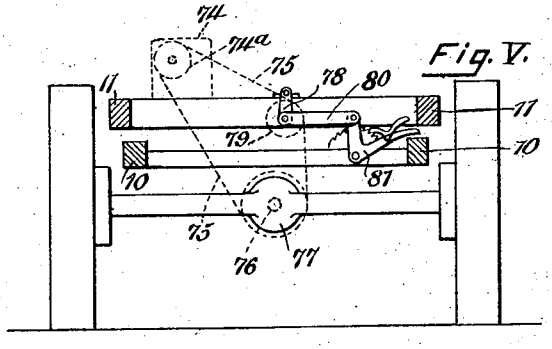


Fig. V.



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Patented July 27, 1926. 1,593,948

UNITED STATES PATENT OFFICE.

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ROAD-EXCAVATING MACHINE.

Application filed July 17, 1922. Serial No. 575,524.

This invention relates to machines for making excavations in or along roads and streets.

An object of the invention is to provide a machine which will excavate asphalt and other pavements as well as ordinary dirt roads, and will load the excavated material into a truck.

Another object is to provide a machine of the indicated character whose excavator is adjustable by power-operated means so as to vary the depth of the cut made.

Further objects are to provide a novel form of material elevating means, and mechanism for adjusting the position thereof.

Still another object is to construct a machine which will operate either forward or backward with the same efficiency, under certain conditions.

The invention has many other objects which will appear from the following detailed description of one preferred embodiment of the invention.

In the accompanying drawings, wherein is shown, for illustrative purposes, a preferred form of the invention:—

Figure 1 is a side elevation, with parts in section, to show the construction more clearly, of a machine constructed in accordance with the principles of the invention;

Figure 2 is a plan view thereof;

Figure 3 is a vertical transverse section on the line 3—3 of Figure 1;

Figure 4 is a fragmentary sectional view, the section line being indicated at 4—4 in Figure 1; and

Figure 5 is a somewhat diagrammatic view of the rear end of the machine showing the power drive for the rear axle.

Referring more specifically to the drawing and to the preferred embodiment of the invention appearing therein merely by way of illustration, there is shown an excavating machine capable of traversing a highway under its own power, and including a main frame 10 supported by four or more wheels, the two forward wheels being movable by a steering gear, and the two rear wheels being power driven, all as appears clearly in the drawing. The main frame 10 is of any well known construction and needs no further description.

Upon the main frame 10, there is supported in super-imposed relation an auxiliary frame 11 which in turn supports digging and material elevating elements. The auxiliary frame is mounted so that its position relative to the main frame, and hence relative to the ground, may be varied to suit conditions, wherefore the excavating element will dig deeper or more shallow as desired. My preferred means for adjusting the height of the auxiliary frame is shown in the drawings and consists of brackets 12 on frame 10 and other brackets 13 on frame 11 directly above brackets 12; a screw 14 bears at its lower end on each lower bracket 12 and engages each bracket 13 with its threads, so that when the screw is turned, the frame 11 is lifted or lowered relative to the stationary frame 10.

While each screw 14 might be turned by hand power, I prefer to employ motor operated mechanism controlled by the operator of the machine. The upper end of each screw 14 may be continued above the bracket 13 as a key-slotted spindle (see the screw 14 at the left end of Figure 1). Upon the said upper ends of each screw shaft 14 a bevel gear 15 is keyed or otherwise mounted so as to slide longitudinally thereon and yet transmit power to the screw shaft when rotated. A shaft 16 extends longitudinally on each side of frame 11 and carries a bevel pinion 17 at its forward end, meshing with the bevel gear 15. The right hand shaft 16 (as viewed from the front of the machine) has a bevel pinion 17^a secured to its rear end which meshes with the rear bevel gear 15. This shaft 16 is driven by a bevel pinion 18 meshing with a bevel pinion 18^a in turn driven by a train of gears 29 (Fig. 2) connected with the motor which drives the machine. The arrangement is such that the motion of the shaft 16 may be reversed, or it may be stopped, at the will of the operator.

The shaft 16 on the left side of the machine carries a bevel gear 19 at its rear end (see Fig. 2), meshing with gear 20 on shaft 21. The latter shaft is turned by means of bevel gears 22 and 23, the latter on a shaft 25. In order to rotate the adjacent bevel gear 15, shaft 25 mounts a bevel pinion 24 meshing with gear 15; and at the rear end of shaft 25 another bevel gear 26 meshes with a bevel gear 27 on a transverse shaft 28. The latter is in turn driven by a train of gears 29^a actuated by motor 30, and the shaft 28 may be reversed or cut off altogether from the source of power. By the mechanism described the four screws 14 are simultane-

ously rotated in the same direction to raise or lower the auxiliary frame 11 to any desired extent.

Upon frame 11 at opposite points, two shaft hangers 31 are secured providing journals for a shaft 32 upon which a digging drum 33 is secured. The drum 33 carries teeth 34 and 35, the teeth 34 being straight and preferably extending at an angle to radial lines through the drum axis with their ends sloping forwardly when they are in their lowermost positions, and the teeth 35 being bent away from the transverse medial plane of the drum, as seen in Figure 2. Preferably the teeth 34 and 35 are arranged in alternating circular series, as shown. As clearly shown in Figures 1 and 2 the teeth in adjacent rows are arranged in staggered relation. The drum 33 is rotated from the motor 30 by gears 35[a], 36 meshing with gears 37, 38 on a countershaft 39. The gears permit a change in speed of rotation of the drum to be had. A clutch 40 controlled by a lever 41 allows the operator to shut off power from gears 37 and 38 and hence from the digging drum. The countershaft 39 is rotated by a bevel gear 42 meshing with bevel pinion 43 on shaft 44 (Figure 2). A clutch 45 is interposed between shaft 44 and motor 30 and a clutch lever 46 gives the operator control over the rotation of shaft 39.

Besides the digging drum, the frame 11 mounts the material elevating and conveying means, by which the material loosened from the road by the digging drum can be carried up to a nearby motor truck to be transported away. There are two journal bearing supports 47 in which the journal bearings 48[a] are slidably mounted. A shaft 48 is received at each end in the bearings and upon this shaft is mounted an elevating or conveying drum 49 provided with dirt holding pockets 50 preferably of the shape shown in Figure 1. The function of drum 49 is to pick up the dirt or fragments of pavement cut by the digging drum and deposit such material onto a conveyer located forwardly thereof.

The mechanism which I prefer to use to rotate the elevating drum includes a worm gear 51 on shaft 48 driven by a worm 52 on a vertical shaft 53 (see Figure 1). The elevating drum is preferably adjustable on the frame 11 independently of the digging drum so that its closeness to the surface of the road may be regulated to suit conditions, and the bearing 48[a] is slidably mounted in the hanger or bracket 47 for this reason. Obviously when the shaft 48 is moved upwardly, the worm gear 51 moves with it, and provision must be had whereby the worm 52 also moves. This result may be reached by slidably mounting the worm 52 on its shaft 53 and keying it thereto whereby power is transmitted to the drum 49. The upper end of shaft 53 mounts a bevel gear 54 driven by a bevel gear 55 fast to a shaft 55[a] on which is also mounted a sprocket wheel 56. A sprocket chain 57 joins wheel 56 and a drive wheel 58 (Figure 2) on counter shaft 39. It has been previously mentioned that countershaft 39 is driven by the motor 30, and may be disconnected therefrom by clutch 45. Thus when the clutch 45 is disengaged, both the digging drum and the elevating drum are idle.

To adjust the height of the conveyer drum 49 there is a screw 59 passing through a fixed part of the frame 11 and engaged therewith by its threads, and secured at its lower end to the shaft bearing 48[a], so that when the screw 59 is turned the shaft 48 will be raised or lowered. It will be understood that there are two screws 59 on opposite sides of the machine; a description of how one is turned will suffice for the two.

The screw 59 is connected to a shaft 60 carrying at the upper end bevel gears 61 and 62, one of which is an idler gear. Both bevel gears 61 and 62 mesh with a bevel gear 63, which is supported above frame 11. Some well known means is employed to engage and disengage the shaft 60 from bevel gear 63, so that the screw 59 does not rotate except when the operator wants it to. There is a sprocket wheel 64 secured to gear 63 and a chain 65 transmits power thereto from shaft 39.

The material elevated by the drum 49 is dumped by the drum onto a belt conveyer, in the preferred embodiment of the invention, and this conveyer is located forwardly of the drum, so that the material is carried out at the front of the machine. In Figures 1 and 2 there are shown two belt conveyers 70 and 73, the former running crosswise of the machine adjacent the elevating drum, the latter extending longitudinally of the machine and receiving material from the former, and rising to any desired height so that the excavated material may be dropped into a wagon or otherwise disposed of. The means for driving these conveyers includes a chain 66 actuated by shaft 55[a] and in turn driving shaft 67. The bevel gear 68 (Fig. 2) on shaft 67 meshes with gear 69 fast to the shaft which drives conveyer 70. This conveyer is located somewhat below the center of the drum 49, as seen in Figure 1, and receives all the material elevated by said drum as the pockets 50 are successively presented bottom side up. In order to guide the dirt onto the belt 70, there may be boards 71 above the belt and extending the length thereof or at least the width of drum 49. The conveyer 70 is preferably horizontal.

The conveyer 73 is driven by a sprocket chain 72 also deriving its power from shaft 55[a]. Any well known mechanism (not

shown) may be used to adjust the height of the upper end of this conveyer.

At the rear of the machine there is a drive gear for the hind wheels so that the machine is self-propelled. See Figure 5. The motor shaft extends to a point near the rear axle where a clutch 74 is provided. This clutch permits the power from the motor to be transmitted or disconnected from a sprocket wheel 74ª with which a sprocket chain 75 engages. This chain drives a shaft 76 which enters the differential gear casing 77, whereby the rear wheels are driven. In order to tighten the chain 75, a link 78 is swingably mounted on the rear end of frame 11 and carries a sprocket wheel 79 over which chain 75 passes. To the link 78 a second link 80 is pivotally connected, and a lever 81 pivoted on lower frame 10 provides means to swing link 78 to cause slack in the chain to be taken up. It will be readily understood that some such mechanism as the one just described is necessary because the distance between frames 10 and 11 is varied by the operator. The chains 66 and 72, which transmit power between sprockets mounted on upper frame 11 and the conveyers which are carried by the lower frame 10, must also be provided with some means for taking up their slack, although in the drawing such means are omitted for the sake of clearness.

The operation of the machine may be stated in a few words. When the motor is started, the operator can adjust the relative position of the two frames, and hence the position of the digging drum, so that the teeth 34, 35 of the latter touch the road or pavement surface. Then the clutch 45 may be engaged and afterwards the clutch 40, whereupon the digging drum starts rotating and breaks up the pavement into small fragments. The speed of rotation of the drum is changed by shifting gears 37, 38 into or out of engagement with the gears 36, 35ª before the countershaft 39 starts rotating. As the drum 33 rotates in a clockwise direction, it piles up the excavated material in front of it, as indicated in Figure 1, and this material is lifted by drum 49, rotating counter-clockwise. The teeth of the digging drum will cut from one-half inch to six inches deep and will work in dirt, on asphalt, or macadam. The machine operates entirely under its own power and may be moved from place to place with all its working parts at rest. It may operate backward as well as forward on all dirt road; and to effect backward movement any well known form of reversing gearing may be interposed between the engine and the sprocket 74ª. Obviously when the machine operates backward, the elevating drum 49 is lowered to the bottom of the cut made by the digging drum, while in forward operation the drum 49 is somewhat above the original surface of the road, as seen in Figure 1. The screws 14 which raise and lower frame 11 are usually operated simultaneously; but it is an easy matter for the operator to raise or lower one side of the frame at a time, because the two sets of screws are turned by entirely independent mechanisms, as described.

The machine is designed to remove the surface from roads and streets, but it can be employed for other uses, such as in ditching.

While I have described in detail one specific embodiment of my invention, for illustrative purposes, it will be understood that many changes from the above involving omission, reversal, substitution or alteration of parts might be made without involving invention, and all such changes I regard as within the scope of my invention, which is best defined in the following claims.

What is claimed is:—

1. In a machine of the class described, a main frame, a digging drum substantially cylindrical in form and rotating about a horizontal axis transverse relative to the machine and vertically adjustable relative to said main frame, said drum carrying a plurality of teeth arranged in circular series, certain of said series being made up of straight teeth, the other series being made up of teeth which are bent intermediate of their ends, the bent teeth and straight teeth alternating longitudinally of the drum, and the bent teeth on either side of the medial transverse plane of the drum extending in the general direction of the nearer end of the drum.

2. In a machine of the class described, a main frame, a digging drum substantially cylindrical in form and rotating about a horizontal axis transverse relative to the machine and supported below said main frame, said drum carrying a plurality of teeth arranged in circular series, certain of said series being made up of straight teeth inclined with respect to radial lines through the axis of the drum and sloping forwardly in the direction of travel of the machine when said teeth are in their lowermost position, the other series being made up of teeth which are bent intermediate of their ends, the bent teeth and straight teeth alternating longitudinally of the drum, and the bent teeth on either side of the middle of the drum inclined outwardly toward the nearer end of the drum.

3. In a machine of the class described, a digging drum substantially cylindrical in form and rotating about a horizontal axis transverse relative to the machine, said drum carrying a plurality of teeth arranged in circular series, certain of said series being made up of straight teeth, the other series

being made up of teeth which are bent intermediate of their ends, the bent teeth and straight teeth alternating longitudinally of the drum, and the bent teeth on either side of the medial transverse plane of the drum extending in the general direction of the nearer end of the drum, the teeth in adjacent circular rows being staggered relative to each other.

4. An excavating machine for roads, pavements and the like, comprising a vehicle having a main frame, an auxiliary frame mounted for vertical adjustment on said main frame, excavating means supported below said auxiliary frame, a vehicle propelling motor mounted on the auxiliary frame, and means also driven by said motor for effecting the vertical adjustments of said auxiliary frame and said excavating means.

5. In a machine of the class described, the combination of a main vehicle frame, an auxiliary frame on the main frame, excavating means carried by said auxiliary frame, a series of adjusting screws between the main frame and auxiliary frame, a motor on the auxiliary frame connected to propel the machine and to actuate said excavating means, and clutch controlled power connections between said motor and said adjusting screws, whereby one side of the auxiliary frame may be raised higher than the other for effecting the desired adjustments of said excavating means.

6. In a machine of the class described, in combination, a main frame, an auxiliary frame, excavating means and conveying means independently mounted on the auxiliary frame, a motor for driving both means, and means interposed between the two frames whereby the auxiliary frame may be lifted or lowered to vary the amount of digging done by the excavating means, and mechanism connectable to the motor for actuating the means interposed between the frames.

7. In a machine of the class described, in combination, a main frame, an auxiliary frame, a digging drum carried by the auxiliary frame, an elevating drum likewise carried, means for adjusting the position of the auxiliary frame relative to the main frame whereby the height of the digging drum is varied, and means for adjusting the position of the elevating drum independently of the frame adjusting means.

8. In a machine of the class described, in combination, a main frame, an auxiliary frame, a digging drum carried by the auxiliary frame, an elevating drum likewise carried, means for adjusting the position of the auxiliary frame relative to the main frame whereby the height of the digging drum is varied, and means for adjusting the position of the elevating drum independently of the frame adjusting means, and motor driven mechanism connectable with both of said adjusting means whereby the two adjustments may be made independently at the will of the operator.

9. In a machine of the class described, in combination, a main frame, an auxiliary frame, a digging drum carried by the auxiliary frame, an elevating drum likewise carried, means for adjusting the position of the auxiliary frame relative to the main frame whereby the height of the digging drum is varied, and means for adjusting the position of the elevating drum independently of the frame adjusting means, said frame adjusting means acting independently on opposite sides of the auxiliary frame to tilt the frame and hence the digging drum.

10. In a machine of the class described, in combination, a main frame, an auxiliary frame, a digging drum carried by the auxiliary frame, an elevating drum likewise carried, means for adjusting the position of the auxiliary frame relative to the main frame whereby the height of the digging drum is varied, and means for adjusting the position of the elevating drum independently of the frame adjusting means, said frame adjusting means acting independently on opposite sides of the auxiliary frame to tilt the frame and hence the digging drum, and motor driven mechanism connectable with both of said adjusting means whereby the two adjustments may be made independently at the will of the operator.

11. In a machine of the class described, in combination, a main frame, an auxiliary frame adjustably supported thereon, an excavating element carried by the auxiliary frame, an elevating element likewise carried, conveying means supported on the main frame, and means whereby the auxiliary frame may be tilted transversely of the machine.

12. In a machine of the class described, in combination, a main frame, an auxiliary frame adjustably supported thereon, an excavating element carried by the auxiliary frame, an elevating element likewise carried, and adjustable in a vertical direction on the auxiliary frame by independently operated means, conveying means supported on the main frame, and means whereby the auxiliary frame may be tilted transversely of the machine.

13. In a machine of the class described, the combination of two relatively adjustable frames, one of which carries a motor, a digging element, material lifting means, and mechanism whereby the motor drives said element and said means, means driven by said motor for lifting and lowering the frame which carries said element and means, the other frame being mounted on wheels, and means whereby the motor drives the

rear wheels to propel the machine along a highway.

14. In a machine of the class described, the combination of a main frame, an auxiliary frame supported by the main frame, a digging element on the auxiliary frame, material elevating means on the same frame, means for raising or lowering the auxiliary frame or tilting it transversely in either direction, and means for adjusting the height of said material elevating means independently of the adjustment of the auxiliary frame.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature.

DANIEL SHAW MONROE.