

Jan. 29, 1957

J. W. JOHNSON

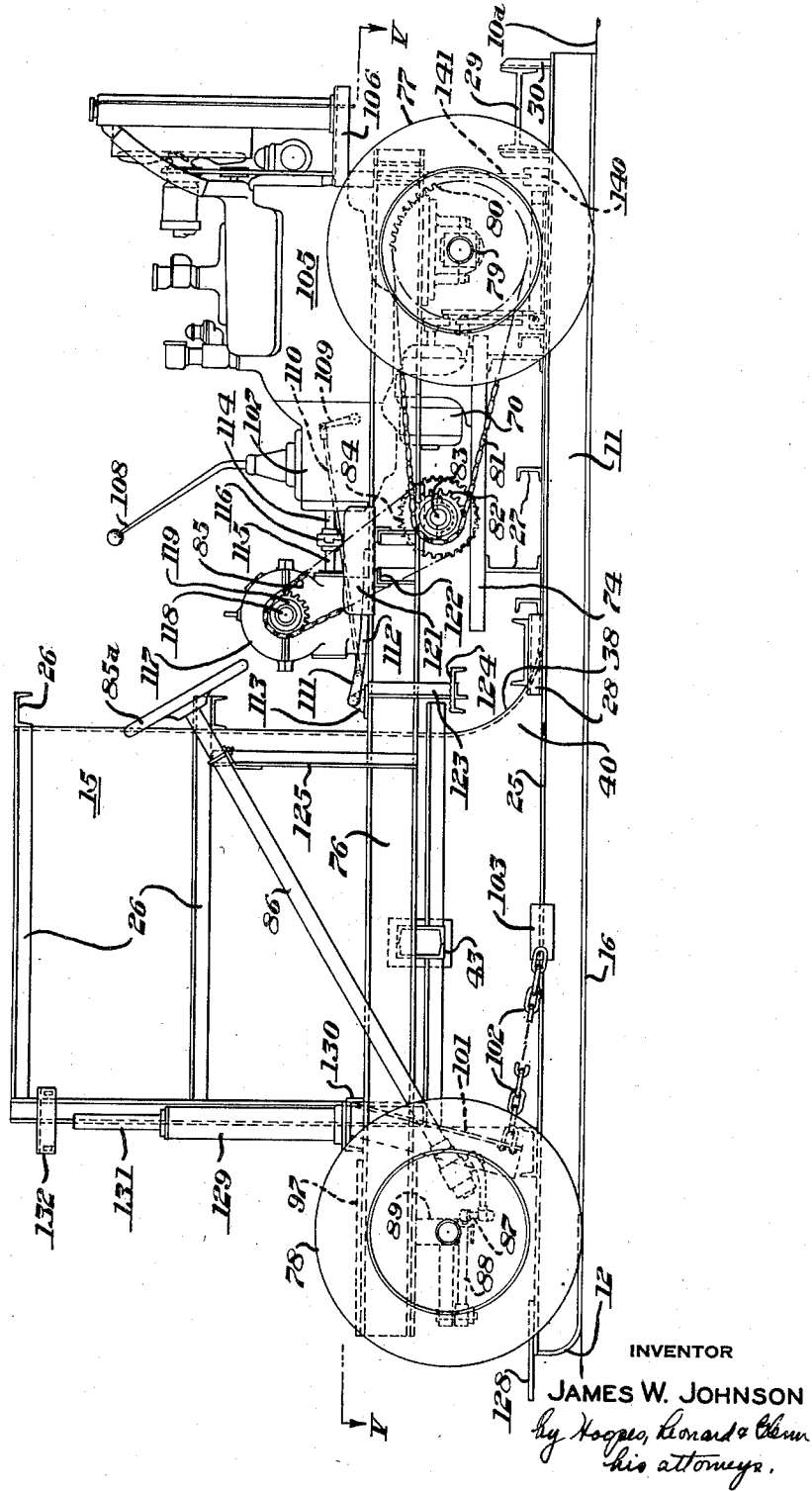
2,779,258

ROAD CONSTRUCTION MACHINE

Filed Sept. 25, 1950

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Fig. 1.



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Fig. 9.

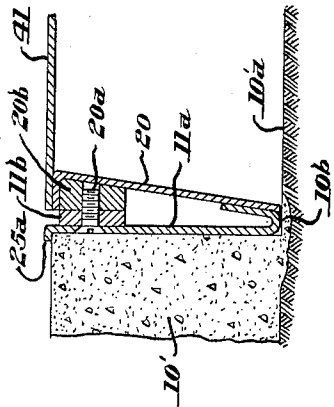
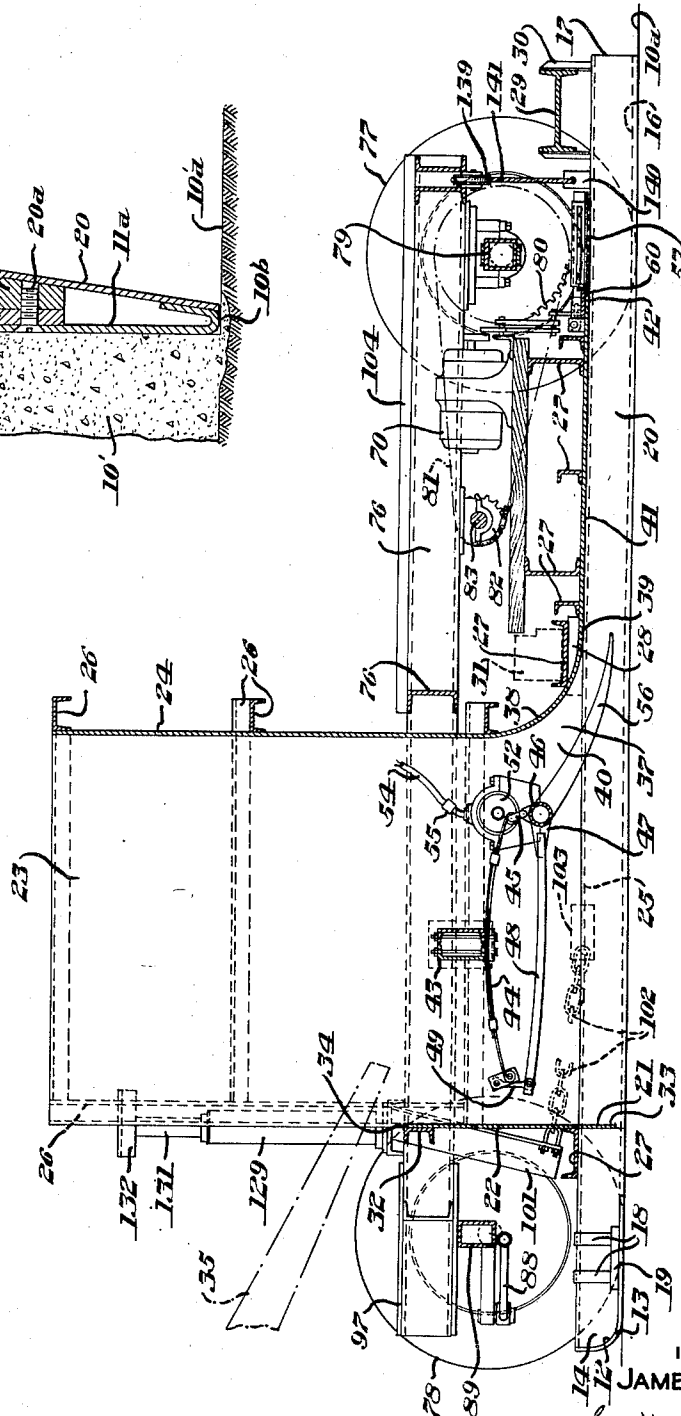


Fig. 4.



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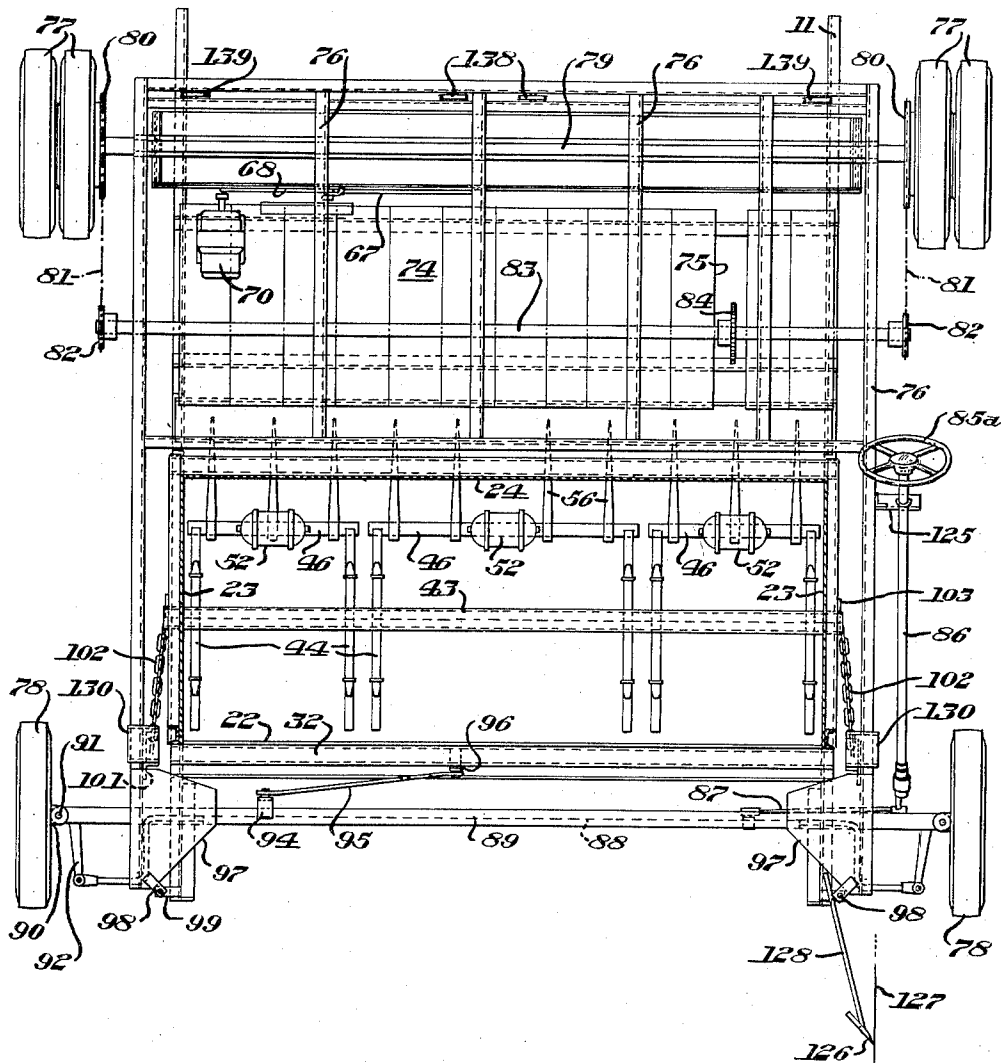
2,779,258

ROAD CONSTRUCTION MACHINE

Filed Sept. 25, 1950

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Fig. 5.



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ROAD CONSTRUCTION MACHINE

Filed Sept. 25, 1950

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Fig. 6.

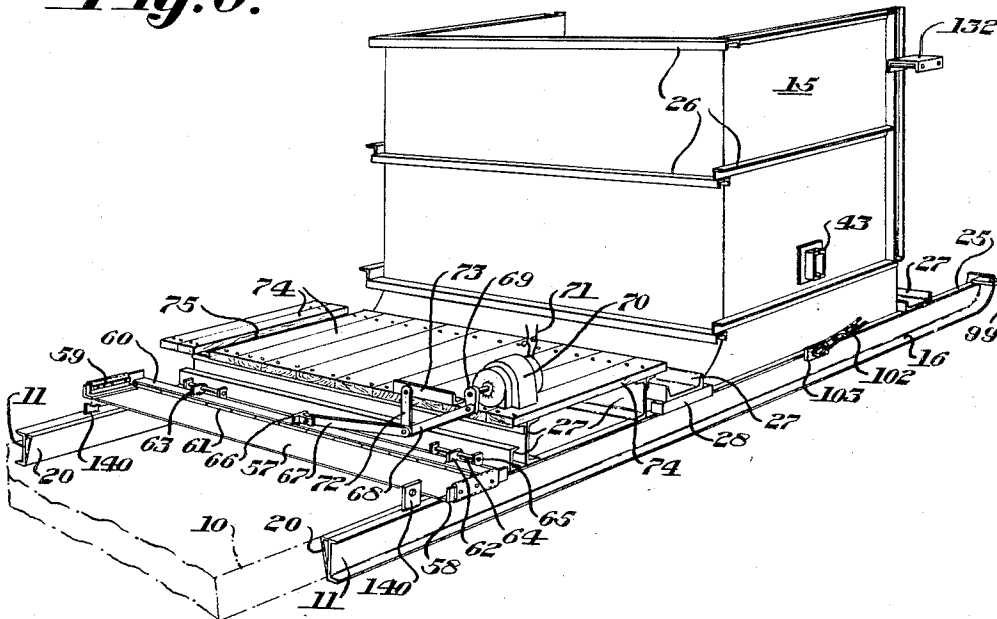
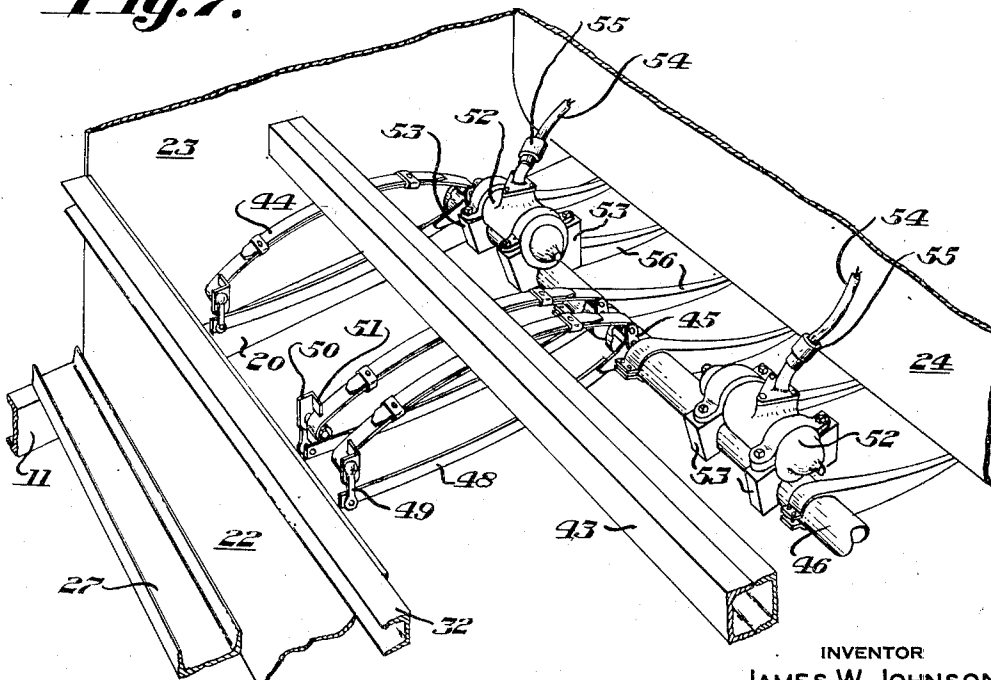


Fig. 7.



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2,779,258

ROAD CONSTRUCTION MACHINE

Filed Sept. 25, 1950

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Fig. 8.

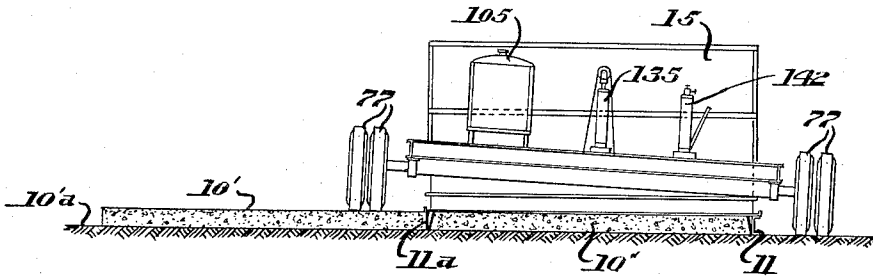


Fig. 10.

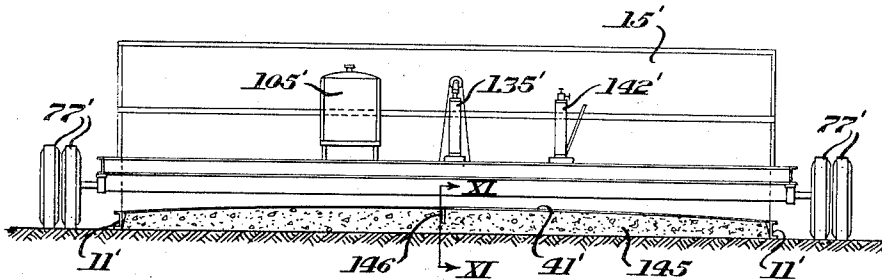
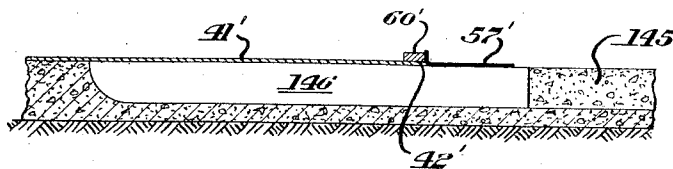


Fig. 11.



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2,779,258

ROAD CONSTRUCTION MACHINE

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Application September 25, 1950, Serial No. 186,609

8 Claims. (Cl. 94—46)

This invention relates to a road construction machine assembly and system to lay a pavement of plastic construction material on a surface or subgrade in a single operation without the use of construction forms.

In the construction of roads or air strips made of concrete or the like, it is usual to first prepare the subgrade with care. Then, side construction forms are fastened down in opposed relation bordering the sides of the area in which the strip is to be made. Such side forms also constitute the rails for the flanged wheels of the heavy machinery conventionally used in laying such roads and strips and require wide bases which must be supported on a level and compact subgrade. Thus, it is frequently common to have one construction machine riding on such rails to spread the concrete deposited between the forms and distribute it relatively evenly from side to side between the forms. Such a spreader may be provided with tampers and strike-offs to settle and rough finish the road material. Subsequently, one or two machines in the nature of finishing machines may be used, each having a smoothing screed or reciprocating trowel. One of these has a screed extending transversely across the road, while a second finishing machine may have a longitudinal screed so that the surface is trowelled in two directions. Following the passage of the finishing machines, the concrete is cured and then the side forms are removed and placed up ahead along the line the road is to take in advance of the section on which the work is then proceeding.

The capital investment for road laying equipment of the foregoing nature is relatively tremendous. Moreover, sizeable gangs of men are required in the handling of the side forms, which must be securely staked to the subgrade in aligned position at true gauge line and elevation. The forms must be heavy to withstand the loads of the massive machinery which they carry and the staking must be rigid and thorough. The stakes become bent and often cannot be driven straight due to stones in the subgrade, rendering form setting a difficult and expensive operation. The subgrade under the forms must be carefully prepared to a true level surface to support the base of the forms. The result is that this item alone in normal road construction is a major cost. Moreover, relatively complicated mechanical road spreaders and road finishing machines with their operators are also required.

In the device of this invention, a pavement can be laid on a subgrade and finished in the course of the movement of the device over the subgrade along the line which the road is to take without the use of the usual side construction forms. Further, the device can be handled by a single operator. Normally, it will be used with concrete or the like in plastic form supplied to it by suitable mixers. The edges of the subgrade do not require special treatment to provide uniform bearing for side forms, it having been discovered that the machine of this invention prepares a level way for its own travel by lateral extrusion of material filling any depressions and irregularities in the subgrade and providing a true level surface for supporting the machine at correct grade.

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Another object of this invention is to facilitate the obtaining of flush surfaces of adjacent strips when two or more strips of pavement are to be laid side-by-side. Heretofore this has been extremely difficult of precise attainment, in either hydraulic or bituminous concrete pavements, as the screeds of the finishing machines had to pass over the edge of the previously laid pavement strip. The result was the second strip was finished in the old practice at a level at least a little higher than the first strip. The structure and system of this invention are not subject to this limitation. In fact, in laying a first strip of pavement with the new structure of this invention a smooth trackway is prepared at the subgrade level, adjacent the strip of pavement and at the elevation of an exact slab thickness below the pavement surface, over which the machine of this invention may pass in laying a second strip in side-by-side relation, thereby insuring that the tops of the first and second strips are flush.

Other objects and advantages of this invention will be apparent from the following description and from the drawings, which are illustrative only, in which

Figure 1 is a view in side elevation looking at the left side of a road construction machine assembly constructed in accordance with this invention;

Figure 2 is a view in front elevation of the assembly shown in Figure 1;

Figure 3 is a view in rear elevation of the assembly shown in Figure 1;

Figure 4 is a vertical section substantially taken along line IV—IV of Figure 2 with the equipment on the vehicle platform removed;

Figure 5 is a view in plan substantially taken along line V—V of Figure 1;

Figure 6 is a perspective view from the rear of the assembly shown in Figure 1 with the vehicle and lifting devices removed;

Figure 7 is a view in perspective showing a portion of the vibrating assembly in the structure shown in Figure 6;

Figure 8 is a partial view of the laying of a strip of pavement in side-by-side relation to a previously laid strip;

Figure 9 is a cross section of a modified runner assembly for use for example in the space between side-by-side strips of pavement as shown in Figure 8;

Figure 10 is a transverse view in section of a modification of the structure shown in Figure 6 taken on a transverse plane behind the back of the hopper; and

Figure 11 is a view taken along line XI—XI of Figure 10.

Material supplying and forming assembly

In the laying of a finished continuous slab or strip 10 of plastic construction having material such as concrete the device of this invention employs a pair of elongated movable supports 11. These supports in the form of channels in the embodiment shown from runners which span the strip 10. Each of these runners 11 is upwardly curved at the front end 12 thereof in the nature of the front of a skid or sled runner. A curve plate 13 is welded to the web 14 of the runners 11 at the curved front edge 12 thereof. The plate 13 on the inside of the respective webs 14 terminates in front of the front plate of a hopper 15 extending transversely across and rigidly welded or otherwise connected to the runners 11 which support it. The bottom flange 16 of the runners 11 form a continuous supporting surface with the outside portion of plate 13 throughout the entire length of the runners 11 to the trailing end 17 thereof respectively. The flanges 16 also constitute a mold surface forming a level trackway of grout extruded laterally beneath them into any depressions along the subgrade or surface 10a, over which

trackway the runners may slide. Brackets 18 are respectively welded at their upper ends to the webs 14 and at their lower ends to a block 19. Block 19 in turn is fastened to the upper side of the portion of plate 13 in each runner 11 to provide stiffening and support for the inner horizontal portion of each plate 13.

In the embodiment shown, a side 20 which acts as a mold, is provided attached to the inside of each web 14. The front end of the side mold 20 commences about at the plane of the front of the hopper 15 and extends rearwardly for the remaining length of the runners 11. Each side mold 20 is fitted along its bottom edge to the bottom of the respective web 14 and slopes inwardly and upwardly for a distance which is substantially equivalent to the height of the pavement to be laid. The top of the side molds 20 is bent horizontally and outwardly to form an edge attached to the top of the respective webs 14 as shown in Figure 3. An appropriate angle between the side 20 and the vertical may be preset in the construction of the device from about 4° to 10°. As a result, for example, when concrete having a relative low slump characteristic is used, the device of this invention and the forming preformed by the side molds 20 laterally confining the sides of the pavement to be laid, allows such sides of pavement to set and harden in a substantially vertical position. In some cases, parabolic curves or the like curving inwardly and upwardly may be substituted for the straight side surfaces of the side molds 20 to achieve similar results. In some cases also, the side molds 20 may be an integral part of the webs of the runners 11. Thus, as the runners 11 are moved along on the subgrade or surface 10a on which a pavement is to be laid by a device of this invention, the horizontal portion of the plates 13, the lower flanges 16 of the runners and the bottom edge of the side molds 20 will move along on such subgrade or surface. The length of the runners 11 is such, with the hopper 15 intermediate the ends thereof, that there can be no bumps in any pavement laid by the device of this invention since there can be no abrupt tipping of the device as it transverses hollows or high spots in the subgrade. This is further prevented by a filling of paving material in any low spots of the subgrade extruded beneath the runners from the mass of material within.

The hopper 15 is provided with a front plate 22 welded along the respective vertical edges thereof to the sides 23 of hopper 15. The vertical rearward edges of the sides 23 in turn are welded to the side edges of the back 24 of hopper 15 forming a generally rectangular hopper in plan. This hopper is supported at its ends on the runners 11 and extends transversely across the space between the side molds 20. The lower edges of the sides 23 are also secured to the inner edges of the respective top flanges 25 of the channels 11. If desired, the bottom edges of the sides 23 of hopper 15 may instead be welded to the top innermost edge of the sides 20 so that no projection exists on the inside of the sides of hopper 15 in a downward direction. Structural members 26 are welded to the sides, back and corners of hopper 15 to strengthen it. Similarly, channels 27 horizontally placed are secured directly to the respective top flanges 25 of the runners 11 or to angles such as angle 28 which in turn are secured to top flanges 25. A beam 29 at the end of the runners 11 is welded to brackets 30 which in turn are secured to the runners. Those channels 27 immediately in front and behind the hopper 15 which have their flanges upstanding, and the beam 29, are weight supporting members on which weights 31, for example, may be placed in order to supply sufficient pressure to cause lateral extrusion of particular concretes or the like of specified stiffness under the runners 11 and to further insure that the runners remain in contact with the high points of the subgrade or surface on which the pavement of such concrete or the like is to be laid. Having a plurality of such weight supporting members along the length of the device and extending transversely across it enables the operator to

obtain an optimum weight distribution desired whenever additional load on the device is desired. In many cases, no weights may be required depending upon the weight of the device itself forming the plastic construction material into the pavement to be laid.

The front 22 is welded on the outside thereof to the rear flange of the front channel 27 and to a further channel 32 part way up the hopper 15. The bottom edge 33 of front plate 22 is above the flanges 16 so as to clear the subgrade or surface on which the pavement is to be laid including any normal size stones or the like that may be encountered on such subgrades or surfaces. The top edge 34 of front plate 22 extends upwardly only a part of the way of the full height of hopper 15. In this way, the edge 34 is low enough so that a chute 35 on the rear end of a transit mixer or the bucket of a conventional paving mixer may continually deposit plastic construction material such as concrete within the hopper 15 during the movement thereof on the runners 11. The supply of concrete in the hopper 15 is continuously replenished to a level at least as high as the top mold 41 at the same time that the device of this invention moves along and lays a pavement. In the case of the use of transit mixers, as each one empties its load into hopper 15, a new transit mixer takes its place until the paving job being done is completed. Any splashing of plastic construction material during the deposit thereof in hopper 15 is limited by the sides and back of the hopper. A window 36 may be installed in the back 24 to increase the arc of the vision of the operator of the device.

The bottom of hopper 15 is wholly open to the subgrade or surface on which the pavement is to be laid. Further, the rear lower part 37 of hopper 15 is open in the sense that a downwardly and rearwardly extending curved throat plate 38 allows plastic construction material in hopper 15 to flow rearwardly as the device moves forward. In effect, throat plate 38 is an arcuate guide, the forward upper edge of which is vertical and flush on the inside with the lower edge of back 24. The rear edge 39 of guide 38 is substantially horizontal at the level of the top of the side molds 20. Guide 38 has the same width approximately as hopper 15 and the sides 40 of guide 38 are integral or welded internally flush continuations of sides 23 of hopper 15. A horizontal top mold 41 has the forward edge thereof welded to the rear edge 39 of guide 38. The underside of top mold 41 is flush with the underside of guide 38. The side edges of top mold 41 are welded at the level of and to the tops of side molds 20. Thus, the section extending rearwardly from rear edge 39 of guide 38 to rear edge 42 of top mold 41 constitutes, with the side molds 20 extending downwardly therefrom substantially to the surface on which a pavement is to be laid, a form which molds the plastic construction material deposited in front of throat plate 38. The throat plate 38 and the form are also open on the bottom, as in the case of hopper 15, to laterally, upwardly and continuously confine plastic construction material deposited in hopper 15. Thus, the runners 11, hopper 15, throat plate 39, and the form comprise a rigid structure capable of spreading and forming a pavement. Such pavement will correspond in transverse dimensions to the dimensions of the interior of the aforesaid form, that is, it will have the height at the sides of the side molds 20 and between such sides of the underside of the plate 41. In width, it will be the distance between the side molds 20. This structure tends to be buoyed up on the plastic construction material so that considerable weight is necessary to hold it down with the runners contacting the high points of the subgrade at each side.

Vibrating assembly

A beam 43 which may be made of two channels in opposed relation extends laterally across the center of hopper 15 between the sides 23 to which the respective ends of the beam 43 are welded or otherwise affixed. A plurality of downwardly bowed longitudinally extending leaf

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type springs 44 are bolted to the underside of beam 43. These springs are arranged in parallel pairs as shown in Figure 5. At the rear end of each pair a shackle link 45 is pivotally mounted. The other end of the shackle links 45 for each pair of springs 44 is pivotally connected to the respective ends of a transverse shaft 46. In the embodiment shown, therefore, there are thus three such transverse shafts independently mounted in alignment across the width of hopper 15. A forwardly extending lug 47 rigidly attached to each shaft 46 at each end thereof is welded to a bar 48. The bars 48 extend forwardly beneath the respective springs 44 and are pivotally connected at their forward ends to a link 49. The upper ends of the respective links 49 are pivotally connected to the forward ends of the respective springs 44. In addition, a plate 50 is welded to each link 49 and extends above that end of the respective spring 44. An arm 51 on each plate 50 extends at an angle thereto and across the top of the adjacent portion of the respective spring 44. These respective arms 51 act as snubbers to prevent undue downward vertical movement of the resilient mounting comprising the springs 44, the bars 48 and the respective links.

Intermediate the ends of each shaft 46 there is positioned a conventional vibrator 52 clamped in fixed position to the respective shafts 46 by the clamps 53. The positioning of the vibrators 52 is such as to obtain the dynamic balance and type of agitation desired. While the conventional vibrators 52 are those having a rotary unbalanced weight mechanism with a driving motor in a self-contained and sealed case, other electrical or mechanical types may be employed. The motor of vibrator 52 obtains its power through the insulated electrical conductor leads in a cable 54. Cable 54 and the joint 55 thereof with the vibrator 52 are impervious to penetration by any of the plastic construction materials encountered.

A plurality of rearwardly extending vibrating bars 56 are rigidly clamped to each transverse shaft 46. These bars in their rest position remain suspended at their rear-most ends between the plane defined by the underside of top mold 41 of the form and the plane defined by the underside of the flanges 16 of the runners 11. Further, during the vibration of the bars 56 and associated mechanism suspended from beam 43, none of the parts strike against any of the other parts of the structure, nor against the subgrade or surface on which the pavement is to be laid.

The vibrating assembly which has been described will be immersed in plastic construction material in hopper 15 to the extent of the amount thereof therein. Thus, if the level of such plastic construction material approaches the top of front plate 22, the entire vibrating assembly will be covered. In the course of receiving concrete or the like from a concrete mixer, the vibrating assembly will agitate the plastic mass in such way as to assist in distributing it within the hopper 15 from side to side thereof. It will assist in working out any excess air or any voids that may exist in the plastic construction material. Further, it will assist in fluidizing the plastic construction material and cause it to flow under applied pressure while laterally confined by the sides of the hopper 15, throat plate 38 and form, out through the rear opening 37 in the hopper and into the space beneath the throat plate 38 and the form comprising top 41 and the sides 20 pertaining thereto. Moreover, such plastic construction material will be extruded somewhat by such pressure under the flanges 16 of the runners wherever there is clearance between portions of the runners and the subgrade to fill any hollows or depressions therein.

The guide 38 therefore acts during the forward movement of the rigid structure on runners 11 as a presser plate. Presser plate 38 and the form together act as a streamline forming means with respect to plastic construction material deposited in front and between the sides thereof. There is sufficient weight in the rigid structure itself or in the structure plus the additional weights that may be placed thereon to maintain contact between the bottom of the runners 11 and the subgrade so that these

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runners effectively control the height of any ribbon of plastic construction material forced under the flanges 16. It will be apparent that such extrusion of plastic construction material to fill low spots between any high points on the surface or subgrade on which the pavement is to be laid, will produce a true and continuous trackway surface adjoining the proximate bottom edge of the pavement being laid. Any such extrusion is very limited and generally will not extend beyond the outermost sides of the flanges 16.

Belter assembly

A belter assembly is also provided in the device of this invention immediately to the rear of rear edge 42 of the former. This belter assembly comprises a flexible belt 57 stretched between two rearwardly extending angles 58. The ends of the belt which may be made of rubberized canvas are turned upwardly over the upstanding flange of each angle and downwardly. A fastening bar 59 is bolted to the respective upstanding angle flanges of the angles 58 with the bolts passing through the respective ends of the belt 57 to removably fasten it in place.

The angles 58 are welded at their forward ends to a rigid crossbar 60. The forward edge of the belt 57 is turned up between the forward end of the horizontal flange of the respective angles 58 and the rear vertical face of bar 60. A clamp strip 61 is bolted to said rear vertical face with the bolts passing through the said upturned vertical edge of belt 57. The horizontal flanges of the respective angles 58 do not extend forwardly as far as the vertical flanges in order that crossbar 60 may be welded or otherwise fastened to the forward ends of the vertical flanges with sufficient clearance between said crossbars 60 and the forward edge of the angles 58 to permit the upturning of the front edge of the belt 57.

Forwardly extending drilled lugs 62 are welded to the top of crossbar 60 adjacent the respective ends thereof. The drilled openings 63 in the lugs 62 are in alignment and fastened in slidable relation to rods 64 passing through said openings respectively. The rods 64 extend laterally and are mounted at their respective ends in the brackets 65. Brackets 65 are welded to the upper surface of the top 41 of the former. The forward edge of crossbar 60 slides on top of the rear edge 42 of the former top 41. Similarly, the side of belt 57 adjacent the ends thereof rests on and passes over the top of sides 20 and flanges 25 at that location.

Belt 57 and its associated parts forming the belter assembly are reciprocated across the top surface of the newly formed pavement 10. For this reciprocation, a lug 66 is welded to crossbar 60 intermediate the ends thereof. A link 67 is pivotally connected at one side to lug 66 and at the other end to a connecting link 68. Link 68 is pivotally connected at its remaining end to crank 69 keyed to a shaft of an electric motor 70. Electric motor 70 receives its energy through insulated electrical conductors in the cable sheath 71. An idler link 72 is also pivotally connected at its one end to the connection between links 67 and 68. At its other end link 72 is pivotally connected to an angle 73 fastened to the platform 74. Platform 74 extends the width of the rigid structure between the runners 11 in a transverse direction. In a longitudinal direction the platform 74 extends across and is fastened to the top flanges of the two larger channels 27 behind back plate 24 of the hopper 15. The motor 70 is bolted to the platform 74. In the embodiment shown the platform is made of planks but may be made of other material. A longitudinal gap 75 is provided in platform 74 adjacent one end thereof.

When power is supplied to the motor 70 rotating the shaft thereof and crank 69, the belter 57 is transversely reciprocated across the top of the newly laid pavement 10 giving it a surface finish which is in addition to the finish imparted to it by the underside of top 41 of the former.

Vehicle and lifting assembly

In order to move the rigid structure comprising the runners 11, hopper 15, throat 38 and former 41—20 along the surface on which the pavement is to be laid, a vehicle may be provided which will also enable the structure to be steered during such movement and to be lifted when it is to be transported to the next job. Such a vehicle may comprise a rectangular chassis or main frame 76 rigidly connected together and surrounding hopper 15 and overlying platform 74. In the embodiment shown, frame 76 is movably supported on dual driving wheels 77 at the rear of the frame and on single steering wheels 78 at the front thereof. As shown, the driving wheels 77 are connected together by a dead axle 79, the wheels being provided with driven sprockets 80 keyed thereto. The sprockets 80 are respectively driven by the sprocket chains 81 which also engage the driving sprockets 82 at the respective ends of a transverse drive shaft 83. Suitable journal mountings for the axle 79 and drive shaft 83 are provided on the frame 76. A further gear 84 is keyed to drive shaft 83 to turn the said shaft whenever a drive chain 85 is turned. The diameter of gear 84 is such that it extends below the plane of the top of platform 74. For that reason, the gap 75 is provided which not only allows the rigid structure to move along in pavement forming position as shown in Figure 1 relative to the vehicle but also provides sufficient clearance when the rigid structure is lifted, lifting runners 11 off of the surface 10a to enable it to be transported.

Although in the mechanism just described no differential is shown, such differential gearing may be provided as is well understood in the automotive art. In the embodiment shown, during the transportation of the rigid structure, one of the sprocket chains 81 can be removed, enabling the vehicle to negotiate turns during the laying of pavement by the device of this invention. There is usually sufficient play in the driving mechanism to the drive wheels 77 to enable slight turns to be made in the course of laying down the new pavement. Sometimes, in order to improve traction, tire chains may be applied to the driving wheels 77.

The steering mechanism for the steering wheels 78 includes a steering wheel 85a and steering column 86 connected in conventional manner by a link 87 to a cross rod 88 which is reciprocable in a guide channel 89. The outer ends of the guide channel 89 form pivotal bearings for the steering knuckles 90 which are pivotally connected thereto by kingpins 91. The knuckles 90 have a forwardly extending integral arm 92 which in turn is pivotally connected to the outer bent ends of cross rod 88. Axles 93 are welded to the outside of the knuckles 90 for conventional rotatable connection relative to the steering wheels 78. While the wheels 77 and 78 are shown as conventional wheels, other types of traction surfaces may be employed such as endless treads.

The guide channel 89 which is a structural member is mounted in the main frame 76 and rigidly connected thereto as shown in Figure 2. A bracket 94 is welded to member 89 and has pivotally connected thereto a centering link 95. The other end of centering link 95 is pivotally and removably connected to a lug 96 welded to channel 32 across the front of the rigid structure. In this way as the vehicle 76—77—78 proceeds, moving the rigid structure over the surface 10a, the link 95 maintains the runners 11 in centered position relative to the wheels 77 and 78 inwardly thereof. Flat corner plates 97 are welded to the front corners of the chassis 76. These corner plates 97 are drilled for the passage of rods 98 which also pass through registering openings in lugs 99 welded to the top flanges 25 at the front of the respective runners 11. Rods 98 pass loosely through the respective holes in the corner plates 97 and lugs 99. Nuts 100 are in threaded engagement with the respective rods 98 at each end of each thereof. As a consequence,

the rods 98 can be used to limit the extent of vertical movement of the rigid structure including the runners 11 relative to the main frame 76 of the vehicle, as well as to provide some additional stability during pavement laying operations. Thus, in the event of any long transport of the rigid structure after it has been lifted away from the surface 10a, the respective nuts 100 can be screwed toward each other along the threaded portions extending in from the ends of the rods 98. Similar means may be used at the rear corners of chassis 76 to suspend that end of the runners 11 and thereby the rigid structure in the case of longer trips or of the storage of the device.

Downwardly and forwardly projecting angles 101 are welded along one flange to the side frame members of frame 76 adjacent the front plate 22 of hopper 15. A drag chain 102 is bolted to each arm 101 at the lower end thereof. The other end of each chain 102 is removably fastened to a plate 103 welded to the top of the respective runners 11 outside of the sides of hopper 15. It is evident that as the vehicle is driven along under its own power, the rigid structure comprising the runners 11, the hopper 15, the streamline guide 38 and the former will be drawn along over surface 10a with the weight of the structure resting on the runners 11.

In some cases the rigid structure by itself may be pulled by a tractor eliminating the need for the aforesaid vehicle. In such cases, the rigid structure would be transported on a flat bed truck to different locations and a generator set would be mounted on platform 74 to supply electric current to the motor 70 and the vibrators 52.

The rear of the main frame 76 behind the back plate 24 of hopper 15 is substantially covered by a platform 104. On the platform a portable internal combustion motor-generator set 104a may be clamped to provide electric current through the conductors within the cable sheath 54 to the respective vibrators 52 and through the insulated electrical conductors in the cable sheath 71 to the electric motor 70. Another internal combustion engine 105 is fixedly mounted on brackets 106 which in turn are welded to frame 76. Engine 105 is provided with a conventional transmission and clutch housing 107 and gear shift lever 108. A lever 109 extending through housing 107 operates the clutch in said housing by its arcuate movement. A rod 110 is pivotally connected to the upper end of lever 109 and at its forward end is connected to a clutch lever 111. Clutch lever 111 is provided with a handle 112. The lower end of clutch lever 111 is pivoted to a bracket 113 fastened to chassis 76. If it be assumed that the clutch within housing 107 is engaged when the handle 112 is in the position shown in Figure 1, the driving shaft 114 of the engine will turn an input shaft 115 by means of a flexible coupling 116. Input shaft 115 is a part of a conventional gear reducer 117 which has an output shaft 118 to which is connected a driving sprocket 119. Driving sprocket 119 engages a sprocket chain 85 which also engages the sprocket gear 84 heretofore described. With the clutch in engagement as shown in Figure 1, the driving wheels 77 will move along surface 10a and drag the rigid structure on runners 11 over the same surface to lay a pavement of the plastic construction material deposited in front of the presser plate 38.

After all of the pavement to be laid in a single operation is laid, the aforesaid vehicle will draw the rigid structure on runners 11 out beyond the end of the new pavement. Then it may readily be lifted without disturbing any of the new pavement. In lifting the rigid structure so that the runners 11 are suspended above the road, hydraulic jacks are employed.

The entire paving operation with a device of this invention may be performed by a single operator. An operator's seat 121 is provided immediately behind the steering wheel 85a. The seat 121 is fastened to brackets 122 welded to frame 76 on that side of the vehicle. Similarly, a bracket 123 supports a foot rest 124 for

the driving operator. The steering column 86 is fastened to the frame 76 by a column 125. From this position the operator can steer the aforeaid vehicle as well as control engine 105 with respect to its driving engagement or disengagement and speed and can also attend to the engine-generator set 104a. From such position also the operator can maintain the line which the road is to take by keeping a pointer 126 following the cord 127 attached to the surveyor's stakes. Pointer 126 is fastened to a forwardly and outwardly projecting mount 128 which is bolted to the front of the flange 25 of runner 11 on the same side as the operator's seat 121.

In lifting the rigid structure resting on runners 11 after passing beyond the end of the newly laid pavement, hydraulic jacks 129 are provided adjacent the front corners of the hopper 15. These jacks 129 are rigidly fastened to bases 130 welded to the sides of chassis 76. The jack plungers 131 can be extended and retracted beneath the jack pads 132. These jack pads are rigidly fastened to the front vertical corner posts of the hopper 15, respectively. A manual hydraulic reservoir and pump 133 is positioned on a corner plate 97 next to one of the jacks 129 and is connected to jacks 129 by conventional hydraulic pipes (not shown). The pump 133 is provided with selector valves 134 which enable the jacks 129 to be extended simultaneously or separately and to be held or locked in any respective extended position desired. The reach of the jacks 129 is sufficient to lift the front of the runners 11 entirely off the ground a sufficient distance for transportation to a new job location. In the case of any long trip with the runners and rigid structure connected thereto so lifted, the nuts 100 can be taken up to take the load off the cylinders 129 and maintain the rigid structure in its elevated position.

At the rear of platform 104 there is a further hydraulic cylinder 135 which is centrally located. The plunger 136 of cylinder 135 is provided with a sheave 137. Fixed sheaves 138 are rotatably fastened to chassis 76 adjacent the base of cylinder 135 and on opposite sides thereof. Additional sheaves 139 rotatably fastened to chassis 76 are provided adjacent the sides of the chassis and above the lugs 140 welded to the respective flanges 25 between the belter 57 and the beam 29. A flexible steel cable 141 shackled to one lug 140 passes over the adjacent sheave 139 under the adjacent sheave 138 over the sheave 137 under the remaining sheave 138 and over the remaining sheave 139. The other shackled end of cable 141 is fastened to the other lug 140, in the position shown in Figure 3 when the trailing ends 17 of the runners 11 rest on the surface 10a. Moreover, in such position, the cable 141 and associated sheaves maintain the rear end of the rigid structure in centered relation relative to the rear end of the frame 76.

When it is desired to elevate the rear end of the rigid structure, an hydraulic reservoir pump 142 is operated by means of the handle 143 and through selector valves 144, plunger 136 is extended lifting the rear of the rigid structure and the rear of the runners 11 off the surface 10a. The valving of the pump 142 is such that the plunger 136 can be locked in any extended position desired. While the operation of the hydraulic jacks 129 and 135 is manual, as is well understood in that art, the regulation and control of such jacks may be centralized and caused to occur by power rather than manual leverage.

In the event that the distance between the sides 20 of the device of this invention which is employed corresponds to the width of one-half of a two-lane road, the second such lane may be laid as shown in Figure 8. In this figure the pavement 10' which was first laid by the device is paralleled by a second strip 10''. In making the second strip, one side of the vehicle dragging the rigid structure of this invention proceeds along the nearer edge of the pavement 10' after it has set. The other driving wheels 77 ride along on the surface 10'a on which the pavement is being placed. However, before

placing the second strip, the runner 11 on the side of the machine which would be next the previously laid slab may be removed and a runner 11a of the form shown in Figure 9 may be secured in its place. Runner 11a has the same longitudinal dimension as the runner 11 which it replaces including a curved front edge. However, instead of being in channel form runner 11a is in a modified S or Z form with a narrow upper flange 25a and a narrow bottom edge 16a. The narrow bottom edge 16a replaces the wider flange 16 on the runner 11 for which it is substituted. The bottom edge of runner 11a further is reentrantly turned inwardly and upwardly so as to lie against and furnish lateral support outwardly of the bottom edge of the adjacent side 20. Machine bolts 20a engage registering threaded openings in the blocks 11b and 20b respectively secured to runner 11a and side 20 at a requisite number of places along the length of each thereof to provide adequate fastening. The runner 11a slides over the perfectly levelled trackway formed by the subgrade 10'a and the extrusions 10'b into any low spots thereon adjoining and at the exact depth of the bottom of slab 10' thereby gauging the form so that the new adjoining slab will be precisely level with the first as well as very close thereto. As the bearing ledge is smooth and hard, and the runner 11a has a narrow bottom area with relatively concentrated pressure, no extrusion of paving material under the runner 11a occurs. After the completion of the pavement 10' forming the second lane the recess between the two generally equal to the width of the runner used on that side may be filled with bituminous material to indicate the center line of the road. Or, if it is desired, it may be filled with additional concrete without undue difficulty or expense.

Modification

In the rigid structure heretofore described including the former 41 with the portions of the sides 20 extending downwardly from the lateral edges thereof, the underside of top 41 was substantially planar in character. However, as shown in Figures 10 and 11, a rigid structure including a former may be constructed in accordance with this invention so as to span and lay a pavement having more than a single lane therein. Further, the underside of the former top of such a structure may be made so as to provide a crown to such a plural lane pavement as shown in the modification of Figures 10 and 11. In this modification, the portions thereof corresponding to the portions of the above-described rigid structure in general construction and purpose are given the same reference numerals with the addition of a prime.

In the plural-lane form in the portion of the modified rigid structure shown in Figures 10 and 11, the underside of the top 41' is transversely arched or curved to the extent desired to provide a crown at the center of the distance between the outer edges of the lanes in the pavement 145. If it be assumed that pavement 145 has two traffic lanes therein, it may also be advantageous to provide a grooving blade 146. Such a grooving blade depends from and is rigidly fastened to the center of the underside of the top 41' adjacent the rear edge 42' thereof. Such a blade 146 extends longitudinally parallel to the runners 11' and in the course of the forming of pavement 145 will groove the center to the depth of the blade. This grooving will provide a suitable expansion space and may be filled with a contrasting colored mastic material to indicate the center line. More than one grooving blade may be applied to the underside of top 41' in appropriate transverse spaced relation in those cases where there are more than two lanes between which grooves are to be made.

In addition, the blade 146 may extend rearwardly of the rear edge 42' and pass beneath the flexible belter 57'. Since the top edge of the blade 146 corresponds to the top surface of the pavement 145 at the crest of the transverse arch or crown therein, the belter 57' will re-

ceive support centrally of the ends thereof. In this way, any tendency of the belter to flatten the crown formed by the top 41' will be prevented.

Various changes and modifications may be made in the devices of this invention without departing from the spirit thereof or the scope of the appended claims.

I claim:

1. In a road construction machine structure to lay a pavement of plastic construction material, in combination, parallel runners to slidably support said structure, said runners being spaced apart approximately the width of said pavement, a material receiving open-top enclosure connected to said runners intermediate the ends thereof, said enclosure being open along the rear lower edge and at least a portion of the bottom thereof, a guide sloping downwardly and rearwardly from a position adjacent the back of said enclosure, and a form connected to the rear of said guide, said form extending substantially the width of said pavement and having downwardly extending sides substantially the height of said pavement, said sides generally sloping inwardly from bottom to top, at least along the rearward portions of said sides, said sides further extending rearwardly of the sides of said enclosure in generally continuous fashion whereby moving said structure along on said runners will lay a pavement of plastic construction material supplied from said enclosure.

2. In a road construction machine structure to lay a pavement of plastic construction material, in combination, rigid parallel runners to slidably support said structure, said runners being spaced apart at least the width of said pavement, a hopper mounted across said runners intermediate the ends thereof, said hopper being open on the bottom and along the rear lower edge thereof, an arcuate guide forming a continuous downward and rearward slope from the back of said hopper, said guide being substantially vertical along its foremost edge and substantially horizontal along its rearmost edge, a vibrating assembly positioned in said hopper adjacent the bottom thereof and extending at least a portion of the way beneath said guide, and a form connected in a continuous manner to the rear of said guide, said form extending the width of said pavement and having downwardly extending sides extending the height of said pavement, the bottom of said sides being adjacent the bottom of said runners, whereby moving said structure along on said runners will lay a pavement of plastic construction material supplied from said hopper and conforming to the interior dimensions of said form.

3. In a road construction machine structure to lay a pavement of plastic construction material, in combination, spaced runners spanning the width of said pavement, said runners further extending along the bottom of the sides of said structure to slidably support the same, a hopper mounted across said runners adjacent the front ends thereof, said hopper being open on the bottom and across the rear lower edge thereof, an arcuate throat plate curving downwardly and rearwardly to define said rear lower edge of said hopper, a form connected to the rear of said throat plate, said hopper, throat plate and form having sides laterally confining plastic construction material deposited in said hopper, said throat plate and form further being open on the bottom, a beam extending across said hopper intermediate the front and back thereof, longitudinally extending cantilever springs suspended from said beam above the surface on which said pavement is to be laid, a plurality of transverse shafts mounted on respective ones of said springs, a plurality of longitudinally and rearwardly extending vibrating bars mounted on said shafts in normally suspended relation between said surface and the plane of the top of said form, and means for respectively vibrating said springs, shafts and bars to agitate said plastic construction material, whereby moving said struc-

ture along on said runners will lay a pavement of said plastic construction material supplied from said hopper conforming to the interior dimensions of said form.

4. In a road construction machine structure to lay a pavement of plastic construction material, in combination, rigid parallel runners spaced apart so as to span the width of said pavement, a hopper supported across said runners intermediate the ends thereof, said hopper being open on the bottom and along the rear lower edge thereof, a continuous throat plate curving downwardly and rearwardly from the back of said hopper, a form connected in a continuous manner to the underside of the rear of said throat plate, said form extending substantially the width of said pavement and having downwardly extending sides extending substantially the height of said pavement, a belter extending transversely substantially in the plane of the top of said form, said belter being connected to said structure in advance of the trailing ends of said runners, the outer ends of said belter engaging said runners substantially in said plane of the top of said form, and means for transversely reciprocating said belter, said last-mentioned means being substantially longitudinally fixed relative to said form, whereby moving said structure along on said runners will lay a pavement of plastic construction material from said hopper conforming to the interior dimensions of said form.

5. In a road construction machine structure to lay a pavement of plastic construction materials, in combination, elongated slidable runners on the bottom of the sides of said structure to support the same forwardly and rearwardly of the center of gravity thereof, said runners being spaced apart so as to span the width of said pavement, a hopper mounted across said runners adjacent the front ends thereof, said hopper having a front plate, the top edge of which is low enough to receive plastic construction material from a materials mixer, and the bottom edge of which is high enough to clear the surface on which said pavement is to be laid, said hopper further being open along the lower rear edge thereof, an arcuate guide extending downwardly and rearwardly in an uninterrupted manner from the back of said hopper, a form connected in an uninterrupted manner to the rear of said guide, said hopper, guide and form being closed on said sides respectively adjacent said runners and open on the bottom in continuous manner respectively, said form having a transversely curved top to mold a crown on said pavement, and a blade projecting downwardly perpendicular to said top beneath the same, whereby moving said structure along on said runners will lay a crown pavement of plastic construction material from said hopper conforming to the interior dimensions of said form and with a groove the width of said blade down the center of said pavement.

6. In a road construction machine structure to lay a pavement of plastic construction material, in combination, runners supporting said structure in operative position and spaced apart so as to span the width of said pavement, a hopper supported across said runners intermediate the ends thereof, said hopper being open on the bottom and along the rear lower edge thereof, a continuous throat plate curving downwardly and rearwardly from the back of said hopper, a form connected to the underside of the rear of said throat plate, said form extending substantially the width of said pavement and having downwardly extending sides extending substantially the height of said pavement, a belter extending transversely, substantially in the plane of the top of said form and rearwardly thereof, and a blade fastened to the underside of the top of said form in perpendicular relation thereto and intermediate the sides thereof, said blade extending rearwardly on a level with the underside of said top and extending beneath said belter to engage the same, whereby moving said structure along on said

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runners will lay a pavement of plastic construction material from said hopper conforming to the interior dimensions of said former and said belter will receive intermediate support from said blade.

7. In a road construction machine to lay a pavement of plastic construction material, in combination, elongated slidable runners spaced apart so as to span the width of said pavement, a hopper supported across said runners adjacent the front ends thereof, a curved throat plate extending downwardly and rearwardly from the back of said hopper, a form connected to the rear of said throat plate and extending rearwardly therefrom, said hopper, throat plate and form being open on the respective bottoms thereof to the surface on which said pavement is to be laid, said hopper, throat plate and form further having sides extending downwardly substantially to said surface, said sides respectively extending rearwardly in continuous fashion, said runners, hopper, throat plate and form further comprising a rigid structure, said runners supporting said structure when in operative position, an open-center vehicle connected to said structure substantially to supply traction only to said structure to move it along on said runners to lay a pavement conforming to the interior dimensions of said form of plastic construction material deposited in said hopper, and lifting means extending between said vehicle and said structure to lift said structure upwardly within said open center of said vehicle when said structure is not operative.

8. In a road construction machine structure to lay a pavement of plastic construction material, in combination, parallel runners spaced apart approximately the width of said pavement and adapted to slide over the subgrade to be paved, said runners supporting said structure when in operative position, a hopper supportably connected to said runners adjacent the front ends thereof, said hopper being open along the rear lower edge and at least a portion of the bottom thereof, a guide sloping downwardly and rearwardly in a smooth manner from the back of said hopper, a form connected to the underside of the rear of said guide, said form extend-

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ing substantially the width of said pavement and having downwardly extending sides extending substantially the height of said pavement, one of said runners being provided with a generally horizontal bottom flange extending substantially the full length of said runner, said flange being flush with the bottom edge of one of said downwardly extending sides of said form and adapted to mold a trackway of plastic construction material by extruding it laterally under said runner from said hopper to fill any depression in said subgrade and provide a relatively smooth and uniform bearing surface over which said runner may slide in laying said pavement, and the other of said runners having a narrow lower edge adapted to slide close to the edge of a previously laid pavement over the aforesaid trackway, whereby at least two strips of pavement may be formed in side-by-side relation with the adjacent top surfaces thereof in precise flush relationship.

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