April 30, 1963 R. G. BARNES 3,087,394

PAVING MACHINE

Filed Aug. 30, 1956 3 Sheets-Sheet 1

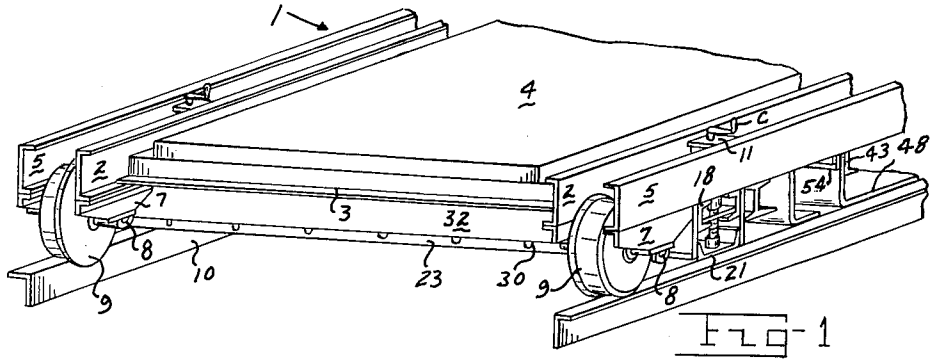


Fig-1

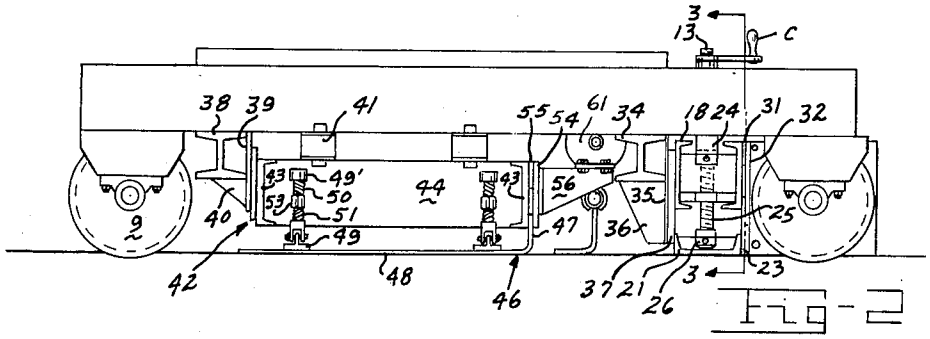


Fig-2

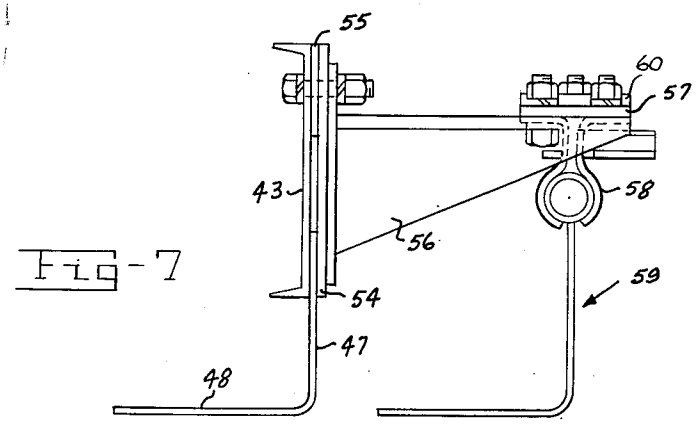


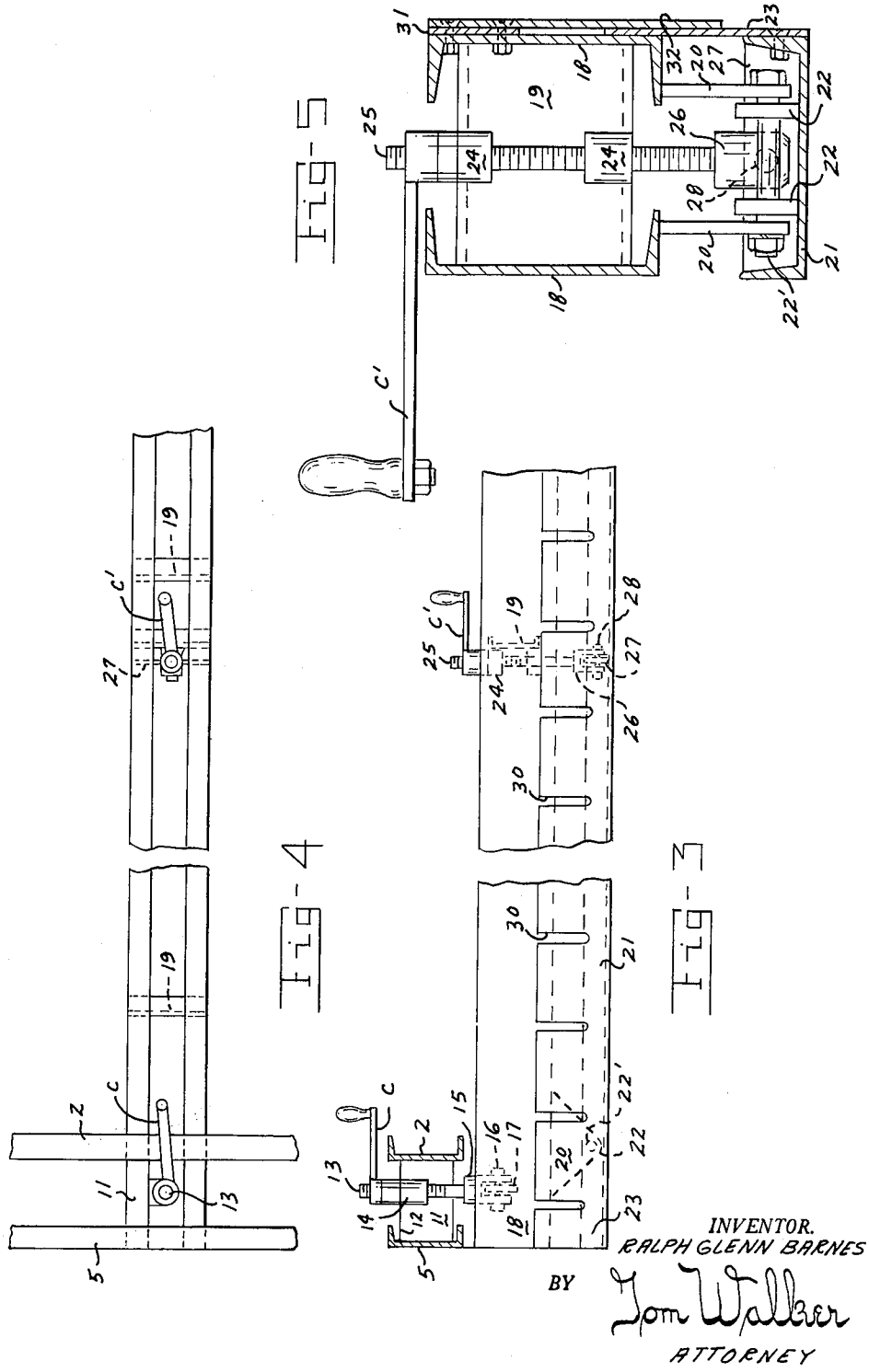
Fig-7

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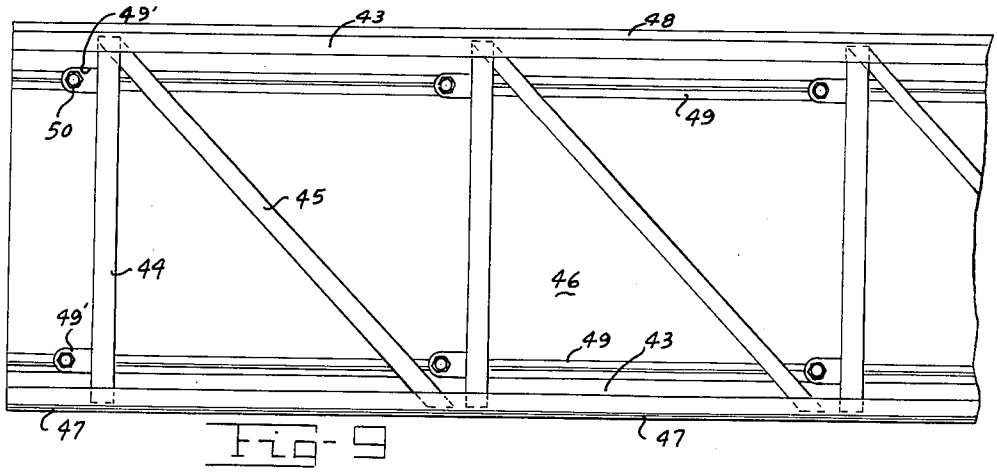


Fig-9

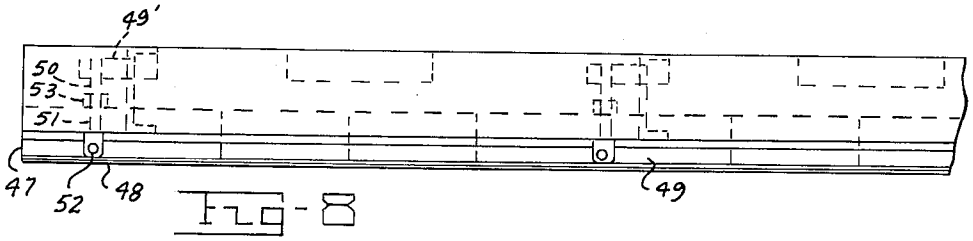


Fig-8

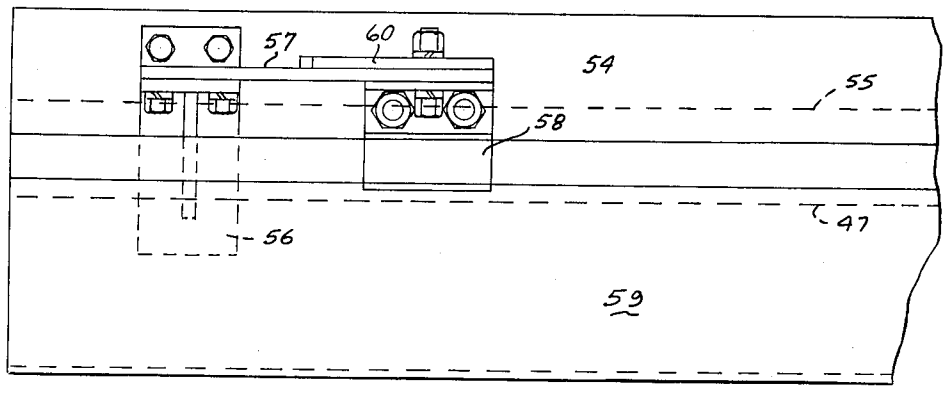


Fig-6

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United States Patent Office

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PAVING MACHINE

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8 Claims. (Cl. 94—48)

This invention relates to paving machines, and more particularly to an improved paving apparatus of a vibratory nature.

The present invention was developed in answer to the problems encountered in the use of pacing machines available in the prior art. One problem is the difficulty in obtaining the proper compaction and stabilization of the concrete in the paving operation. There is generally a tendency of the concrete to flow after paving, particularly on slopes and curves. Also, in the prior paving equipment available there has been a tendency for the concrete to boil up at the trailing edge of the final strike off means.

The object of this invention is to remedy the problems of the prior art type paving machines above enumerated and effect a compact and efficient paving apparatus having wide and economical application. The present invention not only solves the problems mentioned but eliminates the need for costly tamping apparatus in paving machine construction. It reduces the working of the concrete in the paving operation to a minimum. The disclosed embodiment of the invention provides strike off means which are fully adjustable in an improved simplified fashion to meet any required paving problem. An improved relation of the screed and the final strike off plate is provided which avoids undesirable concrete boiling or flow and applies uniform pressure, provides compaction of a high degree, and effects uniform concrete density in paving.

The object of the invention is to simplify the construction as well as the means and mode of operation paving machines, whereby such machines may not only be economically manufactured, but will be more efficient and satisfactory in use, adaptable to a wide variety of applications, and be unlikely to get out of repair.

Another object of the invention is to provide an improved paving apparatus of a vibratory nature.

An additional object of the invention is to provide an improved paving apparatus which eliminates the need for costly tamping devices.

Another object of the invention is to provide an improved paving apparatus employing fully adjustable primary and final strike off means whereby any desired concrete slab contour of a convex or concave nature may be effected in a simple and economical fashion.

A further object of the invention is to provide an improved paving apparatus of simplified construction wherein a vibratory screed and a final strike off plate are so related that a vibration impulse is transmitted to the final strike off plate to provide maximum compaction and a highly stabilized concrete slab.

An additional object of the invention is to provide an improved paving apparatus providing strike off means of an improved nature which is selectively uniformly adjustable in a vertical sense to provide a metering of the cement flow to the desired extent.

A further object of the invention is to provide a paving machine possessing the advantageous structural features, the inherent meritorious characteristics and the mode of operation herein mentioned.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation as hereinafter described or illustrated in the accompanying drawings, or their equivalents.

Referring to the accompanying drawing wherein is shown one but obviously not necessarily the only form of embodiment of the invention,

FIG. 1 is a general front perspective view of a paving machine apparatus as provided by the invention.

FIG. 2 is a side view of the apparatus of FIG. 1.

FIG. 3 is a cross-sectional view taken on line 3—3 of FIG. 2, shown in fragmentary fashion.

FIG. 4 is a top view of the structure as shown in FIG. 3.

FIG. 5 is a cross-sectional view showing the details of the crown adjusting apparatus provided in conjunction with the primary strike off plate in accordance with the invention.

FIG. 6 is a fragmentary front view showing the vibratory screed mounting as provided on the front of the final strike off means in the apparatus of the invention.

FIG. 7 is an end elevational view of the structure illustrated in FIG. 6.

FIG. 8 is a fragmentary elevation view of the final strike off means.

FIG. 9 is a top view of the fragmentary structure shown in FIG. 8.

Like parts are indicated by similar characters of reference throughout the several views.

Referring to the drawings the paving apparatus shown comprises a platform or carriage 1 having channel members 2 forming the sides thereof and arranged to open towards each other. The channel members 2 are transversely connected by longitudinally spaced beams 3 providing support for the superstructure 4 thereon. Channel members 5 are arranged in spaced parallel relation to and in alignment with the respective side members 2 exteriorly thereof. The respective members 2 and 5 to either side of the platform 1 are connected at spaced intervals by struts or channel members such as illustrated at 11 in FIGS. 1, 3 and 4. Mounting brackets 7 are fixed in depending relation at the extremities of each of the channel members 2 and 5 so as to provide pairs of parallel wheel mounting brackets at each of the four corners of the platform or carriage. Each pair of the brackets are connected at their lower ends by axles 8 which rotatably mount wheels 9 therebetween to provide a mobile support means for the carriage 1.

As indicated in FIGS. 1 and 2 of the drawings, the wheels 9 at the sides of the carriage ride the rails or bars 10 provided by the paving forms set up to define the concrete slab to be paved. It is noted that in the event forms are not used the means affording mobility to the carriage may be readily modified to meet the particular application requirements. This is contemplated within the scope of the invention.

Immediately to the rear of the forward wheels 9 the respective pairs of spaced channel members 2 and 5 at either side of the carriage are respectively connected by a channel member 11 so disposed as to have its parallel side elements 12 vertically spaced. A horizontally disposed projecting ear is provided on each member 11 in line with the upper element 12 thereof. A vertically disposed metering screw 13 is mounted to extend through each ear in threaded engagement therewith. Screw guide collars 14 are fixed to either side of the projecting ears in threaded engagement with the screw therethrough an in containing relation thereto. Mounted to each of the upper collars 14 is a control or operating arm C which receives the upper end of the associated screw through a threaded aperture in one end thereof.

Thus, by rotation of the operating arm C, the screw associated therewith may be vertically adjusted. A bifurcated bracket 15 is fixed to the lower end of each screw 13 in axial alignment therewith.

A pair of parallel and longitudinally spaced channel members 18 are arranged below the carriage 1 trans-

versely thereof and in spaced relation thereto. The parallel members 18 are connected adjacent their lateral extremities by plates 17 which extend within the bifurcations of the brackets 15 depending at opposite sides of the carriage. Pivot bolts 16 connect the respective plates 17 to the depending brackets 15. The parallel channel members 18 are further connected by channel struts 19 at uniformly spaced intervals intermediate the ends thereof. Depending triangular bracket plates 20 are fixed to either end of each channel member 18 so as to provide parallel plates 20 at the respective ends of the connected channel members in depending relation thereto. Aligned apertures are provided in opposed plates 20.

A channel member 21 is arranged transversely of the carriage 1 and below the assembly of the channel members 18 in vertically aligned and spaced relation relative thereto. Adjacent the respective extremities thereof, the member 21 is provided with pairs of spaced parallel apertured ears 22 which project vertically relative thereto. A pivotal connection of the member 21 to the channel members 18 at either end thereof is effected by bolts 22' which connect the respective pairs of ears 22 to the spaced plates 20 adjacent the respective ends thereof, the bolts extending through the aligned apertures afforded by the associated elements as seen in the drawings.

A primary striker plate 23 is bolted to the front face of the member 21 coextensive therewith. The upper extremity of plate 23 overlies and bears on the forward surface of the forward channel member 18. In this way the striker plate 23 is supported by the metering adjustment screws 13 for uniform vertical adjustment thereof through the medium of the suspension assembly of the channel members 18.

Fixedly connected, as by welding, to a centrally disposed channel strut 19 are vertically spaced brackets 24 having aligned apertures, the upper one of which is threaded. A crown screw member 25 extends through the apertures in the brackets 24 to be vertically disposed thereby. The lower end of the screw 25 has a depending bifurcated extension 26 fixed thereto and opening downwardly thereof. The member 21 has a plate fixed thereto disposed transversely and centrally thereof. This plate 27 extends upwardly within the bifurcation in the lower extremity of the extension 26 and is pivotally connected thereto by a pin 28 extending laterally through the bifurcated portion of element 26 and the plate 27. The screw member 25 is thus connected also in supporting relation to the channel member 21. Here a control arm C' is connected with the upper bracket 24 and receives the screw 25 therethrough in threaded engagement therewith. On turning the arm C' the screw 25 may be selectively raised or lowered in the well known manner.

Equidistantly spaced parallel slots 30 are provided in the striker plate 23 for purposes to be described. These slots open upwardly of the plate 23.

A front guard or face plate 32 is fixed by bolts to the forward surface of the forward channel member 18 with a spacer plate 31 interposed therebetween. The spacer 31 is in the vertical plane of the striker plate 23 and is spaced vertically therefrom. The guard plate overlies the upper extremity of plate 23 so that the striker plate bears between the front channel member 18 and the guard plate 32 at its upper portion which is slotted. Accordingly, by vertically adjusting the screw 25 which is pivotally connected to the member 21 centrally thereof, the striker plate 23 may have a convex or concave configuration introduced therein at its lower extremity. And by adjustment of the metering screws 13, a uniform vertical adjustment of the whole primary striker plate 23 may be effected.

I-beam sections 34 are fixed to the undersurface of the carriage 1 so as to be parallel to the rear channel member 18 and spaced slightly rearwardly thereof. A

plate 35 is attached to the front faces of the sections 34 parallel to the channel member 18 adjacent thereto. The plate 35 depends relative the sections 34 and thrust brackets 36 are provided which connect the depending portion of the plate 35 to the undersurfaces of the sections 34 for reinforcement thereof. A spacer guide plate 37 is fixed to the front face of plate 35 to abut the rear channel member 18 and afford a bearing and guide therefor and for the rear surface of the member 21 which has the striker plate 23 fixed to the front face thereof.

I-beam sections 38 are fixed to the undersurface of the carriage 1 transversely thereof immediately forward of the rear wheels 9. The sections 38 have a brace plate 39 fixed thereto forwardly thereof and in depending relation thereto. Thrust brackets 40 connect the bottoms of the sections 38 and the depending portion of the plate 39 for reinforcement thereof.

Resilient mounting brackets 41 are fixed to the carriage 1 in depending relation thereto forwardly of the plate 39. These brackets 41 are arranged in transverse and longitudinally spaced fashion. A final strike off assembly is resiliently mounted in depending relation to the carriage by connection to the mounting brackets 41.

The resiliently suspended sub frame assembly 42 includes transversely arranged and longitudinally spaced channel members 43, open to each other and connected by longitudinally disposed and laterally spaced struts 44. Diagonal braces 45 further connect the members 43 for reinforcement of the assembly. The connections are preferably effected by welding. The assembly is suspended by the mounting brackets 41 connecting to the assembly struts 44 and being bolted thereto.

A final strike off plate 46 is provided which is L-shaped and has a relatively short vertical leg 47 and a relatively long rearwardly extending horizontal leg 48. A pair of T's 49 are fixed transversely of the leg 48 on the upper surface thereof in parallel spaced relation to have the central leg of each T project vertically from the plate 46. Each strut 44 has a bracket fixed to one side thereof and projecting horizontally therefrom at a position in vertical alignment with each T 49. A screw element 50 extends through each bracket 49', vertically depending therefrom and fixed thereto at its upper extremity. A second screw element 51 having a bifurcation at the lower end thereof is axially aligned with each of the screw elements 50. The respective elements 51 seat over the T's 49 at their lower end and are pivotally associated therewith by pins 52 laterally extending through the respective bifurcated extremities of the elements 51 and the T's 49 projecting therebetween. An adjusting nut 53 adjustably connects the respective axially aligned pairs of screw elements 50 and 51 which have reversed threads. In this manner, by adjustment of the nuts 53, the plate 46 may be vertically adjusted relative the carriage 1. The vertical leg 47 of the final strike off plate 46 has uniformly spaced slots vertically thereof and opening upward therefrom. Thus, adjustment of the nuts 53 provides for crown adjustment as required for the paving operation.

A brace plate 54 is bolted to the forward surface of the forward channel member 43 with a spacer plate 55 interposed therebetween in the plane of the leg 47 of the final strike off plate and vertically spaced therefrom. Thus, in the vertical adjustment of the final strike off plate, the vertical leg 47 thereof bears between and is guided by the front channel member 43 and the brace plate 54. Spaced brackets 56 are fixed to and project forwardly of the plate 54. To the outer end of each bracket is fixed one end of a leaf spring 57 which mounts to extend parallel to the plate 55.

A bracket is bolted to the outer end of each spring 57 in depending relation thereto providing a tube clamp 58 at its lower end which clamps to the vertical leg of an L-shaped vibratory screed 59 having a tubular configuration at its upper end. The screed 59 has its lower and horizontal leg extending rearwardly to a point adjacent

the front of the final strike off plate, and in the plane of the horizontal leg thereof. The vibratory screed extends transversely of the carriage and is supported by the spaced springs 57 supported forwardly of the spacer plate 55 by the brackets 56. As supported, the vibratory motion of the screed is transferred through the springs to the final strike off plate through the brackets 56. Mounted upon one of the springs 57 in overlying relation to the tube clamp 58 attached thereto is a support plate 60, best illustrated in FIG. 6. This support plate is adapted to support a vibratory device 61 illustrated in FIG. 2. This vibratory device, which has been omitted from FIGS. 6 and 7 to expose constructional detail, may be of a conventional type comprising an electric motor rotating a shaft supporting an eccentrically disposed weight.

Improved paving apparatus is thus provided in accordance with the invention. The structure provided is simple and economical in a relative sense. The device may be applied to paving jobs of any nature, for example, the premixed concrete is fed in front of the primary strike off plate 23. By adjusting the metering screws 13 the depth of the strike off plate 23 may be uniformly regulated in a vertical sense to provide an accurate metering of the uncompacted concrete thereby as the carriage moves forward. This regulates the amount of concrete to be fed to the vibratory screed and the final strike off plate 46. The screw 25 may be adjusted prior to use as desired for the particular application of the paving apparatus to provide a proper crown. The slotted nature of the strike off plate 23 lends itself very readily to the adjustment and the channel member 21 conforms thereto. As the concrete is metered to the vibratory screed 59, the advantageous spring suspension provided for the screed enables a uniform efficient vibration of a controlled nature which compacts the concrete in a uniform manner and force feeds it under the final strike off plate. The metering nature of the primary strike off as provided enables the operator of the paving apparatus to control the height of the concrete head at the final strike off to provide a uniform pressure, compaction and density of the concrete. The brackets 56 supporting the screed transmit the vibrations of the screed to the front of the final strike off plate through the plate 55. This induces a slight vibration in the plate 46 which prevents surface pull and surface tearing of the concrete by reducing the friction of the plate as it slides over the concrete slab surface. The vertical leg 47 of the strike off plate 46 being slotted affords flexibility thereto to allow for crown adjustment as desired. The horizontal leg 48 of the final strike off plate extends substantially rearwardly of the vibratory screed and eliminates boiling up of the concrete at the trailing edge of the leg 48 of the strike off plate. The pressure developed by the vibratory screed in close proximity to the forward vertical leg of the final strike off plate materially assists in compaction. The vibration induced in the final strike off plate in conjunction therewith causes the concrete to be left behind the plate 46 in a stabilized condition that prevents flowing, even on steep slopes and super elevated curves and embankments. The shape of the surface formed by the final strike off is positively maintained to provide a paved section having maximum strength and uniformity.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statue the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise but one of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. In a paving machine having a mobile platform, the combination including a suspended sub frame assembly, means for resiliently suspending the sub frame assembly under said mobile platform, final strike-off means including an L-shaped blade having a horizontally disposed blade portion and an upwardly directed leading edge portion, the forward portion of said frame assembly having a transversely disposed channeled member providing a vertical wall, a brace plate member fixedly mounted in spaced relation parallel to the vertical wall and cooperating therewith to provide a transverse vertical guide slot into which the upwardly directed leading edge portion of the blade projects, adjustable means attached to the sub frame assembly and connected to the horizontal blade portion for supporting the blade to the sub frame assembly, means including a second brace plate mounted under the platform to the rear of the sub frame assembly providing an abutment engaging the sub frame assembly, and means for vibrating the sub frame assembly and the strike-off blade to leave the concrete in a highly stabilized compact condition at the trailing edge of the final strike-off means.

2. Paving apparatus including a mobile carriage, a sub frame assembly resiliently suspended from the carriage, means for resiliently supporting the sub frame assembly under the carriage, said sub frame assembly having forwardly directed rigid brackets fixedly attached thereto, resilient means mounted upon the forward portions of the brackets, vibratory means attached to said resilient means to vibrate the sub frame assembly, an L-shaped final strike-off blade having a horizontal portion and a leading upwardly directed portion, means adjustably supporting the horizontal portion under the sub frame assembly, and transverse guide means mounted on the forward end of the sub frame guiding the upwardly directed portion of the L-shaped blade.

3. A paving apparatus according to claim 2, wherein the upwardly directed portion of the L-shaped strike-off blade is much shorter than the horizontal portion.

4. A paving apparatus according to claim 2, wherein the guide means includes a channel member fixedly mounted on the forward portion of the sub frame, a brace plate, means mounting the brace plate parallel to and in spaced relation to the channel member to provide a vertical slot opening downwardly into which the upwardly directed portion of the strike-off blade projects.

5. A paving machine according to claim 2, wherein an I-beam is fixedly mounted under the mobile carriage and immediately rearwardly of the sub frame assembly, and a bracket plate mounted on the I-beam and contacting the sub frame assembly to provide for longitudinal movement of the sub frame with the mobile carriage, said sub frame having vibratory movement independently of the I-beam and said bracket plate.

6. A paving machine having a primary strike-off plate suspended forwardly thereof for metering the uncompacted concrete and a vibratory screed spaced rearwardly of and close to the strike-off plate for compacting and force feeding the metered concrete, said paving machine comprising a carriage, a sub frame assembly suspended from the carriage towards the rear thereof, means for resiliently attaching the sub frame to the carriage, a final strike-off plate having a horizontal concrete compacting portion and a vertical portion along the leading edge thereof, means adjustably mounting the horizontal portion of the final strike-off plate to the sub frame assembly, means mounted on the forward portion of the sub-frame guiding the vertical portion of the strike-off plate, brackets, disposed forwardly from the front portion of the sub frame assembly, vibratory means resiliently attached to the for-

ward portions of the brackets for vibrating said sub frame assembly to thereby transmit vibrations to the final strike-off plate.

7. A paving machine including a carriage, a sub frame assembly, resilient means supporting the sub frame assembly under the carriage, a final strike-off plate having a horizontal portion and a vertical portion, means connecting the horizontal portion of the strike-off plate to the sub frame assembly selectively in various elevations, guide means engaging the vertical portion of the strike-off plate and fixedly suspended from the sub frame for freely guiding the vertical portion of the strike-off plate, spaced bracket means connected to the forward portion of the sub frame assembly and projecting forwardly therefrom, spring means connected to the brackets, said spring means having portions projecting from the brackets, vibrating means attached to the projecting portions of the spring means in a condition for free vibrations, whereby free vibration effects will be introduced to said strike-off plate due to the resilient suspension thereof.

8. Paving machine apparatus comprising a carriage means, a sub frame assembly resiliently suspended from said carriage means, a strike-off plate having a horizontal portion adjustably suspended from said sub frame assembly for adjustment in a vertical sense relative to said carriage means, said strike-off plate having a leading vertically disposed portion, guide means for the vertically disposed portion of the strike-off plate mounted on the forward portion of the sub frame, spaced bracket means connected to said sub frame and projecting forwardly therefrom, leaf spring elements connected to said bracket means to extend parallel to said plate, and a vibratory screed mounted to the extending ends of said spring elements substantially parallel to said plate and in a condition for free vibration thereby whereby on vibration thereof free vibration effects will be induced in the strike-off plate through the leaf spring elements and the brackets.

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