Nov. 14, 1939. W. P. DAY 2,180,198

APPARATUS FOR EMPLACING CONCRETE

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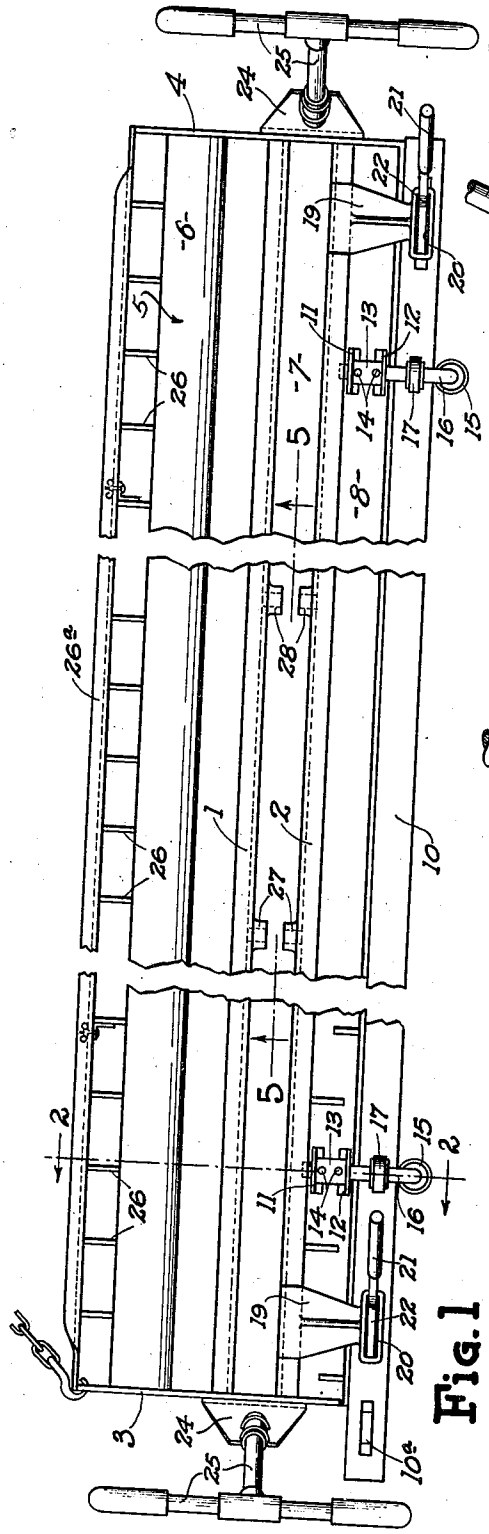


Fig. 1

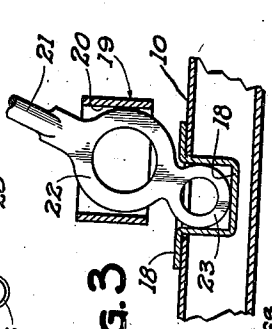


Fig. 3

Fig. 2

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FIG. 6.

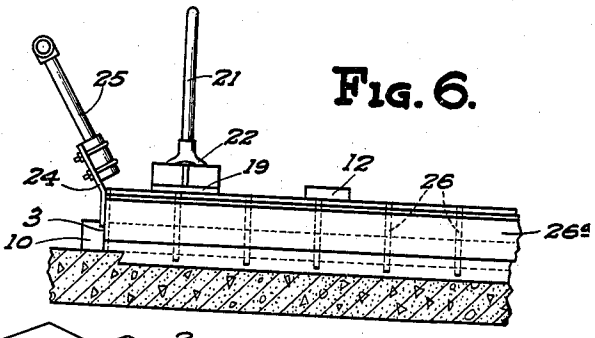


FIG. 4.

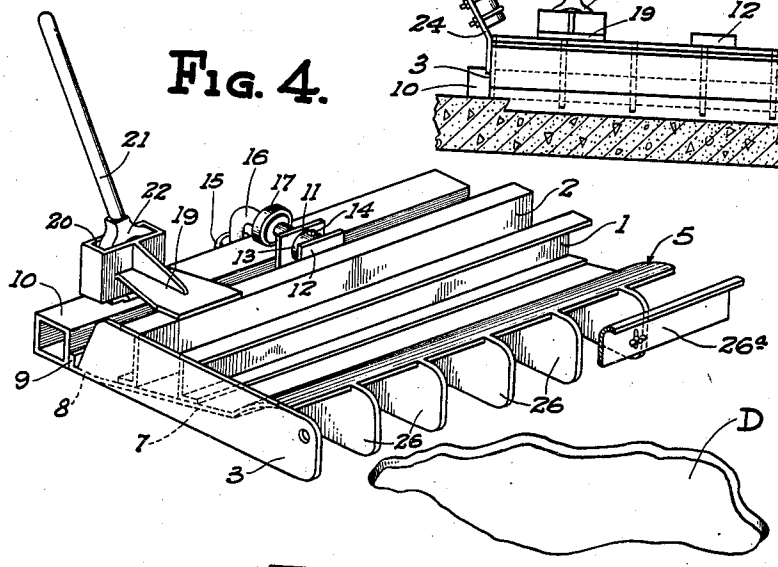
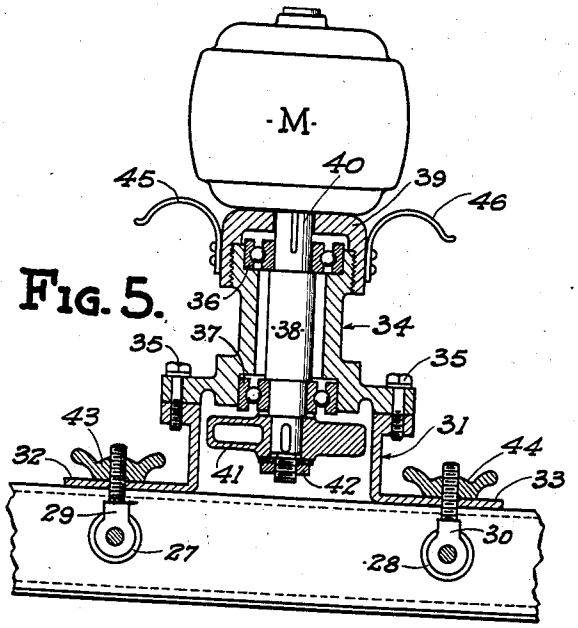


FIG. 5.



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FIG. 7.

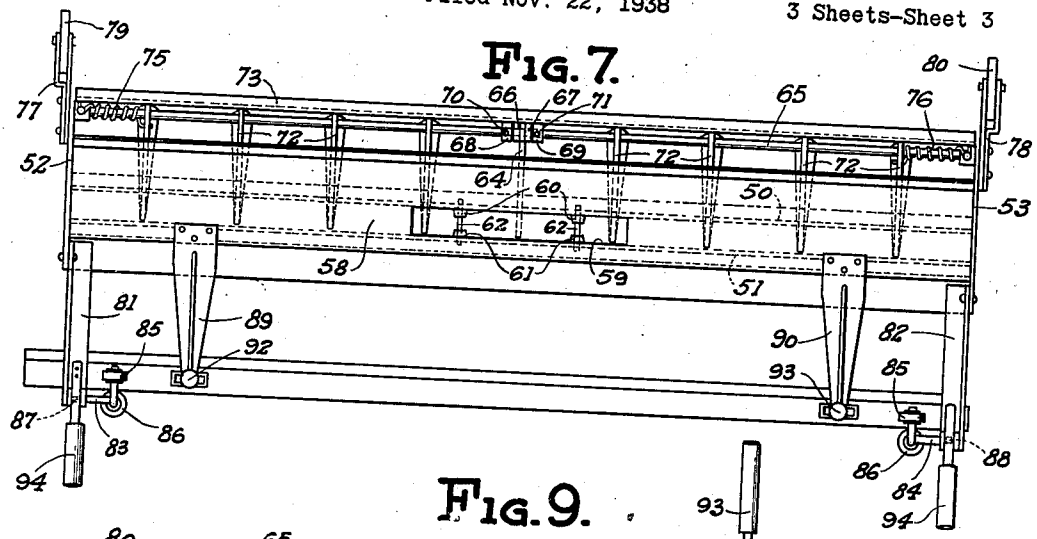


FIG. 9.

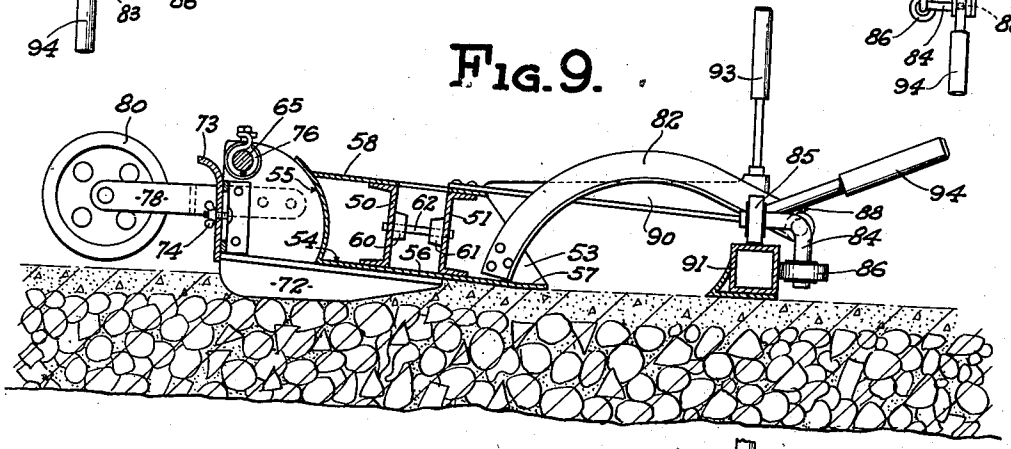
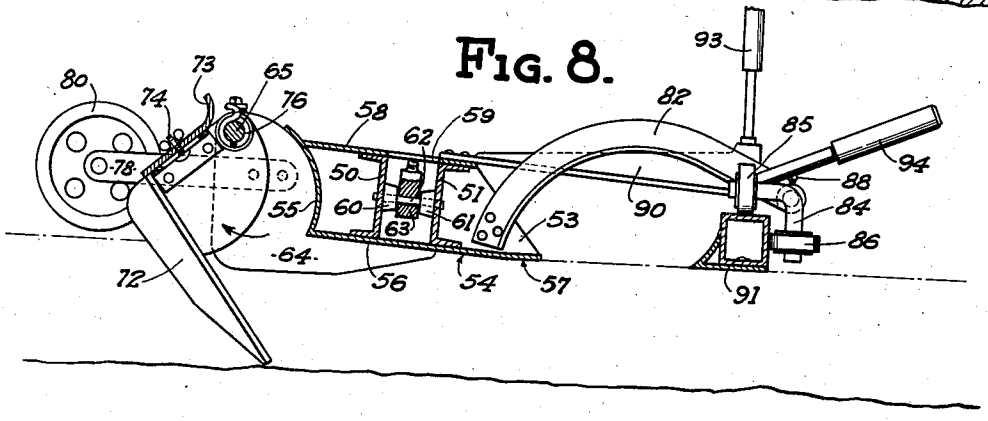


FIG. 8.



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2,180,198

UNITED STATES PATENT OFFICE

2,180,198

APPARATUS FOR EMPLACING CONCRETE

William P. Day, Cleveland Heights, Ohio, assignor to The International Vibration Company, Cleveland, Ohio, a corporation of Ohio

Application November 22, 1938, Serial No. 241,751

8 Claims. (Cl. 94—46)

This invention relates to a method and apparatus primarily designed and intended for applying a thin layer of concrete to the surface of an old road which has become defective.

Heretofore, it has been difficult to re-surface a road with concrete for the reason that the concrete will not bond sufficiently with the old road. According to my method of re-surfacing the road, I spread a thin layer of concrete over the surface of the old road and simultaneously subject such thin layer and the adjacent portions of the old road to a vibrating pressure, the vibrations being rapid and violent and of the order of four to six thousand impulses per minute. Due to the particular form of apparatus, the concrete is subjected to rapid and violent vibrations and at the same time is subjected to a vibrating pressure by reason of the fact that it is caused to flow through a restricted passageway which gradually diminishes in size from the inlet toward the outlet end thereof.

It is well known that concrete and other hard surface roads frequently become cracked and that water and the like seeps into these cracks and due to freezing and thawing action, further deterioration is caused. With my method and apparatus, I am able to re-surface a road with a thin layer of concrete and these cracks and crevices are completely filled with new concrete and the road, when resurfaced, will have a long life due to the fact that the new layer of concrete is caused to thoroughly bond with the old road.

One of the objects of the invention is to provide a method of re-surfacing roads as well as apparatus for practicing the method which will accomplish the objects of the invention and, at the same time, be simple and inexpensive in construction and practical in operation.

Another object of the invention is to provide a method of emplacing concrete which consists in spreading a layer of relatively stiff mix of the desired thickness having a small water content and simultaneously subjecting such layer to a compression and to rapid and violent vibrations applied directly to the mix to cause it to flow in a generally downward direction, such vibrations being applied to the surface of the layer of mix and also below the surface thereof.

Another object of the invention is to provide an apparatus for emplacing concrete in a road which will practice the method herein described and which consists of a pressure screed and a vibratory unit carried by such screed for imparting rapid and violent vibrations thereto and means for supporting the screed in a predetermined position with respect to the surface of the road, said screed being shaped and designed to provide a restricted passageway through which soft concrete may pass, the outlet end of such passageway being restricted in size and of less capacity than the inlet end thereof whereby the concrete is caused to pass through such passageway and to be subjected to a vibrating pressure.

It is old in the art to emplace concrete by distributing a layer of soft mix over a road and then to subject such layer to vibrations to cause the mix to settle in order to eliminate air pockets and voids, the vibrations being usually applied to the surface of the concrete. One of the evils and disadvantages of such a method is that the excess water in the mix is caused to rise to the top. I have discovered that, if the excess water can be caused to flow downwardly or to settle, much better results and a much stronger road can be obtained. I have also discovered that by using a very stiff mix having a very small water content and by subjecting the layer of mix to a vibrating pressure and at the same time forming ducts or passageways in the mix while it is being vibrated, the excess water in the concrete may be caused to flow downwardly through the layer rather than to rise to the surface. It is desirable to use as little water as possible in excess of the water necessary to carry out the chemical action required. The setting or hardening of concrete is a chemical process in which water combines with the cement accompanied by certain physical changes in the structure of the material. The extent to which the concrete will shrink during the initial setting period depends largely upon the amount of excess moisture present. The more water present in excess of that necessary for the chemical action, the more shrinkage will occur. Wet mixtures shrink a great deal more than do the drier ones and most of the shrinkage occurs during the first four hours and therefore much attention should be given to the curing procedure during this period. It is desirable that there be only a sufficient amount of excess water to secure the desired workability of the mix.

Another object of the invention is to provide an apparatus for emplacing concrete in road bed construction which includes a pressure screed and means for supporting the screed in a predetermined position with respect to the surface of the road to be formed, said screed having a plurality of plates pivotally mounted thereon and disposed so as to project downwardly into the

mass of concrete being poured together with means for imparting rapid and violent vibrations to the pressure screed as well as to the plates whereby the mass of concrete being emplaced is subjected to vibrations at the surface thereof as well as below the surface.

A further object of the invention is to provide an apparatus for emplacing concrete which includes a vibrating pressure screed and means for supporting the screed at the desired height, said screed having a plurality of plates pivotally secured thereto and which are adapted to project downwardly into the concrete to a point adjacent or below the bottom of the layer, together with means for imparting rapid and violent vibrations to the screed and to the plates, the screed being so shaped that the concrete is subjected to a pressure as well as to a vibratory action, the plates, when vibrated, serving to form ducts or passageways in the concrete through which the excess water in the concrete may flow downwardly.

A further object of the invention is to provide an apparatus for practicing the method herein described which is well adapted for use either in connection with re-surfacing a street, railway or roadbed or in connection with re-surfacing highways, streets, or the ilke.

Further and more limited objects of the invention will appear as the description proceeds and by reference to the accompanying drawings wherein Fig. 1 is a fragmentary top plan view of the apparatus for practicing the method to be described herein with the vibrator unit removed so as to better disclose the construction; Fig. 2 is a vertical sectional view on the line 2—2 of Fig. 1 showing the apparatus in use as it will appear when in use in re-surfacing a road or in repairing a small surface of the road which may have become defective; Fig. 3 is a detail sectional view showing a connection for operating the strike-off plate or bar; Fig. 4 is a perspective view showing the apparatus as it will appear when used to repair a defective surface in a roadbed; Fig. 5 is a vertical sectional view on the line 5—5 of Fig. 1 but with the vibrator unit in place; Fig. 6 is a fragmentary view partly in section and partly in elevation taken from the front of the apparatus; Fig. 7 is a top plan view of a modified form of apparatus which is particularly adapted for use in emplacing a layer of concrete of substantial thickness or depth; Fig. 8 is a vertical sectional view of the form of apparatus disclosed in Fig. 7 as it will appear when in use; and Fig. 9 is a view similar to Fig. 8 showing this form of apparatus as it will appear when applying grout to a roadbed formed of stone, rock or the like.

The apparatus for practicing the method consists essentially of a screed which is made up of a pair of channel members 1 and 2 which extend transversely and are connected together at the opposite ends thereof by a pair of plates 3 and 4, which are welded thereto. The angle irons 1 and 2 are channel shaped in section and are disposed in the position shown most clearly in Fig. 2. Secured to the channel members 1 and 2 and extending transversely of the apparatus is a plate indicated generally by the reference character 5 and which has at the front end thereof a curved portion 6, an adjacent inclined portion 7 and a straight portion 8, the purpose of which shall hereinafter appear. The plate 5 is preferably welded to the channels 1 and 2 and to the end plates 3 and 4. The rear end of the plate 5 is turned upwardly as shown at 9. Disposed rearwardly of the plate 5 and abutting the turned up portion 9 thereof is a strike-off bar 10 which is shaped in section as shown most clearly in Fig. 2 and which extends transversely the full width of the apparatus. Carried by the plate 5 and welded thereto are two pairs of angle irons 11 and 12 between which is disposed a sleeve 13 having set screws 14 therein. The strike-off bar is held in engagement with the upturned portion 9 of the plate 5, by means of a pair of rollers 15 which are rotatably mounted on a pair of angular arms 16. Also carried by the arms 16 and engaging the top of the strike-off bar and urging it downwardly are a pair of rollers 17. The angular arms 16 extend through the angle bars 11 and 12 and through the sleeve 13 and are adjustably secured in position by the set screws 14. The strike-off bar 10 has in the top thereof a pair of openings into which fit angular plates 18 which are shaped in section as shown most clearly in Fig. 3. Secured to the channel member 2 are a pair of brackets 19 which are preferably welded thereto and the outer ends of which are provided with rectangular openings 20 which receive therethrough operating levers 21, each of which is provided with a circular portion 22 which engages within the openings 20 and a circular portion 23 which engages in the angular plates 18. The operating levers 21 are used to reciprocate the strike-off bar 10. Secured to the end plates 3 and 4, respectively, are brackets 24 to which are secured handle members 25 by means of which the apparatus may be lifted.

Disposed between the end plates 3 and 4 and extending parallel therewith are a plurality of spaced bars or plates 26, the lower edges of which project a slight distance below the lower edges of end plates 3 and 4, as shown most clearly in Fig. 2. The plates 26 are welded to the plate 5 and to the channeled members 1 and 2 and have their rear edges disposed immediately adjacent the straight portion 8 of the plate 5. Secured to the plates 26 and to the end plates 3 and 4 is a strike-off plate 26a which is vertically disposed and adjustably mounted thereon. The position of this strike-off plate 26a determines the height of the layer of material which is to be applied to the surface of the road.

The channeled members 1 and 2 are provided with oppositely disposed pairs of bosses 27 and 28 and disposed therebetween are a pair of clamping members 29 and 30 which are adapted to rigidly secure the vibrator unit in place. The vibrator unit proper is illustrated in Fig. 5 and consists essentially of a base plate 31 which is provided with apertured end flanges 32 and 33. Secured to the base plate 31 is a hollow casting 34 of the shape shown in Fig. 5 and which is held in place by bolts 35. Mounted in the hollow casting 34 are a pair of bearing members 36, 37 and rotatably mounted therein is a shaft 38. Threadedly secured to the hollow casting 34 and enclosing the top thereof is a cap 39 and mounted on the top thereof is a motor M which may be an electric motor, an air motor, or a gas motor and which is provided with a shaft 40 which is keyed or otherwise rigidly connected to the shaft 38.

Non-rotatably mounted on the lower end of the shaft 38 is a flywheel 41 which is held in place by means of a suitable nut 42. The flywheel 41 is weighted at one end thereof and when rotated at high speed serves to impart rapid and violent vibrations to the entire unit. The vibrator unit is rigidly clamped in place by means of clamping nuts 43 and 44 and is readily removed from the

screed. The cap 39 is provided with a pair of handles 45 and 46 by means of which the vibrator unit may be readily removed.

When it is desired to use the apparatus to apply a thin coating to the surface of a concrete road which has become defective, the defective road surface is first scarified and cleaned. The scarifying is done by means of a tool or series of tools known as a scarifier which embodies a plurality of boring or cutting tools which are rotated at high speed and mounted for reciprocatory motion so that the surface of the defective portion of the road may be scored or cut away. In Fig. 4, the reference character D indicates the defective portion of the road which it is desired to repair. The scarifier is used to scarify the surface which has become defective and to cut away the surface for about ¼ to ½ inch. The edges of the portion to be patched may be slightly undercut, as indicated at 47 in Fig. 2. The vibrating screed is then placed upon the road in about the position shown in Fig. 4, with the end plates 3 and 4 resting upon the portion of the road adjacent the defective portion. In applying a thin layer of concrete to the surface of the road which has become defective, it is very desirable that a stiff mix be used. Such a mix preferably consists of one part cement, two parts sand and about four gallons of water per bag of cement. This is a very stiff mix which will not flow without being vibrated and with no more water content than is necessary. A sufficient quantity of this mix is disposed in front of the pressure screed and the motor started. The motor, whatever its type, is adapted to be operated at a high speed so that the impulses imparted to the screed by the vibrator will be of the order of from four to six thousand impulses per minute. When the motor is started and the machine moved in the direction indicated by the arrow in Fig. 2, these vibrations cause the stiff mix to flow under the strike-off plate 26a and through the screed in a generally downward direction. It is to be noted that the curvature of the plate 5 is such that the opening between the plate 5 and the top of the surface to be covered gradually diminishes in size. In other words, the passageway through or beneath the screed decreases in area from the front to the rear thereof so as to provide a restricted throat portion through which the concrete flows while being vibrated. This throat portion is that portion immediately below the straight portion 8 of the plate 5. Due to the rapid and violent vibrations and due to the shape of the restricted passageway, the concrete is subjected to a vibrating pressure. The vibrations are imparted to the soft concrete through the medium of the plates 26. The plates 3 and 4 of the screed normally rest upon the portion of the road adjacent the part to be repaired so that rapid and violent vibrations are imparted both to the thin layer of material being applied and to the adjacent portions of the road. This vibrating pressure which is applied to the thin layer and to the surface of the old road causes the concrete to flow and to effect a thorough and intimate bond with the old road surface without any undue separation or segregation of the aggregate which forms a part of the re-surfacing layer.

While the pressure screed is being vibrated and the concrete is flowing therethrough, the strike-off bar 10 is given a reciprocatory motion by the operators by means of the bars 21. The strike-off bar 10 at the opposite ends thereof rests on the old road surface so that the edges of the layer applied are level with the surface of the old road. In cases where it is necessary to re-surface a defective portion of the road which is immediately adjacent the curb, the bar 10 is provided with a rectangular opening 10a so that it may be shifted toward the right as seen in Fig. 1 to a position where the portion 22 of one of the operating levers 21 may engage in the opening 10a, which will permit the end plate 3 of the screed to be positioned immediately adjacent the curb. The amount of mix which is deposited in front of the screed depends upon the thickness of the layer to be applied to the old road. I have found that the screed should be moved forwardly in the direction of the arrow in Fig. 2 at the rate of about 1 foot to 6 feet per minute, depending upon the thickness of the layer to be applied. The pressure screed may be moved forward by any suitable means, such as a truck, or manually, if desired. The best results are obtained if the defective road surface is thoroughly scarified and cleaned, so that there will be no foreign matter between the road surface and the layer being applied. The scarifying should be done in such a manner as to provide a roughened surface. Such a layer may be applied and the re-surfaced road opened to traffic within from six to twelve hours, thus avoiding considerable expense for red lights, barricades and other hazards. I am able to use a very dry mix and thus obtain a very strong and durable surface. Each particle of stone or aggregate will be coated with a cement paste and the entire layer will be thoroughly bonded with the old road. If desired, the vibrating pressure screed may be shaped so as to fit a curbing.

In Figs. 7, 8 and 9 I have disclosed a slightly modified form of apparatus which is particularly adapted for emplacing concrete in a new roadbed construction where the layer has considerable depth. In this form of apparatus the pressure screed is of slightly different construction and has attached thereto a plurality of plates which are pivotally mounted on the screed. In this form of apparatus the strike-off plate or screed is spaced a slight distance rearwardly of the pressure screed and rests on the form boards. The height of this screed determines the upper level of the road. With this apparatus I am able to apply between 40% and 50% more mix or concrete than could be applied by a tamping operation. Another advantage is that I am able to use a very stiff mix and consequently obtain a much stronger and more durable roadbed which will cure much more rapidly.

The apparatus disclosed in Figs. 7, 8 and 9 consists of a pair of channel members 50 and 51 which are shaped in section as shown most clearly in Figs. 8 and 9 and which extend transversely of the apparatus. These channel irons are secured together at the opposite ends thereof by a pair of plates 52, 53 which are bolted or welded thereto. Forming the bottom of the pressure screed is a plate 54 which is shaped in section as shown in Figs. 8 and 9, and which has a curved forward portion 55. This plate extends the entire width of the apparatus and has an inclined portion 56 and a straight portion 57. Secured to the top of the channel members is a flat plate 58 which extends the full width of the apparatus and is welded or otherwise secured in place. The plate 58 has at the central portion thereof a rectangular opening 59. Welded to

the channel members 50 and 51 are two pairs of hollow bosses 60 and 61. The channel members and bosses each have a central opening therein through which extends a pin 62 which receives thereover a clamping member 63 which is of the same construction as the clamping members 29 and 30 and receive thereover clamping nuts which serve to secure the vibrating unit in place. Disposed centrally of the apparatus is a vertically disposed rigid plate 64 which is welded to the plate 54. Extending transversely of the apparatus is a rod or shaft 65 which has bearings in the opposite ends of the plates 52 and 53. Formed integral with the plate 64 are a pair of bosses 66 and 67 through which the shaft 65 extends, and disposed on opposite sides of the bosses are a pair of collars 68 and 69 which are secured to the shaft by set screws 70 and 71. These collars 68 and 69 prevent any substantial endwise movement of the shaft. Non-rotatably mounted on the shaft 65 and movable therewith are a plurality of plates 72 which are of the shape shown most clearly in Fig. 8.

Secured to the plates 72 and extending transversely of the machine is a strike-off plate 73 which is adjustably secured to the plates 72 by means of clamping nuts 74 in such manner that the height of the strike-off plate may be adjusted. Disposed at opposite ends of the shaft 65 are a pair of coil springs 75 and 76 which tend to turn the shaft 65 clockwise as indicated by the arrow in Fig. 8. Secured to the end plates 52 and 53 are a pair of brackets 77 and 78 which receive and rotatably support a pair of wheels 79 and 80 which are adapted to roll upon a form board and enable the machine to be readily removed therefrom. Secured to the plates 52 and 53 and extending rearwardly therefrom are a pair of angle bars 81 and 82 which are slightly curved as illustrated in Figs. 8 and 9. Carried by the outer ends of the angle bars 81 and 82 are a pair of angular rods 83 and 84 each having three branches which receive and rotatably support rollers 85 and 86. The rods 83 and 84 are secured in place by set screws 87 and 88. Secured to the top plate 58 and extending rearwardly therefrom are a pair of arms 89 and 90 which are substantially identical in construction with the arms 19 shown in Fig. 1 except that they are longer. Disposed rearwardly of the machine and extending transversely thereof and positioned so as to be engaged by the rollers 85 and 86 is a strike-off screed 91 which is adapted to extend transversely of the road and to rest upon the form boards. Carried by the arms 89 and 90 are a pair of handle members 92 and 93 which engage in openings provided in the top of the strike-off screed 91 and serve as a means for reciprocating the strike-off screed. The mechanism for reciprocating the strike-off screed is identical with that shown in the form of the apparatus disclosed in Figs. 1 to 6 inclusive. Secured to the arms 81 and 82 are a pair of handle members 94 which serve as a means for removing the machine from the roller.

The vibrating unit which is applied to this form of apparatus is identical with that disclosed in Fig. 5 and is secured in place in substantially the same manner.

When this form of apparatus is to be used to emplace concrete in a new roadbed construction, the apparatus is placed upon the road with the pressure screed and the strike-off screed both resting on the form boards disposed at each side of the road. The wheels 79 and 80 do not normally engage the form boards but merely serve as a means for readily removing the machine. The strike-off plate 73 is adjusted to the desired height. The springs 75 and 76 urge the plates 72 to the position shown in Fig. 8. A mass of concrete of the desired depth and consistency is spread in front of the machine. The motor is started to vibrate the screed and the machine is moved forwardly preferably at the rate of about three to six feet per minute. When the motor is started, the vibrations of the screed cause the relatively stiff mix to flow through the screed in a generally downward direction. The curvature of the plate 54 is such that the opening between the bottom of the plate 54 and the top of the surface to be covered gradually diminishes in size. In other words, the passageway through or beneath the screed decreases in area from the front toward the rear thereof so as to provide a restricted throat portion through which the concrete flows while being vibrated. This throat portion is that portion of the screed immediately below the straight portion 57 of the plate 54. Due to the rapid and violent vibrations applied to the screed and due to the shape of this restricted passageway, the concrete is subjected to a vibrating pressure. Vibrations are also imparted to the plates 72 which project downwardly through the mass of concrete. At the same time vibrations are imparted to the strike-off screed 91 which is held in engagement with the form boards by the rollers 85 and 86.

It will thus be seen that vibrations are imparted to the top of the layer of mix as well as throughout the mass. As the plates 72 are also subjected to rapid and violent vibrations they will form ducts or passageways through the mass of concrete through which water and the most fluid portions of the mass of mix will flow. Due to the fact that the mass of mix is subjected to vibrations applied to the surface thereof and throughout the mass and also to a pressure, the excess water in the mix is caused to flow downwardly through the ducts formed by the vibrating plates 72 rather than to rise to the surface. For this reason, I am able to use a very stiff mix having a very small water content.

The strike-off plate 73 determines the thickness of the layer of mix which may pass under the vibrating pressure screed and may be adjusted to the desired height. As this strike-off plate is carried by and movable with the plates 72, its height is determined by the depth to which the plates extend into the mass of mix.

In Fig. 9 the apparatus is shown as it will appear when used to form a roadbed in which a mass of stone is first applied to the roadbed and then a coating of grout applied thereto. In this instance the pivotally mounted plates 72 rest upon the rather large particles of stone and impart vibrations thereto. When the apparatus is used to form a road of this character, the plates 72 serve to impart rapid and violent vibrations to the entire roadbed thereby causing the grout to flow through the mass and to thoroughly penetrate the same and to coat each particle of stone with grout.

It will now be clear that I have provided a method and apparatus which is particularly well adapted for accomplishing the objects of the invention as hereinbefore stated. It is to be understood that the embodiments of the invention herein disclosed are to be considered merely as illustrative and not in a limiting sense as various changes may be made in the details of construc-

tion and arrangement of parts without departing from the spirit of my invention. The invention therefore is limited only in accordance with the scope of the appended claims.

Having thus described my invention, what I claim is:

1. An apparatus for emplacing concrete in a road comprising a screed, a plurality of plates pivotally mounted on said screed and adapted to project downwardly into the layer of mix being laid, means for applying rapid and violent vibrations to said plates and to said screed, means for supporting said screed in a predetermined position with respect to the surface of the road to be formed, said screed being shaped and designed to provide a restricted passageway through which soft concrete may pass, the outlet end of said pasageway being of less capacity than the inlet end thereof whereby the concrete passing through the screed will be subjected to a vibrating pressure.

2. An apparatus for emplacing concrete in a road comprising a screed, means for supporting said screed at a predetermined position with respect to the surface of the road to be formed, a plurality of spaced plates pivotally mounted on said screed and disposed so as to project downwardly therefrom into the mass of concrete being laid, spring means urging said plates downwardly, a strike-off plate carried by said plates, the height of said strike-off plate above the surface of the road to be laid being determined by the position of said plates, and means for imparting rapid and violent vibrations to said screed and to said plates.

3. An apparatus for emplacing concrete in a road comprising a screed, means for supporting said screed at a predetermined position with respect to the surface of the road to be formed, a plurality of spaced plates pivotally mounted on said screed and disposed so as to project downwardly therefrom to a point near the bottom of the mass of concerte being laid, spring means normally urging said plates downwardly, a strike-off plate carried by said plates, the height of said strike-off plate above the surface of the road to be laid being determined by the position of said plates, means for imparting rapid and violent vibrations to said screed and to said plates, a strike-off screed disposed rearwardly of and spaced from said first mentioned screed, and means for reciprocating said strike-off screed.

4. An apparatus for emplacing concrete in a road comprising a screed having a plurality of plates secured thereto and adapted to project downwardly into the layer of mix being laid, means for applying rapid and violent vibrations to said plates and to said screed, means for supporting said screed in a predetermined position with respect to the surface of the road to be formed, said screed being shaped and designed to provide a downwardly tapered restricted passageway through which soft concrete may pass, the outlet end of said passageway being of less capacity than the inlet end thereof whereby the concrete passing through said screed will be subjected to a vibrating pressure.

5. An apparatus for emplacing concrete in a road comprising a screed, means for supporting said screed at a predetermined position with respect to the surface of the road to be formed, a plurality of spaced plates pivotally mounted on said screed and disposed so as to project downwardly therefrom into the mass of concrete being laid, spring means urging said plates downwardly, and means for imparting rapid and violent vibrations to said screed and to said plates.

6. An apparatus for emplacing concrete in a road comprising a screed, means for supporting said screed at a predetermined position with respect to the surface of the road to be formed, a plurality of spaced plates pivotally mounted on said screed and disposed so as to project downwardly therefrom to a point near the bottom of the mass of concrete being laid, means for imparting rapid and violent vibrations to said screed and to said plates and a strike-off screed disposed rearwardly of and spaced from said first mentioned screed, and means for reciprocating said strikeoff screed.

7. An apparatus for applying a thin layer of concrete to the defective surface of an old road comprising a screed having a plate so shaped and formed that when the screed is applied to the surface of a road it will provide a downwardly tapered passageway through which concrete is caused to flow, the inlet end of such passageway being of greater capacity than the outlet end thereof, and means for causing the concrete to flow through said passageway including means for imparting rapid and violent vibrations to said plate in a plane parallel with the surface of such layer.

8. An apparatus for applying a surface layer of concrete to an underlying layer of concrete comprising a screed having a plate so shaped and formed that when the screed is applied to an underlying layer, it will provide a downwardly tapered passageway through which concrete mix is caused to flow, the inlet end of such passageway being of greater capacity than the outlet end thereof, means for imparting rapid and violent vibrations to said plate in a plane generally parallel to the surface of the underlying layer to cause the mix to pass through said passageway and to be subjected to a vibrating pressure when the screed is moved forwardly and a plurality of spaced vertically disposed plates carried by said screed and projecting downwardly therefrom and adapted to transmit the vibrations to the layer of mix over substantially the entire area thereof.

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