June 3, 1941. J. N. HELTZEL 2,244,297

VACUUM SCREED

Original Filed Nov. 9, 1936 2 Sheets-Sheet 1

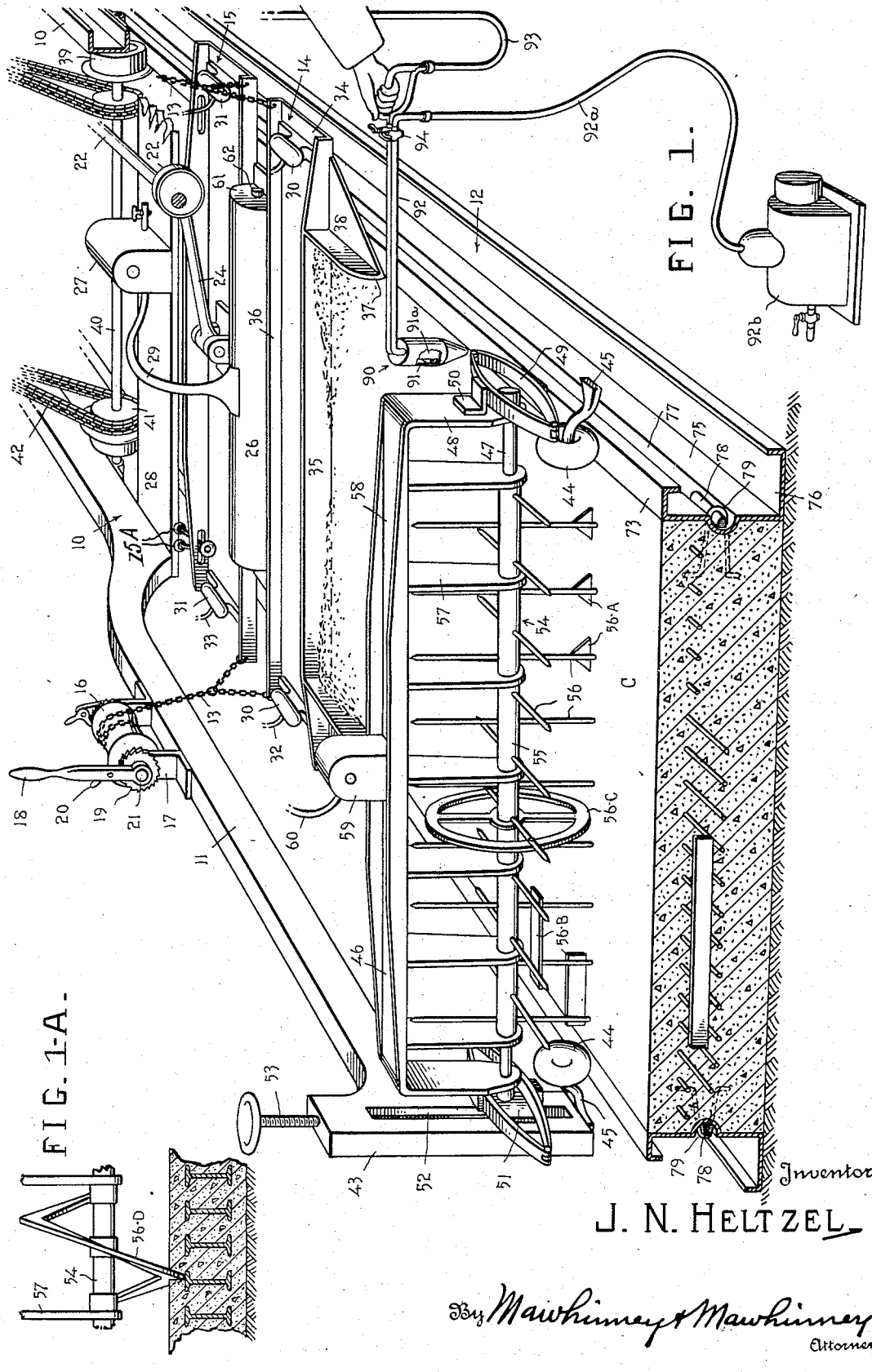


FIG. 1.

FIG. 1-A.

Inventor:
J. N. HELTZEL

By Mawhinney & Mawhinney
Attorneys

June 3, 1941. J. N. HELTZEL 2,244,297

VACUUM SCREED

Original Filed Nov. 9, 1936 2 Sheets-Sheet 2

FIG. 2.

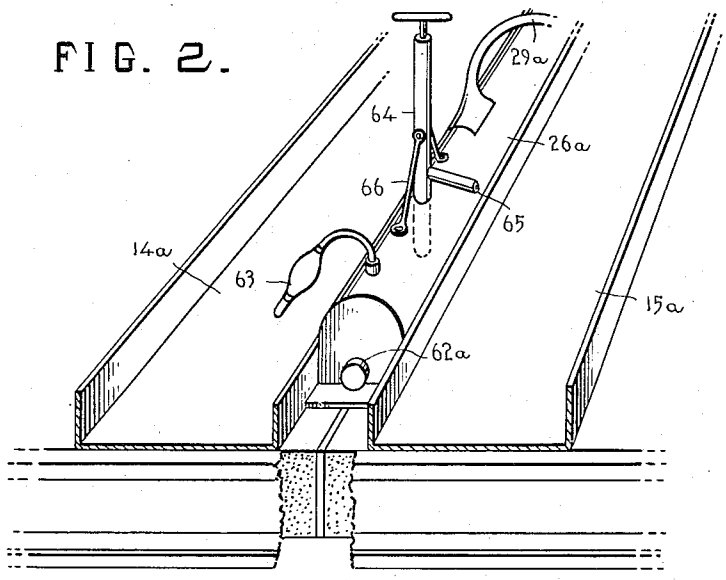


FIG. 3.

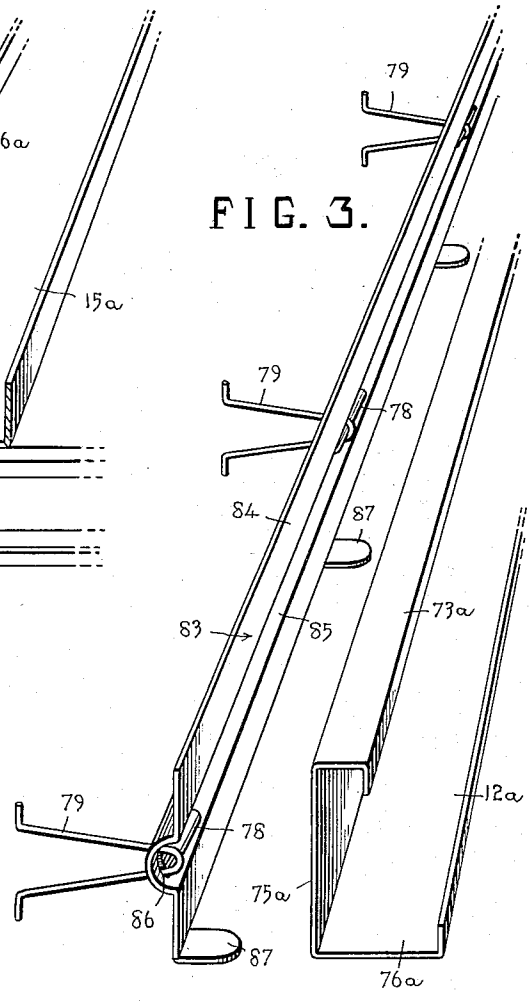


FIG. 5.

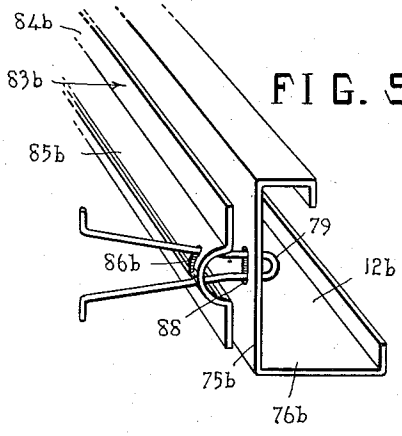


FIG. 4.

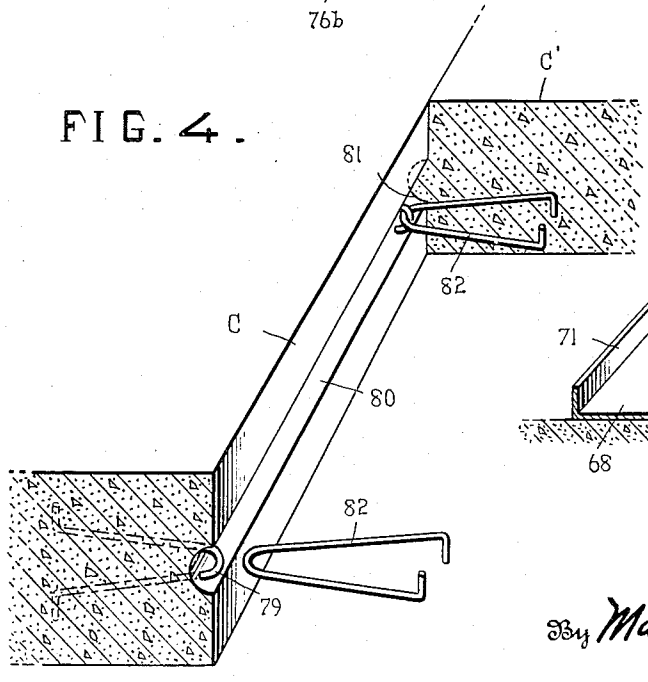
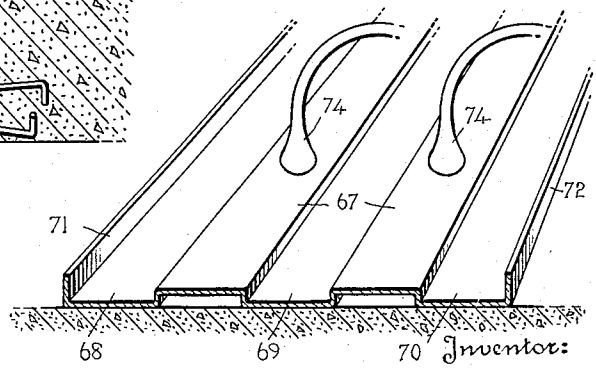


FIG. 6.



Inventor:

J. N. HELTZEL

By Mawhinney & Mawhinney

Attorneys.

Patented June 3, 1941

2,244,297

UNITED STATES PATENT OFFICE

2,244,297

VACUUM SCREED

John N. Heltzel, Warren, Ohio

Application November 9, 1936, Serial No. 110,016
Renewed January 29, 1940

12 Claims. (Cl. 94—45)

This invention relates to road building machines and has for an important object thereof the provision of a machine embodying means whereby the voids in the concrete after the concrete has set will be eliminated.

An object of this invention is to provide a combined surfacing means and a means for withdrawing air and water from the plastic concrete at the time the road surface is being formed.

Another object of this invention is to provide a machine of this type which is so constructed that it will not disturb the plastic material engaging the forms for the roadway and which, at the same time, will compact the material between the side forms and about the reinforcing means usually embedded in the body of the concrete.

A further object of this invention is to provide a means which may be secured to a plastic material spreading and mixing means which is adapted to move along the forms with the mixing machine, the device having incorporated therein means to vibrate the plastic material to thereby compact the material while, at the same time, withdrawing air in the plastic material and simultaneously withdrawing free water.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawings, wherein like symbols refer to like or corresponding parts throughout the several views:

Figure 1 is a fragmentary perspective view of a device constructed to an embodiment of this invention mounted on a frame of a plastic material mixing and discharging machine.

Fig. 1—A is a fragmentary view with parts in section showing the modified form of vibrating device.

Figure 2 is a fragmentary perspective view of a modified form of this invention.

Figure 3 is a fragmentary perspective view of an improved form construction for the side of the roadway.

Figure 4 is a fragmentary perspective view of the abutting edges of a roadway constructed with the forms shown in Figure 3.

Figure 5 is a fragmentary perspective view of another type of form for the edge of the roadway.

Figure 6 is a fragmentary perspective view of a modified form of vacuum screed which may be used with the embodiment shown in Figure 1.

Referring to the drawings and first to Figure 1 the numeral 10 designates generally a frame structure which is associated with a concrete mixing and distributing machine. The frame structure 10 includes side frame members 11 which are preferably disposed in an elevated position from the side form members 12 which constitute the form between which the plastic concrete C is poured. A pair of screed members 14 and 15 are disposed between the side members 11 of the frame and are positioned in spaced relation to each other as will be hereinafter described. The screed members 14 and 15 are adapted to slidably engage the upper edges of the form members 12. Universal couplings 15—A connect the screeds to machine frame for back and forward screeding, while at the same time permitting of the raising and lowering of the screed members.

The screed members 14 and 15 are suspended from the frame members 11 by means of a chain 13, one end of which is secured to the adjacent ends of the screeds 14 and 15 and the remaining portion of the chain 13 is wound about a drum 16 supported by supporting members 17 secured to the side frame members 11. The drum 16 is rotated by means of a lever 18 and a ratchet 19 engaged by a pawl 20. The ratchet 19 is secured to the shaft 21 on which the drum is fastened and the pawl 20 is secured to the lever 18. There are two of these chains 13 and two drums 16 with the other parts associated with the drum 16. The chain 13 is divided at its lower end as shown in Figure 1 so that a single chain may be used to raise or lower the adjacent ends of the screeds 14 and 15.

Through the use of the flexible supporting members 13 the screeds 14 and 15 may be supported in desired relation with respect to the upper edges of the form members 12. The flexible members 13 provide a means whereby the screeds 14 and 15 may be supported for lateral movement across the form and in order to effect lateral movement of the screeds 14 and 15 I have provided a screed reciprocating shaft 22 which is adapted to be connected to a suitable source of power (not shown) and this drive shaft 22 is provided with an eccentric 23 which is engaged by one end of a link 24. The link 24 at the other end is connected to a boss or bearing 25 carried by the screed member 15. As the shaft 22 is rotated the eccentric or cam 23 will effect lateral movement of the two screeds 14 and 15.

A vacuum housing 26 is secured between the two screeds 14 and 15 and holds these two screeds in spaced apart relation so that the screeds will move laterally under the reciprocation of the pit-

man 24. The housing 26 is preferably shorter in length than the length of the screeds 14 and 15 and is also slightly shorter than the distance between the side forms 12. The housing 26 is open on its under side and an air pump 27 secured to a transversely extending beam 28 is connected to the vacuum chamber or housing 26 by means of a flexible tube 29. The details of the pump 27 are conventional and it is thought that a further description thereof is unnecessary. Preferably, the hose 29 is connected to the top of the vacuum housing 26 in the center thereof as shown in the drawings. An additional pitman and eccentric may be mounted on shaft 22 and connected to screed 14; or, as shown, the reciprocating movement of screed 15 may be transmitted to screed 14 by the vacuum casing 26 which is secured to both screeds.

Simultaneous with the lateral reciprocation of the screed members 14 and 15 the screed members may be vibrated by means of vibrating elements 30 and 31 secured to the screeds 14 and 15 respectively adjacent their outer ends. These vibrating elements 30 and 31 may be electrically operated being connected to a suitable source of electric current supply by means of conductors 32 and 33 respectively.

As shown in Figure 1, the screed member 14 is constructed in the form of a channel member having a flat bottom 34 and upstanding walls or flanges 35 and 36. The wall 35 has a pair of forwardly extending vertical wall members 37 braced by bracing members 38. These wall members 37 form a box or material retaining means to retain the concrete on the forward side of the screed member 14 as the machine moves forwardly.

The frame member 10 is moved forwardly on wheels 39 secured to a shaft 40 and the shaft 40 has a sprocket or drive pulley engaged by a flexible driving member 42 which is operated by a suitable source of power supply. The forward ends of the frame members 11 are provided with vertically disposed guide members 43 and wheels 44 are rotatably carried by spindles or brackets 45 secured to the guide members 43. Preferably, these front wheels 44 are of the pneumatic type so that the vibrations of the frame members 11 will not be communicated to the form members 12.

A substantially U-shaped frame 46 is disposed between the guide members 43 and is mounted on a shaft or bar 47 which is secured between the vertical legs 48 of the frame 46. A spring member 49 has one portion thereof secured as at 50 to a vertical leg of the frame 46 and another portion of the spring structure 49 is secured to a guide member 51 which engages in a channel 52 provided in the guide member 43. An adjusting screw 53 threadably engages the slide 51 so that the entire frame 46 may be vertically adjusted between the rails or form members 12. A plurality of plastic material vibrating members 54 are loosely mounted on the shaft 47 and comprise a sleeve 55 which is loose on the shaft 47 and a plurality of elongated teeth 56. There are a number of these material vibrating members 54 mounted on the shaft 47 and the shaft 47 is braced by means of a plurality of depending hangers or bearing members 57 which are secured to the horizontal portion 58 of the frame 46. The frame 46 with the material vibrating members 54, are vibrated by means of a vibrating element 59 which may be electrically operated and connected by conductors 60 to a suitable source of electric current supply.

The vacuum member 26 may be constructed out of sheet metal or may be constructed out of relatively flexible material and this vacuum member 26 is provided in one end wall 61 thereof with a liquid discharge connection 62 so that the water drawn up into the housing 26 may be removed by a suitable suction device.

Referring now to Figure 2, there is here shown a screed structure 14*a*—15*a* having a vacuum housing 26*a* disposed therebetween. The vacuum housing 26*a* has a flexible hose 29*a* secured thereto which is connected to a suction device similar to that shown in Figure 1. The out-let connection for water, designated 62*a*, is adapted to have a siphon member 63 secured thereto so that any water in the housing 26*a* may be siphoned out. If desired the siphon 63 may be supplemented by a pump 64 which extends down through the top of the housing 26*a* and is provided with a discharge nozzle or connection 65. This pump may be braced by means of bracing members 66.

In Figure 6, there is shown a modified form of screed and vacuum means and in this form there are provided a pair of vacuum housings 67 which are formed integrally with the screed members 68, 69 and 70. A vertically extending wall 71 is formed on the longitudinal outer edge of the screed member 69 and a vertical wall or flange 72 is formed on the longitudinal edge of the screed member 70. A pair of suction pipes 74 are connected at one end to the vacuum housings 67 and are connected at the other end to a suction device similar to that shown in Figure 1.

As shown in Figure 1, the side forms 12 are constructed of sheet metal being formed with a top rail 73, a vertical plate 75, and a flanged base plate 76. The vertical wall 75 is preferably provided with a channelled intermediate portion 77 of concavo-convex configuration with the concave side outermost and preferably, the depth of the channel 77 is sufficient to receive wedges 78 which engage in loops 79 formed by tie rods which are embedded in the concrete and project through slots provided for that purpose in the channelled portion 77. The convex inner side of the side rail 12 provides a concave channel 80 in the side wall of the concrete body C. As shown in Figure 4, the adjacent block C' is adapted to be formed with a tongue 81 which engages in the groove or keyway 80 of the block C. The block C' is adapted to have looped tie members 82 which engage the tie members or loops 79 so that two blocks C and C' are securely locked together.

In Figure 3, there is disclosed another form of side rail construction and in this form an outer form member 12*a* is provided having an upper rail 73*a* and a vertical wall 75*a*. The vertical wall 75*a* is secured at its lower end to a channelled base member 76*a*. A separable keyway forming member 83 is adapted to engage against the inner side of the vertical wall 75*a* and comprises an elongated plate 84 having a concavo-convex intermediate portion 85 provided with a plurality of spaced apart slots 86 through which the looped portions of the tie members 79 are adapted to engage. Wedges or tapered securing members 78 hold the tie members 79 in the slots 86. The lower edge of the plate 84 is provided with a plurality of outwardly extending feet or base members 87 which are adapted to engage beneath the base 76*a* and thereby hold the plate

84 in upright position and in contacting relation with the inner side of the vertical wall 75a.

In Figure 5, there is disclosed another form of side rail construction somewhat similar to that disclosed in Figure 3. In this form, however, the outer form member 12b is provided in the vertical wall 75b with a plurality of slots 88 through which the loops of the tie members 79 are adapted to project. An inner keyway forming member 83b comprising a plate 84b having a concavo-convex channel 85b is adapted to engage against the inner side of the vertical wall 75b and is provided with spaced apart slots 86b through which the tie members 79 project. These slots 86b are adapted to register with the slots 88 so that wedges or other holding means may be passed through the projecting loop portion of the tie member 79 on the outer side of the vertical wall 75b.

In the use and operation of the device disclosed in Figure 1, the material is poured into the space between the form members 12 and the frame extensions 11 may be disposed on either the forward or rear end of the concrete mixing and distributing machine, depending upon the condition of the road and other conditions which may be encountered. The screeds 14 and 15 are adjusted relative to the rails 73 by the chains 13 so that after one portion of the lateral reciprocation thereof the screeds 14 and 15 will substantially contact with the rails 73 and adjacent the end of the lateral movement of these screeds in either direction the screeds will be slightly raised thus effecting a pulling of any water or air in the space between the screeds which is occupied by the vacuum housing 26. The suction member 27 will be operated continuously to continuously withdraw air and substantially free water from the plastic concrete and the water will be retained in the housing 26 from which it may be withdrawn by the means disclosed in Figure 2. Simultaneous with the lateral reciprocation of the screeds 14 and 15 by means of the shaft 22 and the pitman 24, the screeds may be vibrated by the vibrating elements 30 and 31.

At the same time that the screeds 14 and 15 are reciprocated and vibrated, the frame 46 is vibrated by means of the vibrating member 59 and the teeth 56 of the compacting members 54 will be vertically vibrated within the plastic concrete. The teeth 56 may extend down into the plastic concrete to the depth of the reinforcing rods or may extend below these rods if desired, this being accomplished by the adjusting screw 53 carried by each guide member 43. It has been found that vibrating elements 56 also serve as re-mixing agents and increase the strength of the concrete by this re-mixing operation simultaneously as these elements are vibrated when being moved in and out of the plastic mass as the machine moves forward.

The screed construction disclosed in Figure 6 will be used with the compacting members 54 and the screed members here disclosed will be suspended by similar flexible members to those shown in Figure 1.

It is the general practice to vibrate along the side forms by using a portable vibrator. For this operation I provide a vibrating element 90, which is enclosed in the outer casing 91. There is also an inner casing 91a to protect the vibrating mechanism, which may consist of an electric apparatus or a pneumatic hammer, as might be required. There is a suction tube 92, which connects with the space between the casings 91 and 91a, and there is a strainer pad between the two casings to prevent concrete from entering, but the padding is so arranged to admit free water and air into the chamber, which is then drawn through the tube or pipe 92. A flexible tube or hose 92a is connected to a suitable vacuum pump 92b to draw the air and water from the plastic material. If the vibrator is operated by air, then the line 93 would consist of hose to supply the air to operate the pneumatic vibrator. Where electric current is used, then the line 93 would consist of suitable electric wire. In either case suitable valve arrangements 94 are supplied to operate the vibrator, as well as the vacuum apparatus.

It will be understood that this portable vibrator is moved manually and is projected down into the plastic concrete at various intervals along the side forms to produce the required density of the concrete.

The suction chamber 26 may also be used with the screed construction shown without reciprocating the screed construction, and it will be understood that the moist concrete engaging the lower edges of the chamber 26 will act as a seal so that only air and water will enter the chamber 26 which has been drawn from the plastic concrete.

Compression plates 56—A assist compacting member, such plates being carried by the teeth or pins 56 near the ends thereof. Instead of the plates, compacting bar members 56—B may be provided, or these bar members may be provided in conjunction with the plates 56—A. The bars 56—B are carried by pairs of the pins or teeth 56 so as to rotate therewith around the shaft 47. These plates 56—A and the bars 56—B are tamping members which bear down on the concrete at the same time that the concrete is being internally vibrated. The bars 56—B are arranged to bear down on the reinforcing rods and simultaneously vibrate the rods while the pins are internally vibrating the concrete.

The sleeves 55 may also carry rotary contact members 56—C secured to the sleeves by the vibating pins 56, also having other spoke reinforcements if desired. Such members 56—C will rotate on the reinforcing rods or bars and vibrate the same.

Referring more particularly to Figure 1—A, there here appears a girder reinforcing in a concrete slab and a spiral contact member 56—D which contacts the steel reinforcing and rotates progressively as the machine moves forward. This spiral member is mounted on one of the sleeves on shaft 47.

It is obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims.

What is claimed is:

1. In a road building machine, spaced screeds, a vacuum casing between the screeds and extending substantially from one screed to the other screed, means for laterally reciprocating the screeds across the road of plastic concrete, means to withdraw air from the casing whereby to create an area of vacuum between, and extending substantially the full longitudinal distance between, the laterally reciprocating screeds, and means for discharging the water from said casing.

2. In a road building machine for use with plastic material retained by side forms, a plurality of screeds spaced apart longitudinally of the road and supported for lateral reciprocation on the side forms, means to laterally reciprocate said screeds and to slightly raise the screeds adjacent the end of their lateral movements thus effecting a pulling of any water or air in the space between the screeds, a vacuum casing secured to the screeds and lying between the same, said casing having an open bottom to subject the area of the concrete between the screeds to the vacuum action, means to create a condition of vacuum in said casing, and means to relieve the water from the casing.

3. In a road building machine for plastic roads retained by side forms, a plurality of screeds spaced apart longitudinally of the road and supported upon the side forms for lateral reciprocating motion, means to laterally reciprocate said screeds, a vacuum casing between and secured to said screeds being shorter in length than the screeds and shorter than the distance between the side forms, said vacuum casing being reciprocated laterally with the screeds and having an open bottom portion for subjecting the intervening area of concrete between the screeds to the vacuum action, means for producing a condition of vacuum in said casing, and means for relieving water therefrom.

4. In a road building machine for plastic roads confined by side forms, a screed, means to reciprocate said screed laterally of the road, a vacuum casing secured to said screed and reciprocated therewith, said casing being open at its bottom just above the plastic road material and immediately adjacent said screed for subjecting such material to the action of vacuum, means for creating a condition of vacuum in said casing, and means for withdrawing the water from the casing.

5. In a road building machine for concrete roads under construction confined by side forms, a screed, means for laterally reciprocating said screed over the road and across the side forms, means for vibrating said screed as it is reciprocated, a vacuum casing extending off and secured to move with said screed, said vacuum casing being open at its bottom adjacent an area of the concrete lying beside that being screeded whereby to withdraw the air and water from such concrete, means to produce a condition of vacuum in said casing, and means to withdraw the water and air from the casing.

6. In a road building machine, spaced screeds, a vacuum casing between the screeds and extending substantially from one screed to the other screed, means for laterally reciprocating the screeds across the road of plastic concrete, and means to withdraw air from the casing whereby to create an area of vacuum between and extending substantially the full longitudinal distance between the laterally reciprocating screeds.

7. In a road building machine, a screed, a vacuum hood secured thereto, a second screed secured to the hood, and means to apply reciprocating motion to one screed transferred through the hood to the other screed.

8. The hereindescribed method for solidifying plastic concrete of a road under construction, which consists in pouring plastic concrete, moving a surfacing member longitudinally over the plastic mass of concrete while in contact with such concrete, and simultaneously with the surfacing action drawing air and water from the mass of concrete.

9. A device as described comprising a weighted plate portion for resting upon the surface of a plastic road under construction and for compacting and smoothing the same and driving the water and air upwardly from the plastic mass, means behind said plate portion for withdrawing the liberated air and water from the plastic road surface, a second rear plate portion following said means and subjecting the plastic mass to weight and pressure to break down the cell walls and to compact the mass, means for drawing said plate portions and said means along the surface of the roadway in a continuous operation, and means for subjecting both plate portions to a substantially continuous vibration.

10. A device as described comprising a wide and long heavy plate portion resting directly on the surface of the plastic roadway under construction for smoothing and compacting the plastic material and driving the water and air to the surface vacuum means for withdrawing the air and water at the rear edge of said plate portion, a second plate portion wide and long following said vacuum means and being of substantial weight and resting directly on the surface of the plastic material to break down the cell walls and to compact and smooth the plastic mass; means for subjecting both plate portions substantially continuously to vibratory action, and means for drawing both plate portions and said vacuum means along the surface of the plastic material in a continuous operation.

11. In a device for making plastic roads, a carriage movable along the road, a plate member being freely suspended from said carriage and adapted to be directly supported on the plastic road, and vacuum means carried by an intermediate portion of the plate for withdrawing air and water from the plastic concrete.

12. In a device for making roads of plastic material, a carriage movable along the road, a plate member wholly supported from the carriage and adjustable therewith adapted to rest directly on the plastic material, and a vacuum chamber carried by an intermediate part of the plate for withdrawing air and water from the plastic material of the road.

JOHN N. HELTZEL.