July 30, 1935. W. P. DAY 2,009,542

METHOD AND APPARATUS FOR RESURFACING ROADS

Original Filed Nov. 2, 1931 4 Sheets-Sheet 1

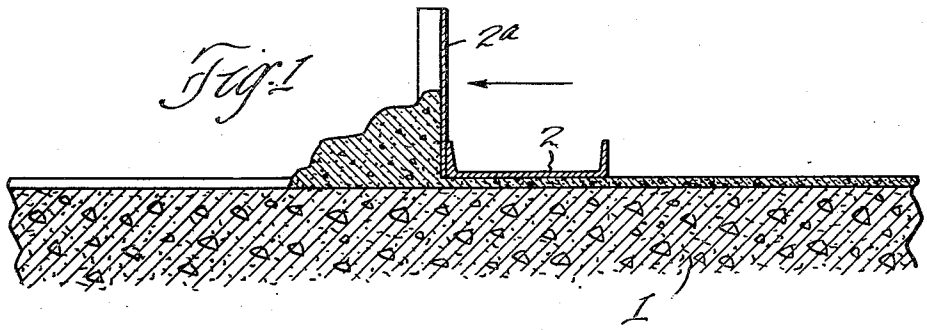

Fig. 1

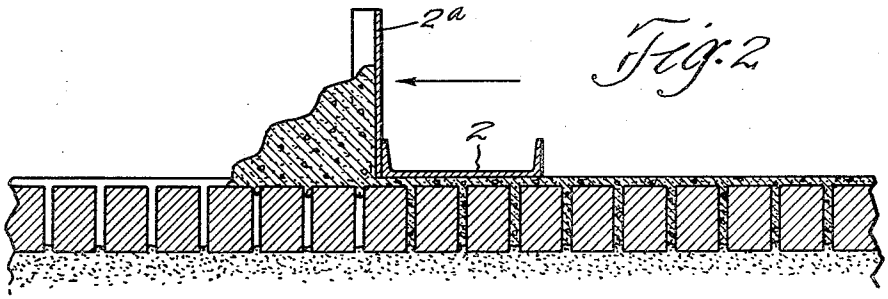

Fig. 2

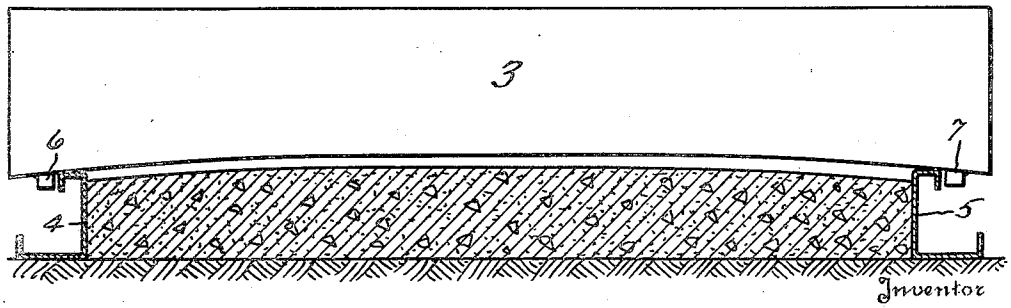

Fig. 3

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METHOD AND APPARATUS FOR RESURFACING ROADS

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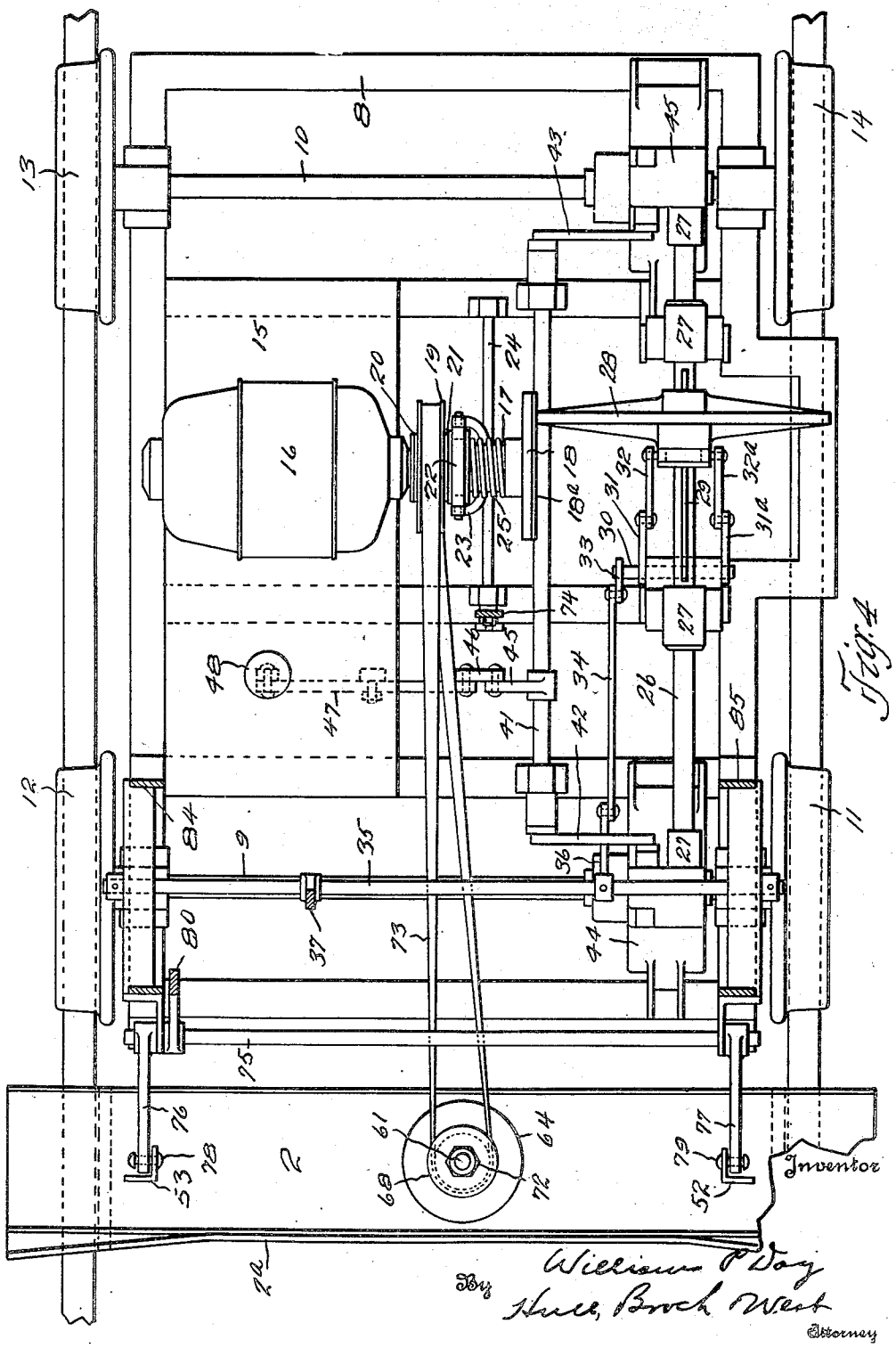

Fig. 4

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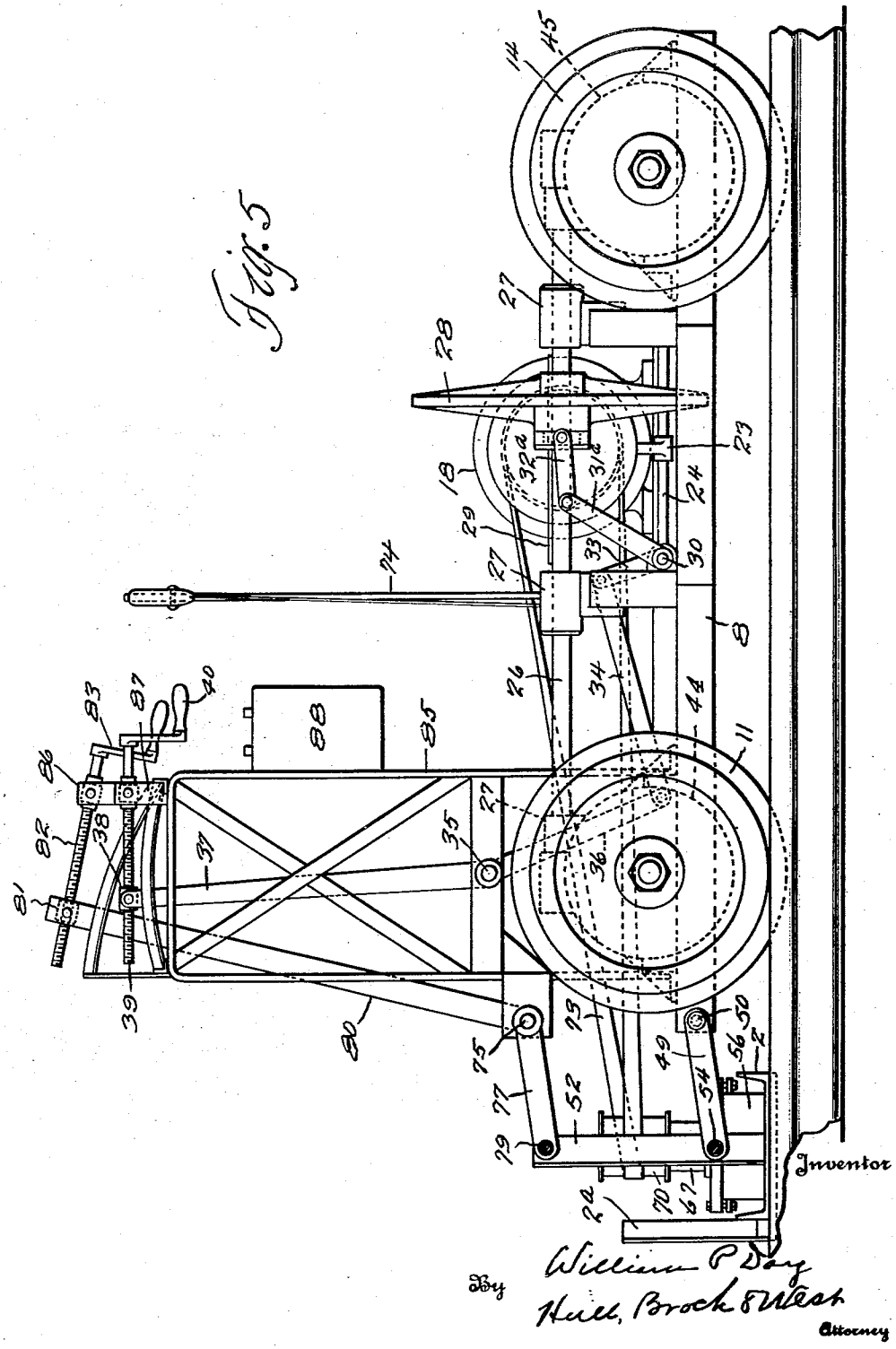

Fig. 5

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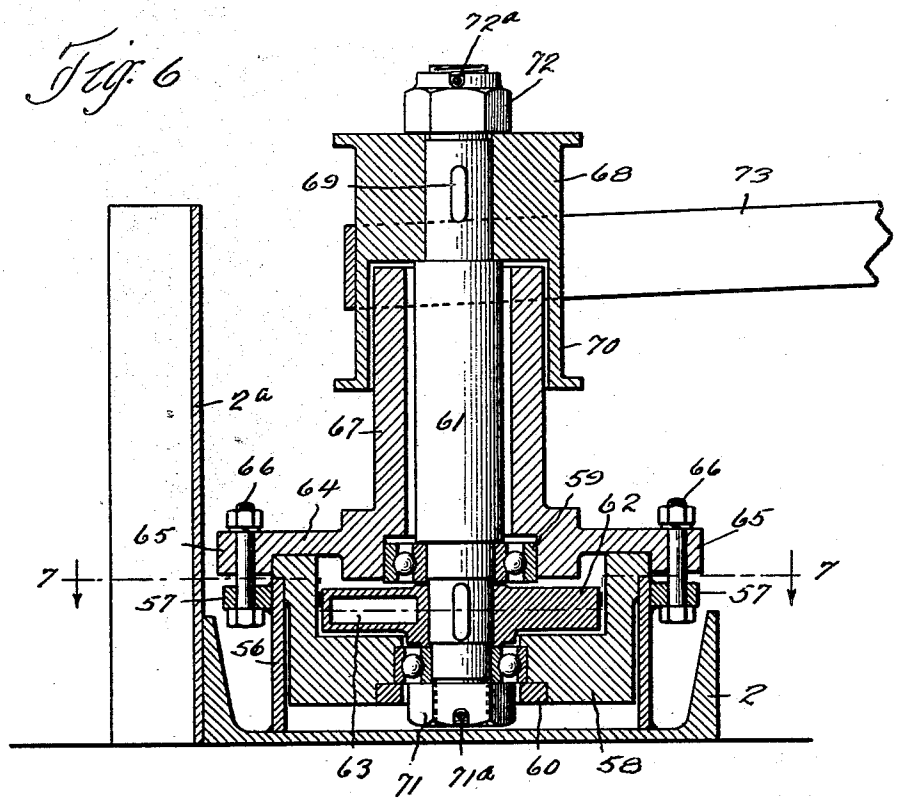
Fig. 6



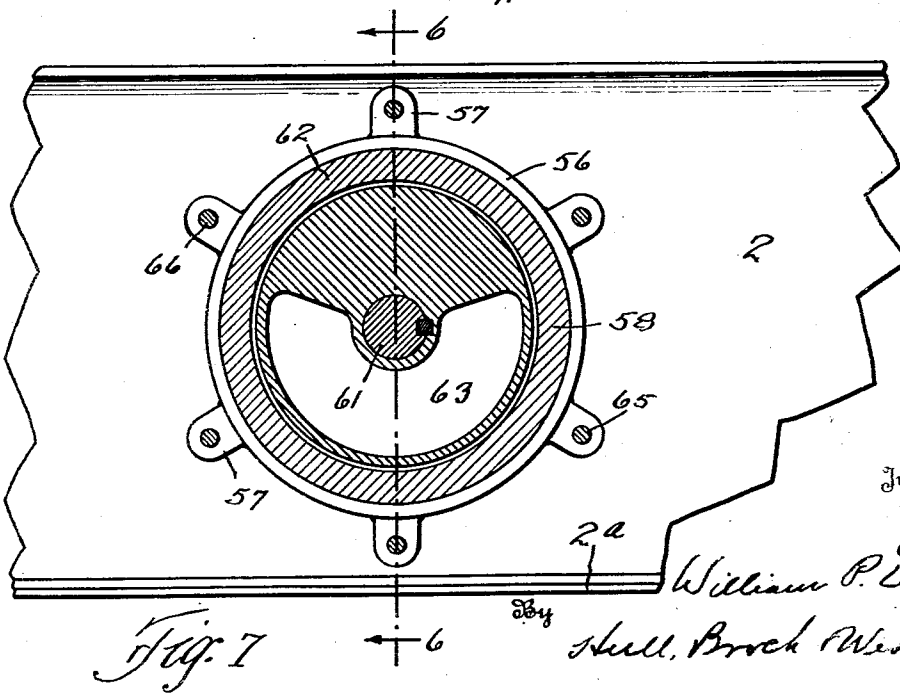


Fig. 7

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UNITED STATES PATENT OFFICE

2,009,542

METHOD AND APPARATUS FOR RESURFACING ROADS

William P. Day, Cleveland, Ohio

Application November 2, 1931, Serial No. 572,616
Renewed October 1, 1934

13 Claims. (Cl. 94—45)

This invention relates to a method and apparatus for resurfacing a roadbed such as a street or highway the surface of which is defective.

Heretofore it has been impractical, if not impossible, to resurface a road with concrete for the reason that no method has been devised for causing a thin layer of concrete to properly bond with the original road. According to my method of resurfacing the road, a thin layer of concrete is caused to adhere to and bond with the original surface of the road in such a manner that the resurfaced road will not crack or crumble under ordinary conditions of use. It is a well known fact that concrete and other hard surface roads now in general use become cracked and water and the like seeps into these cracks and causes further deterioration. According to my method of resurfacing a road, these cracks and crevices are completely filled with concrete and the road when resurfaced will have a very long life.

The main object of my invention is to provide a method of resurfacing a road as well as an apparatus for carrying out the method which will eliminate the difficulties hereinbefore mentioned and at the same time be simple and practical in operation.

A further object of my invention is to provide a method of resurfacing hard surface roads formed of concrete, granite blocks, brick or the like in which a thin coating or layer of concrete is applied to the surface of the old road and caused to bond therewith and in which there is substantially no segregation of the aggregate forming the resurfacing layer.

A further object of the invention is to provide a method and apparatus for carrying out the method herein described which is sturdy in construction, dependable in operation and well adapted for the purpose for which it is intended.

A still further object of the invention is to provide a machine for carrying out the method herein described which is well adapted for use either in connection with the resurfacing of a street railway roadbed or in connection with the resurfacing of a highway or street.

Further and more limited objects of the invention will appear as the description proceeds and by reference to the accompanying drawings in which Fig. 1 is a somewhat diagrammatic sectional view illustrating the manner in which the coating or layer of resurfacing material is applied to the surface of a roadbed the foundation of which is concrete; Fig. 2 is a view similar to Fig. 1 somewhat diagrammatically disclosing the manner of applying a layer of resurfacing material to a roadbed formed of granite blocks or brick; Fig. 3 is a view partly in section and partly in elevation illustrating the use of my method in connection with the resurfacing of a highway the foundation of which is formed of concrete; Fig. 4 is a sectional plan view disclosing the machine which is used in connection with my method of resurfacing the road; Fig. 5 is a view in side elevation of the machine disclosed in Fig. 4; Fig. 6 is a vertical sectional view on the line 6—6 of Fig. 7; and Fig. 7 is a horizontal sectional view on the line 7—7 of Fig. 6.

According to my method of resurfacing a road I apply to the surface of the defective road a thin layer or coating of concrete. The thickness of such layer of concrete may vary from ¼th of an inch up to 2 or 3 inches, or even more. This layer of concrete is applied to the surface of the roads while soft or plastic and while the layer is still in this condition vibrations or pulsations are imparted thereto in a substantially horizontal direction which cause the excess moisture to be brought to the surface and also cause the layer of concrete to settle and to bond with the original road surface. This vibration or agitation of the newly applied layer of concrete also causes it to fill all the cracks and crevices present in the old road.

In the practical application of this method I provide along each side of the road a plate or form of suitable height and size which projects a slight distance above the surface of the original road. These plates are preferably of such size and thickness as to form a suitable support for the vibrating or pulsating machine which is to be described in detail hereinafter. The machine is mounted on suitable wheels which roll on and are supported by the plates. Supported on the form plates is what I term a pulsating surfacer which is operated or vibrated by a motor carried by the machine. When resurfacing a portion of the roadbed between the rails of a street railway, the pulsating surfacer is preferably supported on the rails. The layer of concrete which is to be applied to the surface of the road preferably consists of one part cement, one and one-half to two parts sand, and two to three parts stone (screenings) with which is mixed five to six gallons of water for each bag of cement (96 lbs). These screenings are preferably hard screenings which will pass through a ⅛th inch mesh screening. The concrete is mixed in approximately these proportions and is spread upon the surface of the road immediately in front of the surfacer. The machine is moved forward over the road at the

rate of from 1 to 5 feet per minute and the number of vibrations or pulsations imparted to the surfacer are about 2600 per minute. This vibration of the surfacer agitates the layer of resurfacing material and causes the excess moisture to come to the surface and the heavier particles of aggregate to settle and to bond with the old road surface. After the vibration is terminated the layer of resurfacing material should be allowed to thoroughly set. I have found that the layer of resurfacing material, when applied according to this method, forms such a bond with the road that it is quite difficult to distinguish between the old road and the layer of resurfacing material. The strength of the road is greatly increased and the life of the road greatly prolonged by this layer of surfacing material applied in the manner described.

While my method is particularly useful in resurfacing roads formed of concrete, the same method may be used in applying a layer of concrete to roads formed of granite blocks, brick or other similar material.

Referring now to the drawings, and especially Figs. 1, 2 and 3, the reference character 1 designates the original road formed of concrete and to which it is desired to apply a layer or coating of concrete. The reference character 2 designates the pulsating surfacer which is preferably in the form of a channel and which is supported either upon the metal forms, in the case of a highway, or upon the rails when the method is used in resurfacing a railway roadbed. The distance between the bottom of the pulsating surfacer and the old road surface determines the thickness of the layer of resurfacing material. Carried by the pulsating surfacer is a guard plate 2^a which is secured thereto in any suitable manner. The concrete is deposited upon the old road surface in front of the guard plate 2^a and the surfacer is moved over the road at about the speed hereinbefore specified. The surfacer spreads the layer of concrete evenly over the surface of the road and determines the height of the resurfacing layer. As the surfacer is moved over the road vibrations or pulsations are imparted thereto by means of the machine which will be hereinafter described. These pulsations or vibrations are quite violent and rapid.

In Fig. 2 there is disclosed a slightly different form of roadbed which is formed of bricks or granite blocks. The same method is used to resurface a road formed of this material and in the same manner. The vibrations of the pulsating surfacer, in addition to removing the moisture and causing a more perfect bond of the resurfacing material, also causes the resurfacing material to settle and to fill up the cracks between the bricks or blocks and to bond therewith.

In Fig. 3 I have disclosed a slightly different form of pulsating surfacer which is indicated by the reference character 3 and is adapted for use in connection with resurfacing a street or highway. It will be noted that the lower edge of the surfacer is somewhat arched to conform to the shape of the surface of the road. When using my method in connection with resurfacing a street or highway, I preferably provide form blocks or plates 4 and 5 which form a support for the surfacer. The surfacer is also provided with lugs 6 and 7 which are adapted to engage the forms to prevent excessive movement of the surfacer due to the vibration thereof. The pulsating surfacer performs the function of spreading the layer of concrete and also determines the thickness of the layer.

When my method is used for resurfacing a portion of a street between the rails of a street railway, the surfacer is preferably supported on the rails.

I will now describe the machine or apparatus which is used to impart the vibrations or pulsations to the pulsating surfacer. This machine consists essentially of a rectangular frame 8 having mounted thereon axles 9 and 10 and to which are secured wheels 11, 12, 13 and 14. Carried by the frame is a plate or platform 15 on which is mounted an electric motor 16 having a shaft 17 on which is keyed a driving wheel 18. Loosely mounted on the shaft 17 is a pulley 19 to the opposite sides of which are secured friction plates 20 and 21. Also mounted on the shaft 17 is a clutch 22 to which is connected a yoke 23 which in turn is connected with a shaft 24. Surrounding the shaft 17 and disposed between the clutch 22 and the driving wheel 18 is a coil spring 25 which urges the clutch 22 and driving wheel 18 apart. Disposed at one side of the machine and extending longitudinally thereof is a shaft 26 which is journaled in suitable bearings 27. Nonrotatably mounted on the shaft 26 is a driving disk 28 which is keyed thereon by means of a key 29. The opposite ends of the shaft 26 are operatively connected with the axles 9 and 10 (preferably by means of a worm and worm wheel) in such a manner that the shaft 26 drives the wheels 11, 12, 13 and 14. Also journaled in the frame of the machine is a shaft 30 to which are connected a pair of links 31 and 31^a which are connected with the driving disk 28 by means of links 32 and 32^a. Also connected with the shaft 30 is a crank 33 to which is connected a link 34 which in turn is connected to a shaft 35 by means of a link 36. The shaft 35 extends across the machine and connected therewith is a lever 37 to the upper end of which is connected a threaded block 38 through which extends a screw 39 which is operated by a crank 40.

Upon movement of the crank 40 in either direction, movement is transmitted to the shaft 30 and the links connecting the same with the driving disk 28. The driving disk 28 has frictional engagement with the driving wheel 18 which is driven by the motor 16. The face of the driving wheel 18 is provided with a friction disk 18^a. It will be seen that by moving the driving disk 28 longitudinally of the shaft 26, the speed of rotation of the driving disk and shaft 26 may be varied. It will also be seen that by moving the driving disk 28 to the opposite side of the driving wheel 18 the direction of movement of the disk 28 and shaft 26 may be reversed. As the shaft 26 drives the vehicle, it will be clear that the direction of movement of the vehicle may be reversed as desired by turning the crank 40.

Also journaled in the frame of the machine is a shaft 41 to which are connected links 42 and 43. The reference characters 44 and 45 designate clutch housings in which are arranged clutches for forming a driving connection between the shafts 9 and 10 and the drive shaft 26. The links 42 and 43 are operatively connected to these clutches. Also connected with the shaft 41 are links 45 and 46. Pivotally mounted on the platform 15 is a lever 47 one end of which is connected with the link 46. Connected to the opposite end of the link 47 is a treadle 48 adapted to be operated by the foot of the operator to impart movement to turn the shaft 41 to disengage the

clutches which form a driving connection between the shaft 26 and the axles 9 and 10. The treadle 48 is normally urged to the position shown in Fig. 4 by means of a spring.

Disposed at the front of the machine is what I term the pulsating surfacer 2 which is connected with the frame of the machine by a pair of links 49 which are pivotally connected with the frame by bolts 50. The forward ends of the links 49 are connected with angle irons 52 and 53, on the surfacer by means of bolts 54. The connection between the surfacer and the links 49 is somewhat loose so as to permit vibration of the surfacer.

Disposed centrally of the pulsating surfacer 2 is a cylindrical casing 56 having a plurality of apertured ears 57. Fitting within the cylindrical casing 56 is a cylindrical block 58 having an overhanging peripheral flange at its upper end which rests upon the upper end of the cylindrical casing 56. Carried by the cylindrical block 58 are bearings 59 and 60. Journaled in these bearings and extending upwardly therefrom is a shaft 61. Disposed within the cylindrical block 58 is a flywheel 62 having at one side thereof a cored portion 63. The flywheel is keyed to the shaft 61, and rotates therewith. Fitting over the upper end of the cylindrical casing 56 is a cover member 64 which is provided with apertured ears 65. The cover is secured in place by means of bolts 66 which extend through the ears 57 and 65. The cover member 64 is provided with an annular upstanding portion 67 which extends upwardly about the shaft 61. Carried by the upper end of the shaft is a pulley 68 which is connected to the shaft by means of a key 69. The pulley 68 has a downwardly extending skirt portion 70 which fits over the upstanding portion 67 of the cover member. The shaft 61 is secured in place by means of nuts 71 and 72 which are held in place by cotter pins 71a and 72a. The pulley 68 is driven from the pulley 19 by means of a belt 73.

The pulley 19 is loosely mounted on the shaft 17 and a driving connection between the pulley 19 and shaft 17 is formed by means of the clutch member 22 which is urged into frictional engagement with the pulley by the spring 25. The driving wheel 18 is non-rotatably but slidably mounted on the shaft 17 and is urged outwardly by means of the spring 25 into engagement with the driving disk 28. The driving connection between the pulley 19 and the shaft 17 is disengaged by means of a lever 74 which is connected with the shaft 24. The motor 16 operates at a high speed and the connections between the motor and the pulley 68 is such that the shaft 61 and flywheel 62 are rotated at about 2600 revolutions per minute. In view of the fact that the flywheel is heavier at one side than at the other, it will be seen that very rapid and violent vibrations will be imparted to the pulsating surfacer.

Also journaled on the front of the machine and extending transversely thereof is a shaft 75 to which are connected links 76 and 77 the forward ends of which are connected with the angle irons 52 and 53 by means of bolts 78 and 79. Also connected with the shaft 75 is a bell crank 80 to the upper end of which is connected a threaded block 81 through which extends a screw 82 to one end of which is connected a crank 83. Carried by the front of the machine are a pair of somewhat U-shaped brackets 84 and 85 which are disposed at opposite sides thereof. Mounted on the brackets 84 and 85 are a pair of blocks 86 and 87. The screws 39 and 82 are pivotally mounted in the blocks 86 and 87 respectively. It will be seen that by turning the crank 83 in an appropriate direction, a movement will be imparted to the shaft 75 which will lift the vibrating surfacer. In the embodiment of the invention illustrated in Figs. 4 and 5 the surfacer is shown as being supported upon the rails of a street railway; and when it is desired to lift the surfacer from the rails, the crank 83 may be operated for this purpose.

The operation of the device is as follows: The shaft 17 is driven from the motor 16. The clutch 23 and coil spring 25 form a driving connection between the shaft 17 and pulley 19 which in turn drives the pulley 68 through the medium of the belt 73. It will be seen that these connections impart a rapid and violent vibration to the pulsating surfacer 2. The driving wheel 18 being in frictional engagement with the driving disk 28 imparts movement to the shaft 26 which in turn is operatively connected with the shafts 9 and 10 of the machine by means of the clutches hereinbefore referred to. It will thus be seen that the vehicle will be driven in a forward direction moving with it the pulsating surfacer. The speed at which the vehicle is driven may be varied by adjusting the position of the driving disk 28 with respect to the driving wheel 18. The direction of movement of the machine may be reversed by moving the driving disk toward the left as seen in Fig. 4 whereupon the driving disk 28 will be moved in the opposite direction. Should it be desired to discontinue the movement of the machine without discontinuing the operation of the pulsating surfacer, the operator steps upon the treadle 48 which actuates the shaft 41 and links 42 and 43 to disengage the clutches forming the driving connection with the shafts 9 and 10. Should it be desired to move the machine forward or backward without operating the pulsating surfacer, the lever 74 may be moved to turn the shaft 24 to disengage the drive between the shaft 17 and the pulley 19.

Mounted on one of the brackets 84 or 85 is a switch box 88 which controls the circuit to the electric motor 16. The operator of the machine stands upon the platform 15 where he may have access to the switch box as well as to the other parts of the machine. It is to be understood that the machine may be supported either upon the rails of a street railway when resurfacing the surface of a road between the rails, or it may be supported on the form plates 4 and 5 as illustrated in Fig. 3 when the machine is used for resurfacing a street or highway.

The concrete which forms the resurfacing is delivered in front of the pulsating surface in any suitable manner and is spread over the road by means of the pulsating surfacer and the guard plate 2a. Rapid and violent vibrations are imparted to the surfacer in the manner hereinbefore described. The machine is moved forward at the rate of from 1 to 5 feet per minute. The height at which the pulsating surfacer is supported determines the thickness of the resurfacing layer. The vibration of the surfacer agitates the layer of concrete and causes it to fill the voids in the old road surface and to bond therewith. Due to the speed at which the motor is operated, the vibrations imparted to the surfacer are of negligible amplitude, that is to say, the surfacer is moved rapidly and violently a

very short distance as distinguished from a relatively slow reciprocating movement.

It will now be clear that I have provided a method and apparatus for resurfacing a roadbed such as a street or highway which will accomplish the objects of the invention as hereinbefore stated. Various changes may be made in the details of the machine without departing from the spirit of my invention and the embodiment of the invention herein disclosed is to be considered merely illustrative as the invention is limited only in accordance with the scope of the appended claims. My method and machine are primarily adapted for use in resurfacing an old road or street as distinguished from the methods and machines now in general use for surfacing paving material or for tamping paving material and which are generally known as tamping and finishing machines.

Having thus described my invention, what I claim is:

1. The method of applying a thin layer of concrete to the surface of a road, which consists in spreading a thin layer of concrete over the surface of the road and applying thereto rapid vibrations of negligible amplitude, by rapidly vibrating a pulsating surfacer, having a wide horizontal surface, in a plane substantially parallel to the surface of the road, without tamping or compressing said layer of concrete.

2. The method of applying a thin layer of concrete to the surface of a road, which consists in spreading a thin layer of concrete over the surface of the road and simultaneously applying thereto rapid vibrations of negligible amplitude, by rapidly vibrating a pulsating surfacer, having a wide horizontal surface, in a plane substantially parallel to the surface of the road, without tamping or compressing said layer of concrete.

3. The method of applying a thin layer of concrete to the surface of a road, which consists in spreading a thin layer of concrete over the surface of the road, leveling said layer and simultaneously applying thereto rapid vibrations of negligible amplitude, by rapidly vibrating a pulsating surfacer, having a wide horizontal surface, in a plane substantially parallel to the surface of the road, without tamping or compressing said layer of concrete.

4. The method of applying a thin layer of concrete to the surface of a road that has become defective, which consists in covering the surface of the road with a thin layer of concrete and then applying thereto rapid vibrations of negligible amplitude, by rapidly vibrating a pulsating surfacer, having a wide horizontal surface, in a plane substantially parallel to the surface of the road, without tamping or compressing said layer of concrete whereby to cause said thin layer of concrete to settle and form a more perfect bond with the old road surface.

5. A concrete surfacing device having in combination a pulsating surfacer having a wide horizontal surface, and means vibrating said pulsating surfacer solely in a horizontal plane with rapid vibrations having negligible amplitude.

6. In a concrete surfacing device, the combination of a pulsating surfacer having a wide horizontal surface, means for supporting said pulsating surfacer, in a substantially horizontal plane, and means for applying rapid vibrations of negligible amplitude thereto, said vibrations acting solely in the plane of the pulsating surfacer.

7. In a concrete surfacing device the combination of a frame, a pulsating surfacer having a wide horizontal surface, means on said frame for swingingly supporting said pulsating surfacer in a substantially horizontal plane, and means for applying vibrations of negligible amplitude to said pulsating surfacer, said vibrations acting solely in the plane of the pulsating surfacer.

8. In a concrete surfacing device the combination of a frame, a pulsating surfacer having a wide horizontal surface, means on said frame for adjustably supporting said pulsating surfacer in a substantially horizontal plane, and means for applying vibrations of negligible amplitude to said pulsating surfacer, said vibrations acting solely in the plane of the pulsating surfacer.

9. In a concrete surfacing device, the combination of a movable frame, means carried by said frame for propelling said frame, a pulsating surfacer having a wide horizontal surface, means on said frame for supporting said pulsating surfacer in a substantially horizontal plane, and means for applying vibrations of negligible amplitude to said pulsating surfacer, said vibrations acting solely in the plane of the said pulsating surfacer.

10. In a concrete surfacing device, the combination of a pulsating surfacer having a wide horizontal surface, means for supporting said pulsating surface in a substantially horizontal plane, means for applying rapid vibrations of negligible amplitude thereto, said vibrations acting solely in the plane of the pulsating surfacer, said second mentioned means comprising a shaft rotatably supported on said pulsating surfacer, perpendicular to the surface thereof, a weight eccentrically mounted on said shaft, and means for rotating said shaft.

11. In a concrete surfacing device, the combination of a frame, a pulsating surfacer having a wide horizontal surface, means on said frame for supporting said pulsating surfacer in a substantially horizontal plane, a shaft mounted on said pulsating surfacer perpendicular to the surface thereof, a weight eccentrically mounted on said shaft, and means for rotating said shaft, thereby to impart rapid vibrations of negligible amplitude to said pulsating surfacer, said vibrations acting solely in the plane of said pulsating surfacer.

12. The method of applying a layer of concrete to a road which consists in spreading a layer of concrete over the road and applying thereto rapid and violent vibrations of negligible amplitude by rapidly vibrating a pulsating surfacer, having a relatively wide horizontal surface, in a plane substantially parallel to the surface of the road and without tamping or materially compressing said layer of concrete.

13. The method of applying a layer of concrete to a road which consists in spreading a layer of concrete over the surface of the road and simultaneously applying thereto rapid and violent vibrations of negligible amplitude by rapidly vibrating a pulsating surfacer, having a wide horizontal surface, in a plane substantially parallel to the surface of the road and without tamping or materially compressing said layer of concrete.

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