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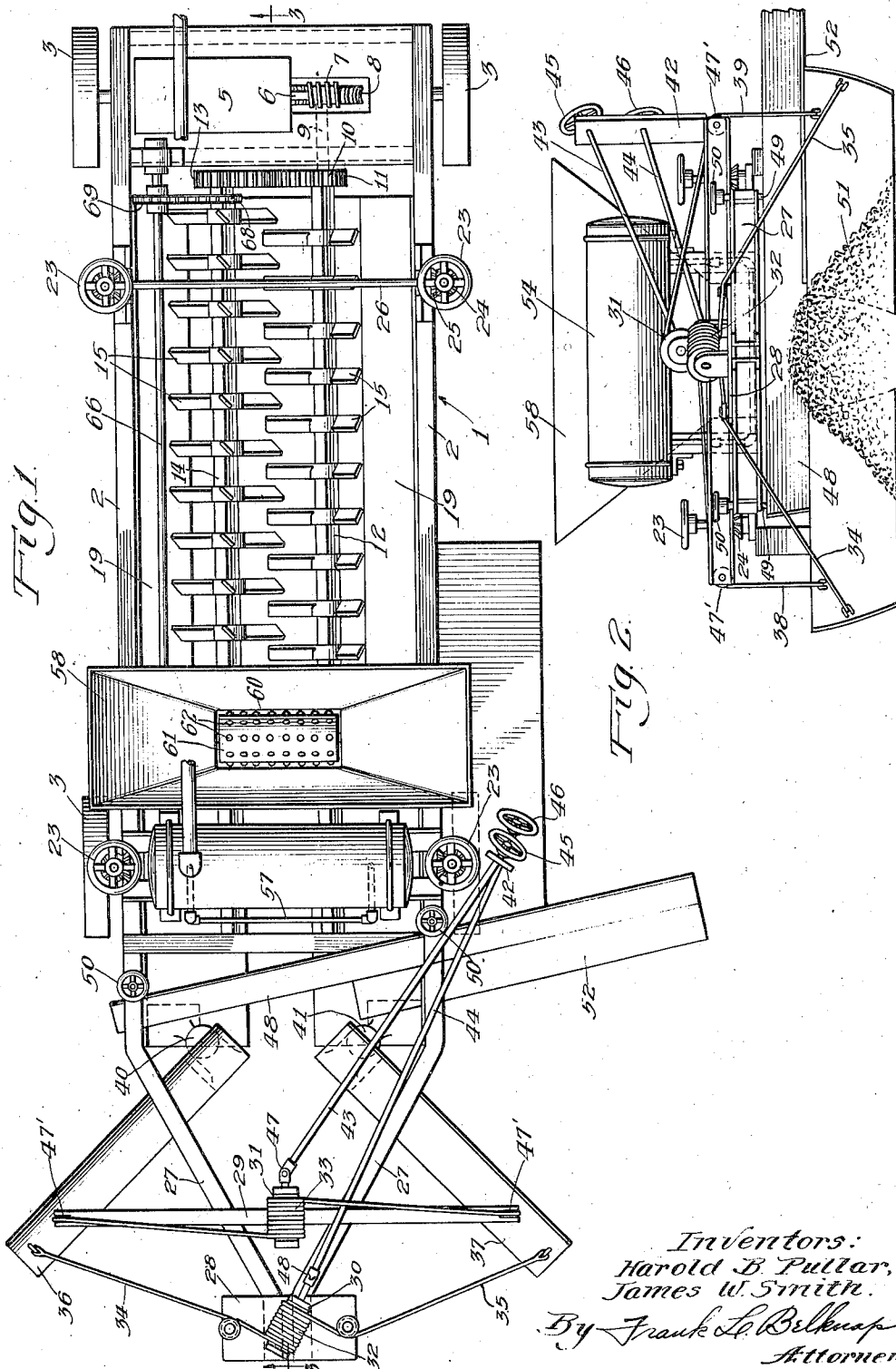
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2,059,607

APPARATUS FOR MIXING AGGREGATE AND BINDER UPON A ROAD

Filed June 16, 1932

2 Sheets-Sheet 1



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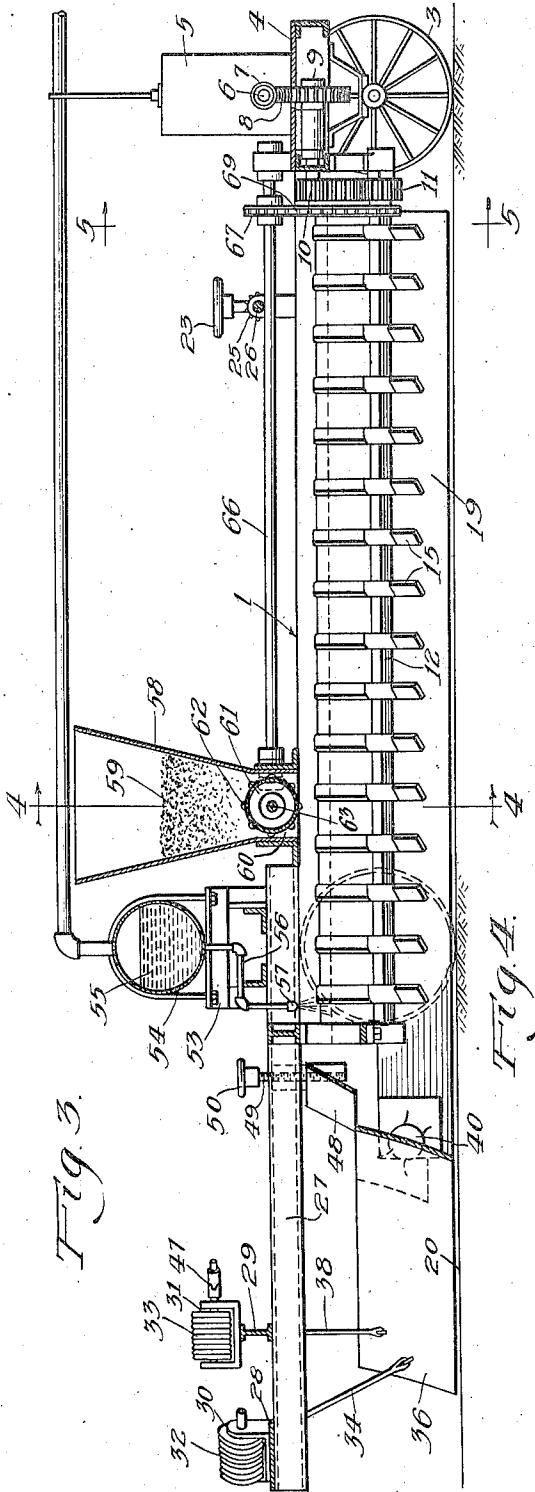
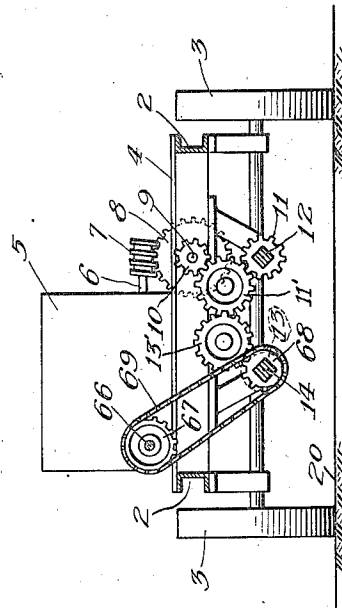
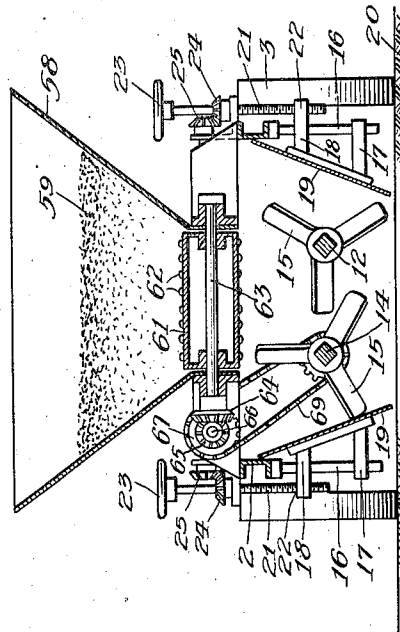


Fig. 3.

Fig. 4.



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APPARATUS FOR MIXING AGGREGATE AND
BINDER UPON A ROADHarold B. Pullar, Chicago, Ill., and James W.
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Application June 16, 1932, Serial No. 617,519½

2 Claims. (Cl. 94—44)

This invention relates to improvements in a method and means for uniformly mixing aggregate and bituminous material upon a road or pavement, and refers particularly to a method and the provision of portable apparatus whereby aggregate upon a road may be mixed with and thoroughly coated by bituminous material as a continuous operation.

It has heretofore been the practice in the construction of bituminous roads to utilize what is commonly known as the road mix method or the method of mixing bituminous materials and mineral aggregate on the road, to use for this purpose blades, drags, road maintainer, disks or similar apparatus in order to properly combine and coat the mineral aggregate with bituminous material.

This method, while economical has not been satisfactory, due to the fact that suitable apparatus for thoroughly combining or mixing in a uniform manner the bituminous materials and mineral aggregate has not been available to the industry.

Another method of mixing mineral aggregate and bituminous materials which has been heretofore used is to provide stationary or portable mixing plants in which the aggregate is raised from the road and mixed and combined with the bituminous materials in definite proportions. In using this method the aggregate is properly coated and combined but the cost of apparatus and operation is expensive and adds considerably to the cost of the finished road.

In utilizing our method and apparatus, the aggregate is thoroughly coated and combined with the bituminous material as a continuous operation while said aggregate remains on the road, no expensive machinery being necessary to raise the aggregate from the road surface.

Other objects and advantages of our invention will be apparent from the accompanying drawings and following detail description.

In the drawings, Fig. 1 is a top plan view of suitable apparatus for carrying out our invention.

Fig. 2 is a front elevational view of the device shown in Fig. 1.

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 3.

Fig. 5 is a transverse, sectional view taken on the line 5—5 of Fig. 3.

Referring in detail to the drawings, 1 indicates a frame structure which may comprise parallel spaced beams 2 which, in turn, may be mounted upon wheels 3.

The rear portion of the frame 1 may be provided with platform 4 upon which may be mounted an internal combustion engine or other prime mover 5. The engine shaft 6 may carry worm gear 7 which is adapted to mesh with worm wheel 8 mounted upon shaft 9. A spur gear 10 may also be mounted upon shaft 9 and is adapted to mesh with gear 11' which, in turn, may mesh with gear 11 mounted upon shaft 12. The gear 11' meshes with a similar gear 13' which, in turn, may mesh with gear 13 mounted upon shaft 14 disposed parallel to shaft 12.

The shafts 12 and 14 traverse substantially the entire length of the frame 1 and each may be provided at spaced intervals along its length with paddles or blades 15, said blades being inclined at an angle to the axes of the shafts 12 and 14 in a manner similar to that of the usual propeller blade. The blades 15 may be grouped in units of three, each blade of said unit being spaced through an angle of 120 degrees from adjacent blades. Of course, it is to be understood that we do not wish to be limited to the use of three blade propellers or mixers since any number of blades to the unit may be used.

Guide rods may be mounted upon the lower surfaces of each of the beams 2 and may extend downwardly therefrom, said guide rods being adapted to carry arms 17 and 18 which, in turn, support the inclined sides 19. The sides 19 in conjunction with the road surface 20 define a volume within which the blades 15 rotate and said sides may be adjusted upwardly or downwardly by means of screws 21 which threadedly engage an extended portion 22 of the arms 18. Said screws may be operated by hand wheels 23, the device illustrated showing the use of four such adjusting hand wheels. However, it is to be understood that we do not wish to be limited to the specific number of adjusting mechanisms shown inasmuch as any number found desirable may be provided.

The guide rods 16 may be provided in pairs disposed transversely opposite each other and the shanks of the screws 21 may carry bevelled gears 24 which, in turn, mesh with bevelled gears 25 mounted upon shafts 26 which extend transversely across the machine. By this arrangement it can readily be seen that the sides 19 may be adjusted upwardly or downwardly simultaneously by operating the hand wheels 23 upon either side of the machine.

A frame comprising arms 27 may extend outwardly from the front end of the frame 1, said arms converging at their outer extremities and

carrying platform 28. A beam 29 may be transversely disposed with respect to the arms 27 and may be mounted upon said arms intermediate their length. The platform 28 and beam 29 are adapted to respectively carry drums 30 and 31 upon which cables 32 and 33 may be positioned. The ends 34 and 35 of the cable 32 may be respectively connected to scraper blades 36 and 37 and ends 38 and 39 of cable 33 may also be connected to the blades 36 and 37 respectively. The opposite ends of the scraper blades 36 and 37 may be mounted upon respective side plates 19 carried upon the frame 1. Said connection may be made by means of knuckle joints 40 and 41. A support 42 may be mounted upon the frame 1 and is adapted to carry one end of shafts 43 and 44, hand wheels 45 and 46, being respectively mounted upon said shafts. The opposite end of the shafts 43 and 44 may be respectively connected to drum 31 and drum 30, the connection being made through universal joints 47 and 48.

The arrangement is such that by appropriate manipulation of the hand wheel 45, drum 41 may be so rotated as to raise the scraper blades 36 and 37 or lower the same as desired. By proper manipulation of hand wheel 46, drum 30 may be so rotated as to swing the blades 36 and 37 inwardly or outwardly about the knuckle joints 40 and 41. It is to be understood, of course, that when the blades 36 and 37 are swung inwardly, wheel 45 must be so manipulated as to permit said blades to maintain their position in the same horizontal plane and when the blades are swung outwardly, the swinging force, of course, may be established by supplying tension to the ends 38 and 39 of the cable 33, and due to the positioning of said ends over the sheave wheels 47' at the ends of the beam 29, said blades may be swung in an outwardly direction while slack is simultaneously provided by means of hand wheel 46 in the ends 34 and 35 of cable 32.

In carrying out our invention the mixing machine may be pulled over a road which may have applied thereto a layer of gravel or other mineral aggregate. The device may be pulled by a tractor or may be driven by means of the engine 5 through a suitable driving mechanism, not shown. Previous to setting the device in motion, the blades 36 and 37 may be so adjusted as to accumulate a predetermined quantity of stone or aggregate and direct the same backwardly between the sides 19. To control the quantity of the material thus passed, the blades 36 may be drawn closer together or may be more widely separated by means of suitably manipulating the control wheels 45 and 46.

The cross-section of the mound of stone or other aggregate accumulated by the scrapers 36 and 37 may be controlled by weir 48 which may be adjustably supported from the rear ends of the arms 27, the weir being suspended upon screws 49 which may be raised or depressed by means of hand wheels 50. As can readily be seen by reference to Fig. 2, the quantity of aggregate 51 accumulated by the scrapers and which is permitted to pass between the sides 19, may be controlled by the weir 48 which will determine the depth of the aggregate 51, the width of the aggregate being determined by the scrapers 36 and 37. The weir 48 may be disposed at an angle to the direction of travel of the machine, the arrangement being such that the excess aggregate removed by the weir will be discharged through the trough 52 to the side of the road.

A platform 53 may be mounted upon the frame

1 and may be adapted to support tank 54 which may contain a quantity of liquid binder 55. Pipes 56 may connect into the lower portion of said tank and may be connected to spray pipe 57 which is adapted to spray the liquid binder 55 over the width of the mass of aggregate 51 passing beneath said spray.

The binder 55 may take the form of road oil or residuum oil which is a relatively heavy viscous oil produced from the refining or cracking of petroleum oil. However, it is to be understood that any desirable flux oil is contemplated as a binder.

The aggregate mass 51 upon passing the weir 48 is contacted by the rotating blades 15 upon the shafts 12 and 14 and immediately before said blades contact and agitate the aggregate mass, the spray 57 directs a suitable quantity of binder upon said mass. As the machine moves forwardly the blades 15 agitate and vigorously mix the aggregate mass and the binder, thoroughly coating the individual aggregates with the oil.

As the device continues its forward travel, the aggregate mass passes beneath hopper 58 which may be adapted to contain a quantity of powdered asphalt 59. The hopper 58 may be provided with an open bottom 60 and drum 61, containing a plurality of spikes or projections 62 upon its surface, may be adapted to rotate within the opening 60. During the rotation of the drum 61 a quantity of the powdered asphalt 59 is released from the hopper 58 and is deposited upon the coated aggregate mass.

The drum 61 may be mounted upon shaft 63 which may be adapted to be rotated by means of bevel gears 64 which may mesh with cooperating bevel gear 65 mounted upon shaft 66. The shaft 66 may travel to the rear portion of the machine and may carry sprocket wheel 67 at its rear extremity. The sprocket wheel 67 may be operatively connected to sprocket wheel 68 mounted upon shaft 14 by means of sprocket chain 69, the arrangement being such that upon stopping the machine the drum 61 will be stopped and no powdered asphalt 59 will be discharged from the hopper 58.

The asphalt utilized may have a melting point or softening point from approximately 250° F. to 350° F. and a penetration of approximately 0 to 7. However, it is to be understood that we do not wish to be limited to the particular materials used inasmuch as our invention is broadly directed to a method and the provision of means for intimately mixing aggregate and a bituminous material while maintaining said aggregate upon the road.

As the machine moves forwardly the aggregate mass 51 thoroughly mixed with the binder 55 is further agitated with the powdered asphalt 59, said agitation taking place throughout the entire length of the machine. As the device passes onwardly the mixed aggregate is deposited at the rear portion of the machine and can subsequently be spread to the desired thickness upon the road surface. As can readily be seen our mixing process is continuous in that the machine may travel at a uniform speed throughout a desired length of the road and will efficiently mix that portion of the aggregate over which said machine passes.

If desired, the liquid binder and the powdered bituminous material may be deposited upon the aggregate upon the road previous to the accumulation of the same by the blades 36 and 37.

The partially coated aggregate may then be acted upon or worked by the mixing blades 15 as the machine travels forwardly and the said aggregate may be mixed and thoroughly coated with the binder and bituminous material. If 5 desired, the liquid binder may be applied to the aggregate previous to the accumulation of the aggregate by the blades whereas the solid bituminous material may be applied during the agitating period, 10

We claim as our invention:

1. In combination, a device for mixing aggregate and a binder upon the surface of a road while maintaining said aggregate upon the road 15 comprising a frame mounted upon a plurality of wheels for movement over said road, scraper blades mounted upon the forward end of said frame for accumulating said aggregate upon said road in the form of a relatively elongated mound 20 over which said frame travels, means carried by said frame immediately behind said scraper blades for controlling the height of said mound as said frame passes over the mound, means upon said frame for depositing a binder upon 25 said mound after the frame passes thereover,

means carried by said frame and disposed parallel to the direction of travel of the frame for mixing said aggregate and binder, and means carried at each side of the frame and disposed parallel to the direction of travel of the frame 5 for confining the sides of said mound during the passage of the frame over the mound.

2. In combination, a device for mixing aggregate and a binder upon the surface of a road while maintaining said aggregate upon the road 10 which comprises, a frame mounted upon wheels for movement over said road, a mixing chamber in said frame and defined by lateral walls disposed parallel to the direction of travel of said frame, a mixing member positioned in said mixing chamber, the longitudinal axis of said mixing member being positioned parallel to said lateral walls, said frame being adapted to pass longitudinal over a mound of aggregate, said aggregate passing relatively through said mixing 15 chamber and means upon said frame for depositing a binder upon said aggregate. 20

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