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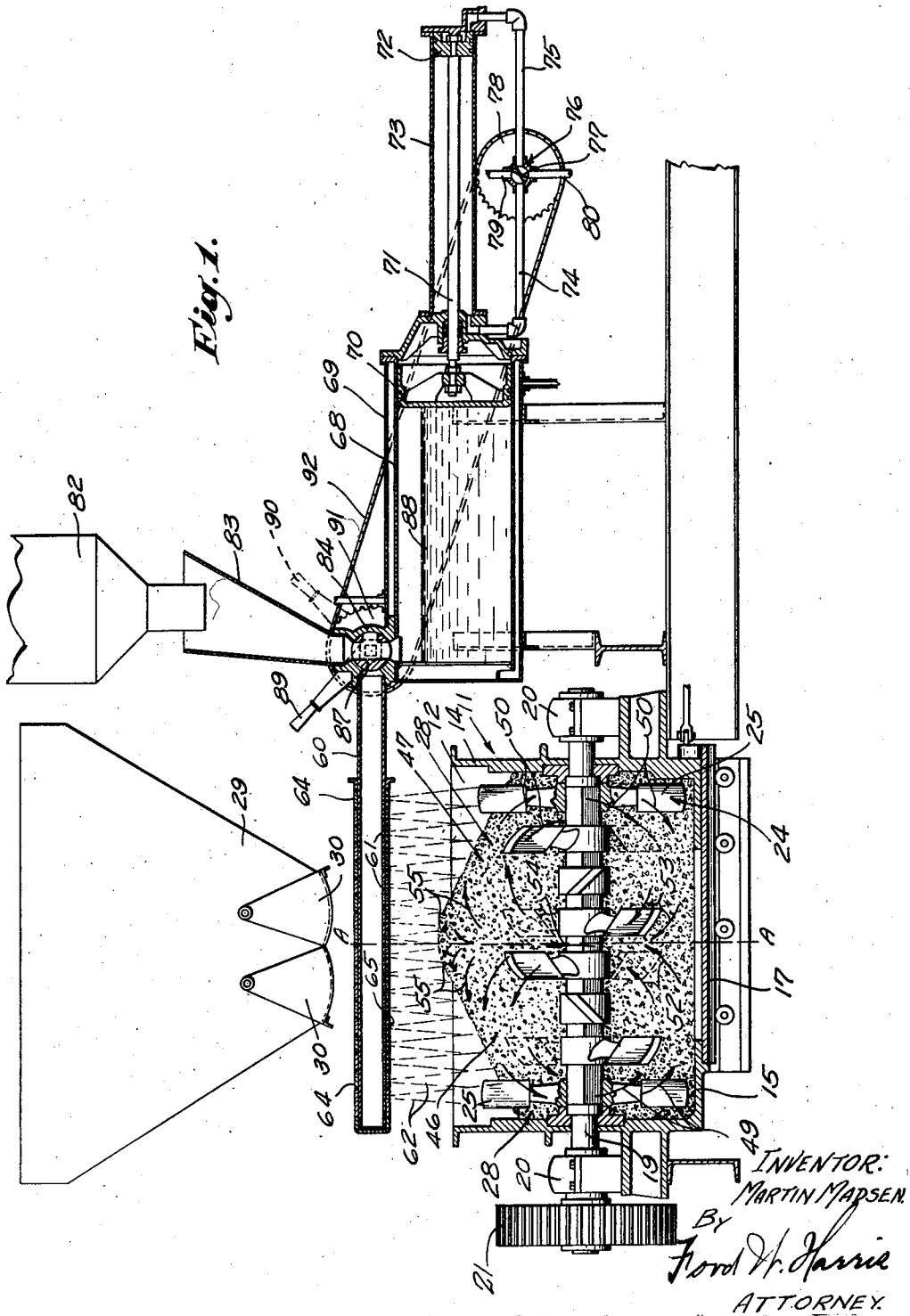
M. MADSEN

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METHOD AND APPARATUS FOR PRODUCING PAVING MATERIAL

Filed March 7, 1932

3 Sheets-Sheet 1



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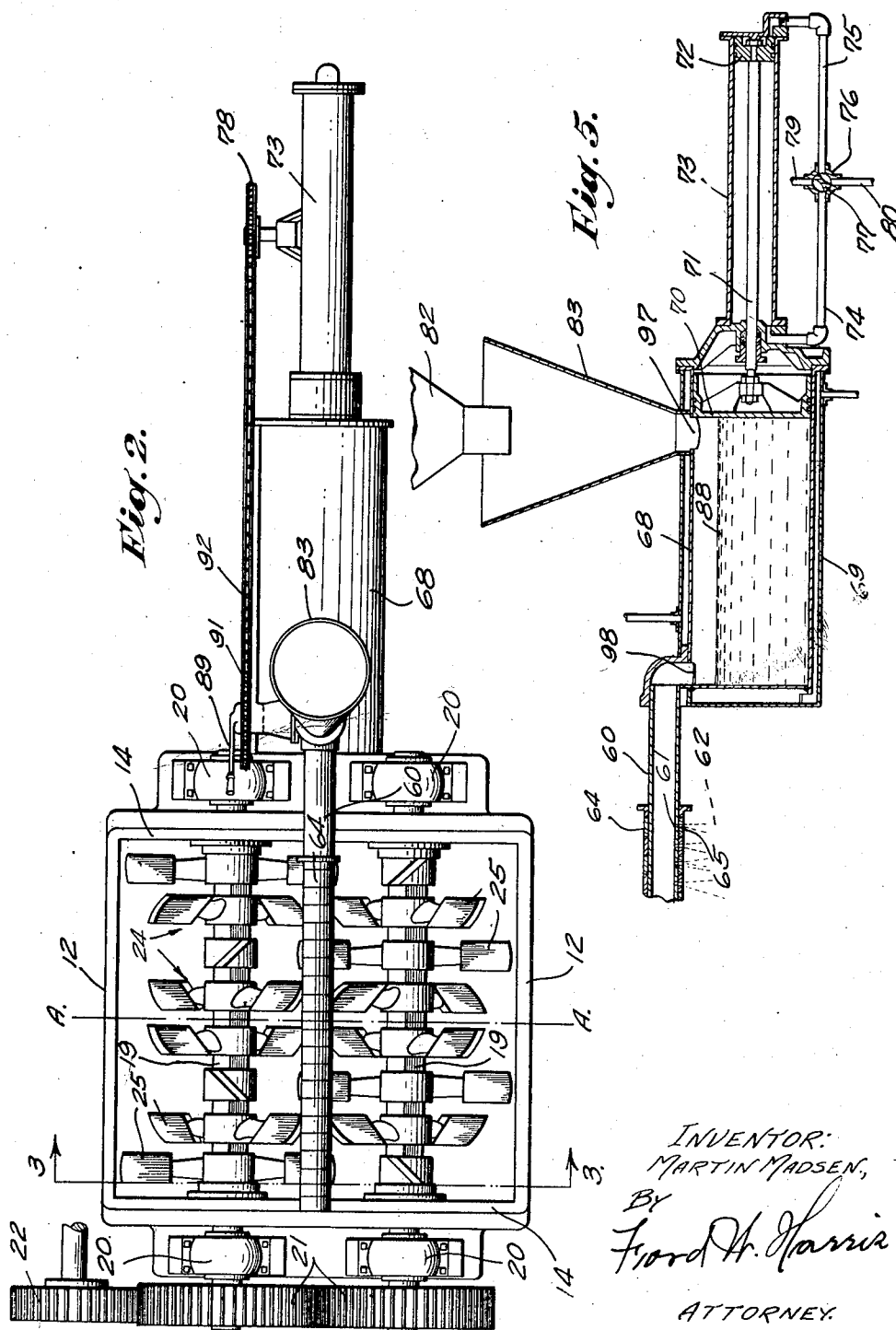
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METHOD AND APPARATUS FOR PRODUCING PAVING MATERIAL

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3 Sheets-Sheet 2



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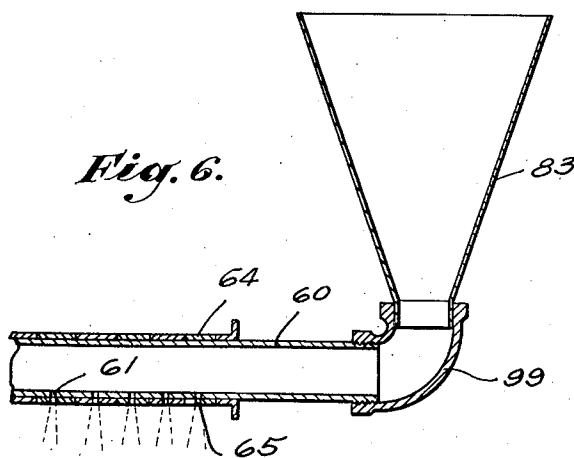
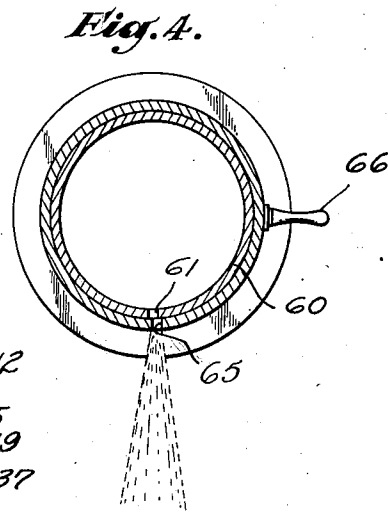
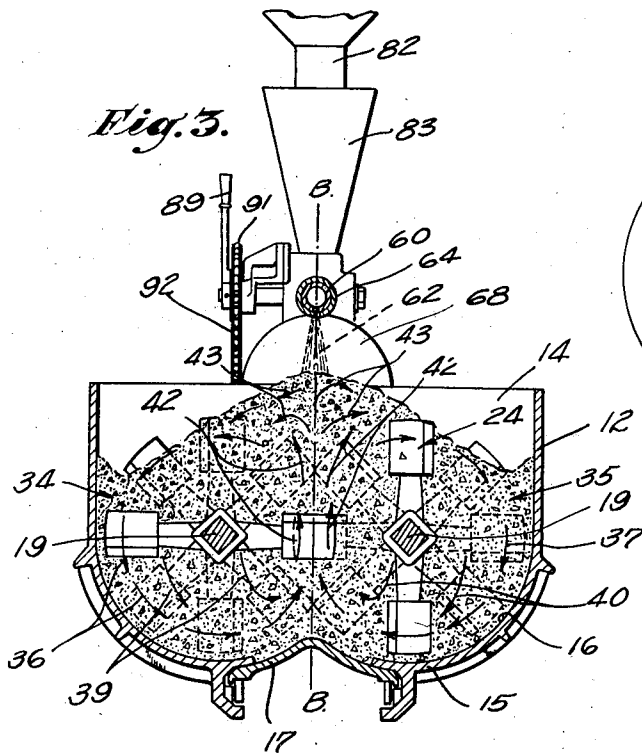
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METHOD AND APPARATUS FOR PRODUCING PAVING MATERIAL

Filed March 7, 1932

3 Sheets-Sheet 3



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## UNITED STATES PATENT OFFICE

1,987,243

METHOD AND APPARATUS FOR PRODUCING  
PAVING MATERIAL

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Application March 7, 1932, Serial No. 597,203

14 Claims. (Cl. 94—43)

My invention consists of a method and apparatus for mixing a solid material with a liquid and is particularly designed for thoroughly mixing such ingredients in a shorter period of time than is possible by present methods or apparatus.

My invention has a peculiar utility in the road construction industry and in that industry has to do with the preparation of paving material. In view of the fact that the use of my invention in connection with the road construction industry very clearly illustrates the utility of my invention, I will describe that form of my invention which is particularly useful in the road construction industry. In electing to describe that form of my invention which may be employed in the road construction industry, I do not intend to limit my invention thereto, since I clearly understand that the invention is useful in many other industries. I therefore desire that the character and scope of my invention be determined by reference to the appended claims in which the true scope of my invention in both its broad and narrow aspects is clearly defined.

In order that the features and advantages of my invention may be more readily understood, I will refer to that part of the road construction industry to which my invention particularly relates.

It is common practice at the present time to produce a paving material by mixing a mineral aggregate, which consists of sand, gravel, granite, or rock pieces of different sizes, with a binding material, such as a bituminous or asphalt material. It is quite essential to the production of a material which will make a good road to take care during the mixing operation that each mineral aggregate piece will be coated with binder material. In this way the paving material, when properly laid on the roadbed, will produce a road which produces a better traveling surface and which has a longer life than it would have if the mixture of mineral aggregate and binder were not as thorough as pointed out above.

Practically all road work is performed under contract from Federal, State, county, or city government, and such work is very meticulously supervised by Government inspectors. This appears to be quite essential in order that all road work may be maintained at the desired standard. The mixing of the mineral aggregate with the binder material is performed under rigorous supervision by Government inspectors, and all batches must be mixed for a length of time which will produce a thorough mixture, which length

of time having been previously determined by experiment. This inspection has been carried so far as to require the use of timing devices on mixing apparatus.

It is clearly evident that considerable money could be saved in the building of roads where the process and apparatus would thoroughly mix the mineral aggregate and binder in a shorter length of time than such thorough mixing can be accomplished with present methods and apparatus.

I have produced a method and have constructed an apparatus which will thoroughly mix mineral aggregate and liquid binder in a shorter length of time than is possible by present methods and apparatus. It is accordingly an object of my invention to produce a method and an apparatus in which a solid material, such as a mineral aggregate, may be mixed with a liquid, such as a bituminous binder, so that the liquid will thoroughly coat the solid material, and in which the thorough mixing may be accomplished in a shorter period of time than may be accomplished by present methods or apparatus.

It is an object of my invention to produce a method and apparatus which will enable paving material to be produced at less cost.

It is another object of my invention to provide a method and an apparatus in which a better paving material will be produced due to the superior mixing actions which may be obtained thereby.

In the development and production of my invention I spent considerable time in scrutinizing the present mixing methods and in experimenting with new methods and apparatus whereby the mixing might be performed in a superior manner and in a shorter length of time. After spending some length of time on this particular problem, I found that by agitating or mixing the mineral aggregate so that it would be divided into two contiguous bodies, each of which moved through cylindrical or spiral paths, and by causing the contiguous parts of the two bodies to merge into each other and move in the same direction, it would be possible over a relatively short period of time to cause all of the mineral aggregate to be carried to the upper central part of the mixing chamber. I then determined that by applying the binder to this particular point where the levitating mineral aggregate would reach the surfaces of the two bodies and tend to separate, all of the pieces of mineral aggregate would be coated in a relatively short length of time, and the binder could be very quickly distributed throughout the entire mass of mineral aggregate.

It is an object of my present invention to provide a method and apparatus whereby the mineral aggregate is mixed or moved as pointed out in the foregoing paragraph, and in which the binder material is applied at or near the important location where the mineral aggregate reaches the surface of the mass and moves outwardly along the top surface thereof, as also pointed out in the foregoing paragraph.

I determined from experimenting with the method and apparatus pointed out in the two foregoing paragraphs that by such a method it was possible to thoroughly coat the mineral aggregate in a shorter period of time than is possible with methods and apparatus commonly employed in the industry. I then sought to improve upon this basic method and to make the method superior and to make its mixing action quicker. I found that by applying the liquid binder under pressure and in separate streams it was possible to obtain a penetration of the liquid binder into the mass of mineral aggregate so that all of the mineral aggregate, passing adjacent the point where the merged parts of the two bodies reached the surface of the mass and adjacent the surface of the entire mass, might also be contacted by the liquid binder.

It is a further object of my present invention to provide a method and apparatus for producing paving material as pointed out heretofore, in which the binder is applied under suitable and sufficient pressure to cause penetration into the mineral aggregate, as pointed out in the foregoing paragraph.

It is a further object of my invention to apply the liquid binder to the mineral aggregate which is being mixed or moved, as pointed out heretofore, along the upper surface of the mineral aggregate in a plane which substantially coincides with the plane in which the merged portions of the bodies of mineral aggregate move upwardly toward the surface of the mass of mineral aggregate.

Other objects and advantages of my invention inhere in details of my method and apparatus, and the same may be pointed out during the course of the ensuing description in which I will point out in detail the form of my method and apparatus which is particularly suitable for use in the paving industry.

Referring to the accompanying drawings:

Fig. 1 is an elevational sectional view showing one embodiment of the apparatus of my invention.

Fig. 2 is a plan view of Fig. 1.

Fig. 3 is a sectional view taken as indicated by the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary sectional view showing a valve means provided on the binder-applying means of my invention.

Fig. 5 is a view illustrating a portion of a second embodiment of my invention.

Fig. 6 is a fragmentary view showing a portion of a third embodiment of my invention.

I will now refer to the drawings and particularly Figs. 1 to 4 inclusive, and will describe the embodiment of the apparatus disclosed in these figures and the method of my invention which may be performed in the utilization of that apparatus.

The numeral 11 represents a tank or casing in which the mixing action is produced. This casing 11 is provided with vertical side walls 12 and end walls 14 and is provided with a bottom wall 15 which is divided into two partly cylindrical portions 16 which extend longitudinally of the axis of the casing 11. The central part of the bottom 15 is provided with an opening which is closed by a slidable door 17 whereby the paving material,

after the completion of the mixing operation, may be discharged from the mixer.

The mixing means of my invention will now be described. This mixing means includes a pair of shafts 19 which extend longitudinally of the casing 11 and which are supported at each end by bearings 20 and which are simultaneously rotated by enmeshed gears 21 secured to the ends thereof, one of which gears 21 is operated by a drive gear 22. An inspection of Fig. 3 will clearly disclose that the shafts 19 are placed on axes which are concentric or substantially concentric to the point around which the partly cylindrical portions 16 of the bottom wall 15 are generated. Each shaft 19 carries a plurality of paddle members 24, each of which has arms which carry paddles 25. It will be noted that these paddles 25 are arranged symmetric to a plane A—A, the paddles on one side of this plane being angularly disposed in one direction, while the paddles on the opposite side of this plane are angularly disposed in an opposing direction. These paddles 25 are especially arranged in order that the aggregate will be caused to pass through a certain path of travel, as pointed out in the statement of invention and as is highly desirable to the performance of my invention. My invention, however, is not limited to the particular mixing means disclosed herein nor to the particular arrangement or positioning of the paddles 25. I have found, however, that this arrangement produces a highly desirable mixing action, and such an arrangement of parts as disclosed in Figs. 1 to 4 inclusive constitutes the preferred embodiment of my invention.

The mass of solid material, which in this particular embodiment of my invention is a mineral aggregate, is represented in the casing 11 by the numeral 28; this mineral aggregate being delivered thereto by a suitable hopper 29 having swinging doors 30. In Figs. 1 and 2 I have illustrated by arrows the path of travel of the mineral aggregate 28 during the mixing operation. In view of the fact that this path of travel is not only cylindrical but also longitudinal, and due to the fact that the mineral aggregate tends to move diagonally inwardly along the bottom of the casing toward the center thereof and diagonally outward along the upper surface of the aggregate material, it is somewhat difficult to pictorially illustrate the true path which the mineral aggregate passes through. As pointed out in the statement of invention, the mineral aggregate during the mixing operation may be considered as a whole or as a mass which, however, is divided up into two more or less integral bodies which are moved around each of the shafts 19. These two bodies will be generally designated by the numerals 34 and 35. In Fig. 3 arrows 36 designate in general the cylindrical path or the cylindrical movement of the mineral aggregate of the body 34, while arrows 37 represent the cylindrical path or the cylindrical movement of the mineral aggregate of the body 35. It must be remembered that in addition to the cylindrical movement there is also a longitudinal movement in opposite directions in each mass 34 and 35, which renders the illustration extremely difficult. It must be further remembered that due to centrifugal force and gravitation there is a marked tendency for the mineral aggregate in each of the bodies 34 and 35 to move downwardly toward the bottom wall 15, as indicated by arrows 39 and 40. As likewise indicated in Fig. 3, the two bodies of mineral aggregate 34 and 35 are

contiguous to each other along a central plane B—B, and in fact the contiguous portions of these two bodies 34 and 35 merge into each other and move together in an upward direction along the plane B—B, as indicated by arrows 42. As the merged portions of the bodies 34 and 35 reach the upper surface of the mass of mineral aggregate, the merged portions tend to separate and move outwardly from the plane B—B, as indicated by arrows 43. It will therefore be seen that during the progress of the mixing operation mineral aggregate will pass through paths indicated by the arrows 36, 37, 39, 40, 42 and 43. This movement will in a relatively short period of time bring all of the mineral aggregate of both of the bodies 34 and 35 into the merged portion of the mass and cause same to move upwardly along the plane B—B so that each piece of mineral aggregate is brought to the surface of the mass or adjacent the surface of the mass along the plane B—B or at a position closely adjacent thereto.

In addition to the motion of the mineral aggregate, and in addition to the paths of the mineral aggregate as described in Fig. 3, the pieces of mineral aggregate simultaneously move in paths represented by arrows in Fig. 1. Fig. 1 is intended to represent the movement of the mineral aggregate along a longitudinal plane in each of the bodies 34 and 35. Due to the fact that the paddles 25 are arranged symmetric along the plane A—A, each body may be said to be divided into two distinct parts which move in a somewhat opposing relation to each other. Each body therefore will, for the purpose of description, be divided into parts 46 and 47. The mineral aggregate of the part 46 moves downwardly near the end of the casing 11 and near the side wall thereof, as indicated by arrows 49, while a similar motion occurs in the part 47 as indicated by arrows 50. Near the plane A—A and also near the central longitudinal axis of the casing 11 which is indicated by the plane B—B, the mineral aggregate of each part 46 and 47 moves upwardly as indicated by arrows 52 and 53. The two parts 46 and 47 merge together along the plane A—A and move upwardly as indicated by arrows 54, and then the merged parts separate and move outwardly at the surface of the mass 28, as indicated by arrows 55. It should be strictly understood that the downward motion of the mineral aggregate of each part 46 and 47 is outside the shafts 19 and is between the shafts 19 and one of the side walls 12. It should further be understood that the upward movement as indicated by the arrows 52 and 53 and also by the arrow 54 occurs in the space between the two shafts 19 and approximately along the plane B—B shown in Fig. 3.

The mineral aggregate in passing through the lateral intricate paths illustrated as nearly correct as possible by the arrows of Figs. 1 and 3, will in a relatively short length of time be brought to or adjacent the surface of the mass 28 at or near the plane indicated by the line B—B.

In conjunction with the method of mixing just described and with the apparatus for performing this mixing operation just described, I employ a liquid-binder-applying means which is preferably in the form of a spray pipe 60 which extends over the casing 11 along or substantially along the plane B—B, as illustrated clearly in Fig. 3. This spray pipe 60 has a multiplicity of spray openings 61 which are formed in the lower part

of the spray pipe 60 in order that liquid passing therethrough will be directed downwardly onto the upper surface of the mass 28 along or closely adjacent to the plane B—B in the form of separate streams 62, as indicated by dotted lines in Figs. 1 and 3. In order that the amount of liquid projected through each of the openings 61 may be controlled, I provide a series of valve members 64 which, as clearly shown in Fig. 4, have openings 65 and have handles 66 whereby the relation of the openings 65 to the spray openings 61 may be regulated. When the openings 61 and 65 are in full alignment, the greatest stream may be projected, while when the openings are disaligned, a smaller stream will be projected, and by completely disaligning these openings, the stream may be cut off entirely. In view of the fact that the particular type of mixing action of my invention brings all of the pieces of mineral aggregate at or adjacent the surface of the mass along or adjacent the plane B—B, the applying of the streams 62 of liquid along the plane B—B enables all of the pieces of mineral aggregate to be coated in a minimum of time. It further permits a very even distribution of the liquid and therefore is productive of a batch of paving material which is very uniform throughout its entirety.

The spray pipe 60 and the parts associated therewith constitute a preferred means for applying the liquid binder to the mineral aggregate. It should be strictly understood, however, that my invention is not limited to this particular type of spray means. It would be possible to provide entirely separate sprays delivering larger or smaller streams as desired, or to provide a trough having a spill wall which would deliver a sheet of liquid to the surface of the mass 28 along the plane B—B. The spray pipe 60, I have found from experiment, is the most desirable type of spray means, and I therefore desire to use this construction in the preferred embodiment of my invention without, however, being limited to the details of construction thereof.

The spray pipe 60 is connected to a liquid delivery means which, in the preferred form of my invention, is adapted to deliver the liquid under a pressure in order that the stream 62 will have some force or velocity which will cause a penetration of the liquid into the surface regions of the mineral aggregate. This I have found will increase the rapidity with which a thorough mixing of the liquid and aggregate may be accomplished. This supply means includes a cylinder 68 provided with a steam jacket 69 in order to heat the cylinder and to prevent solidification of the liquid, which is usually a hot asphalt material, in the cylinder. Operating in the cylinder 68 is a piston 70 which is connected with the inner end of a piston rod 71. On the right end of the piston rod 71 is an operating piston 72 which reciprocates back and forth in a small cylinder 73. Reciprocation of the piston 72 is accomplished by admitting a fluid under pressure through either of the pipes 74 or 75, one of which is connected to each end of the cylinder 73. This is accomplished by means of a valve 76 having a valve member 77 which is operated by a sprocket 78. The valve member 77 is so arranged that when one of the pipes 74 or 75 is connected to a fluid supply pipe 79, the other of the pipes 74 or 75 is connected to a fluid exhaust pipe 80. The liquid, which, as pointed out heretofore, is usually a heated asphalt or other bituminous material, is

delivered by means of a weigh bucket 82 to a hopper 83, which hopper 83 is supported by a casting 84 which is located at the left end of the cylinder 68 and which provides a chamber in which a three-way valve 87 is situated. When the three-way valve 87 is in the position shown in full lines in Fig. 1, the hopper 83 is connected to the cylinder 68, and when this is the case the liquid may flow from the hopper 83 into the cylinder 68 and occupy a position therein, as indicated by the numeral 88. After a batch of liquid 88 has been supplied to the cylinder 68, as I have just pointed out, the three-way valve 87 is then rotated ninety degrees by means of a handle 89, this handle 89 being moved into the position indicated by dotted lines 90. This moves the three-way valve into such a position that the hopper 83 is disconnected from the cylinder 68 and the spray pipe 60 is brought into communication with the cylinder 68. It will be noted that associated with the three-way valve 87 there is a gear 91, and extending around the sprocket 91 and the sprocket 78 of the control valve 76 is a chain 92 whereby the valve member 77 of the control valve 76 is operated simultaneously with the three-way valve 87. It will therefore be seen that upon moving the three-way valve 87 from the position shown in full lines in Fig. 1 into the position indicated by dotted lines 90 in Fig. 1, in which position the spray pipe is communicated with the cylinder 68, the valve member 77 is moved into such a position that fluid under pressure is applied to the piston 72 so as to move same in a leftward direction. This exerts a force on the piston 70 and causes same to move in a leftward direction. The body of liquid at this time is therefore forced from the cylinder 68 through the three-way valve 87 and into the spray pipe 60. The liquid then passes from the spray pipe 60 through the openings 61 and in streams 62 as previously pointed out. It will be seen that there is a pressure applied to the liquid which gives force or velocity to the streams 62 and will cause a penetration of the liquid into the surface regions of the mineral aggregate. The pressure which is utilized depends upon the size of the mineral aggregate and the viscosity of the liquid which is being used. I find ordinarily that twenty or thirty pounds per square inch is quite suitable. This pressure per square inch is readily controllable by a regulating valve, not shown, which may be connected to the fluid supply line 79 and may control the pressure of the fluid which actuates the small piston 72.

My experiments have indicated to me that superior results may be obtained where a greater portion of liquid is applied at the intersection of the planes A—A and B—B. I therefore desire to provide the regulating valves 64 illustrated in detail in Fig. 4, whereby the volumes of the various streams may be controlled. I do not wish to be limited to any particular proportions of liquid delivered at various points along the axis B—B, but I do wish it to be understood that in the preferred form of my invention the spray openings 61 are regulated so that the streams 62 adjacent the intersection of the planes A—A and B—B are larger.

In the form of my invention disclosed in Fig. 5 the three-way valve and mechanism associated therewith is eliminated, and the hopper 83 is connected directly to the cylinder 68 by an opening 97 which is provided at the right end of the cylinder. The spray pipe 60 likewise is directly connected by means of a passage 98 to the extreme left end of the cylinder 68. In this form

of my invention the piston 70 is first retracted to the position shown in full lines in Fig. 1, and the batch of liquid is delivered to the cylinder. The control valve 67 is then operated so that the piston 70 is moved in a leftward direction. This will force the liquid through the passage 98 and into the spray pipe 60.

In the form of my invention illustrated in Fig. 6, the pressure applying means is entirely eliminated, and the hopper 83 is directly connected by means of an elbow 99 to the spray pipe 60. In this form of my invention the liquid is fed to the spray pipe and is caused to flow through the spray openings 61 entirely by gravity. Where the liquid is not too viscous, this method may be utilized. Experience has taught, however, that the gravity feed is not preferred, although it may be utilized with satisfaction, due to the fact that it takes a slightly longer period of time for the liquid to flow in the form of streams 62 onto the mineral aggregate and will therefore increase the length of time required for a thorough mixing of the mineral aggregate and the bituminous binder. So far as final results are concerned, one method is nearly as good as the other. However, in view of the fact that the element of time is of considerable importance, the method and apparatus disclosed in connection with Figs. 1 to 5 inclusive will undoubtedly be preferable.

It should be clearly understood that various other types of liquid supply means may be provided without departing from my invention. For example, in place of the pressure applying means disclosed in Figs. 1 to 5 inclusive, I may employ an ordinary reciprocating pump for continuously forcing the liquid through the spray pipe 60. The particular dose method disclosed in Figs. 1 to 5 inclusive, however, is quite desirable due to the fact that the dose may be measured and may be continuously applied to the spray pipe 60 without any interruption.

It is believed that the foregoing description, taken in connection with the drawings, fully illustrates not only the method of my invention but the various apparatus which may be utilized to perform my method. It should be clearly understood that the method of my invention is distinct from the apparatus and may be performed by any other apparatus which is capable of performing the various steps of my process, which are pointed out as essential thereto in the accompanying claims. It should further be clearly understood that the particular designs of apparatus are a part of my invention, and not only do I consider the apparatus invention to be broadly new and capable of broad patentable definition, but I also consider the various details of construction to be patentably new and to be subject to patent appropriation.

I wish my invention to be construed in accordance with the appended claims and not to be limited except as pointed out in the claims, which define the true scope of my invention.

I claim as my invention:

1. A method of producing paving material, which includes the steps of: mixing an aggregate so that same is divided into two contiguous bodies which move in separate spiral paths which merge together and move upward along the contiguous parts of said bodies, the material of said bodies separating and moving outward and out of contact when the upper end of their merged and contiguous travel is reached; and applying, under sufficient pressure to obtain penetration into said aggregate, a liquid binding material in

streams to said aggregate during the aforesaid mixing operation at the upper part of said contiguous parts of said bodies, where said material of each body separates and moves outward from the other body, said mixing action being continued to thoroughly coat said aggregate.

2. A method of producing paving material, which includes the steps of: mixing an aggregate so that same is divided into two contiguous bodies which move in separate spiral paths which merge together and move upward along the contiguous parts of said bodies, the material of said bodies separating and moving outward and out of contact when the upper end of their merged and contiguous travel is reached; and applying a liquid binding material in streams to said aggregate during the aforesaid mixing operation at the upper part of said contiguous parts of said bodies, where said material of each body separates and moves outward from the other body, said mixing action being continued to thoroughly coat said aggregate.

3. A method of producing paving material, which includes the steps of: mixing an aggregate so that same is divided into two contiguous bodies which move in separate spiral paths which merge together and move upward along the contiguous parts of said bodies; and applying a liquid binding material in streams to said aggregate during the aforesaid mixing operation at the upper part of said contiguous parts of said bodies, said mixing action being continued to thoroughly coat said aggregate.

4. In an apparatus for mixing paving material, the combination of: mixing means for mixing an aggregate so that same is divided into two contiguous bodies which move in separate spiral paths which merge together and move upward along the contiguous parts of said bodies; and liquid applying means for applying a liquid binding material in streams to said aggregate during the aforesaid mixing operation at the upper part of said contiguous parts of said bodies, said mixing action being continued to thoroughly coat said aggregate.

5. In an apparatus for mixing paving material, the combination of: mixing means for mixing an aggregate so that same is divided into two contiguous bodies which move in separate spiral paths which merge together and move upward along the contiguous parts of said bodies, the material of said bodies separating and moving outward and out of contact when the upper end of their merged and contiguous travel is reached; and liquid applying means for applying a liquid binding material in streams to said aggregate during the aforesaid mixing operation at the upper part of said contiguous parts of said bodies, where said material of each body separates and moves outward from the other body, said mixing action being continued to thoroughly coat said aggregate.

6. In an apparatus for mixing paving material, the combination of: mixing means for mixing an aggregate so that same is divided into two contiguous bodies which move in separate spiral paths which merge together and move upward along the contiguous parts of said bodies, the material of said bodies separating and moving outward and out of contact when the upper end of their merged and contiguous travel is reached; and liquid applying means for applying, under sufficient pressure to obtain penetration into said aggregate, a liquid binding material in streams to said aggregate during the aforesaid mixing operation at the upper part of said contiguous parts of said

bodies, where said material of each body separates and moves outward from the other body, said mixing action being continued to thoroughly coat said aggregate.

7. In an apparatus for mixing paving material, the combination of: a casing; a pair of mixing means in said casing having means whereby the aggregate being mixed is divided into two spirally moving bodies having contiguous parts which merge together and thereafter separate and move outward from each other; and liquid supply means above the plane on which said bodies merge for delivering liquid binding material to said aggregate where said merged parts of said bodies separate and move outward from each other.

8. In an apparatus for mixing paving material, the combination of: a casing; a pair of mixing means in said casing having means whereby the aggregate being mixed is divided into two spirally moving bodies having contiguous parts which merge together and thereafter separate and move outward from each other; and liquid supply means above the plane on which said bodies merge for delivering liquid binding material in the form of separate streams to said aggregate where said merged parts of said bodies separate and move outward from each other.

9. In an apparatus for mixing paving material, the combination of: a casing; a pair of mixing means in said casing having means whereby the aggregate being mixed is divided into two spirally moving bodies having contiguous parts which merge together and thereafter separate and move outward from each other; liquid supply means above the plane on which said bodies merge for delivering liquid binding material to said aggregate where said merged parts of said bodies separate and move outward from each other; and pressure means for applying a pressure to said liquid to cause same to penetrate said aggregate.

10. In an apparatus for mixing paving material, the combination of: a casing; a pair of mixing means in said casing having means whereby the aggregate being mixed is divided into two spirally moving bodies having contiguous parts which merge together and thereafter separate and move outward from each other; and liquid supply means in the form of a spray pipe which extends above the plane on which said bodies merge for delivering liquid binding material to said aggregate where said merged parts of said bodies separate and move outward from each other.

11. In an apparatus for mixing paving material, the combination of: a casing; a pair of mixing means in said casing having means whereby the aggregate being mixed is divided into two spirally moving bodies having contiguous parts which merge together and thereafter separate and move outward from each other; liquid supply means in the form of a spray pipe which extends above the plane on which said bodies merge for delivering liquid binding material to said aggregate where said merged parts of said bodies separate and move outward from each other; and pressure means for applying a pressure to said liquid to cause same to penetrate said aggregate.

12. In an apparatus for mixing paving material, the combination of: a casing adapted to contain an aggregate; mixing means for causing a mixing action in said aggregate; a cylinder adapted to receive a liquid binding material; a liquid delivery means connected to said cylinder and extending above said aggregate, said delivery means being adapted to direct a stream against said aggregate; and a piston in said cylinder for forcing

said liquid binding material through said liquid delivery means.

13. In an apparatus for mixing paving material, the combination of: a casing adapted to contain an aggregate; mixing means for causing a  
5 mixing action in said aggregate; a cylinder adapted to receive a liquid binding material; a liquid delivery means connected to said cylinder and extending above said aggregate, and having a  
10 spray pipe through which liquid binding material may be sprayed onto said aggregate; and a piston

in said cylinder for forcing said liquid binding material through said liquid delivery means.

14. A method of producing paving material which includes the steps of: mixing a mass of aggregate in a manner to bring different portions to  
5 the top of the mass; and applying to the upper surface of said mass of aggregate in the form of separate streams under pressure, a liquid binding material which becomes thoroughly and evenly  
10 mixed with said mass of aggregate.

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