No. 808,599. PATENTED DEC. 26, 1905.

G. W. CRICHFIELD.

APPARATUS FOR MIXING PAVING COMPOSITIONS.

APPLICATION FILED MAR. 1, 1905.

2 SHEETS—SHEET 1.

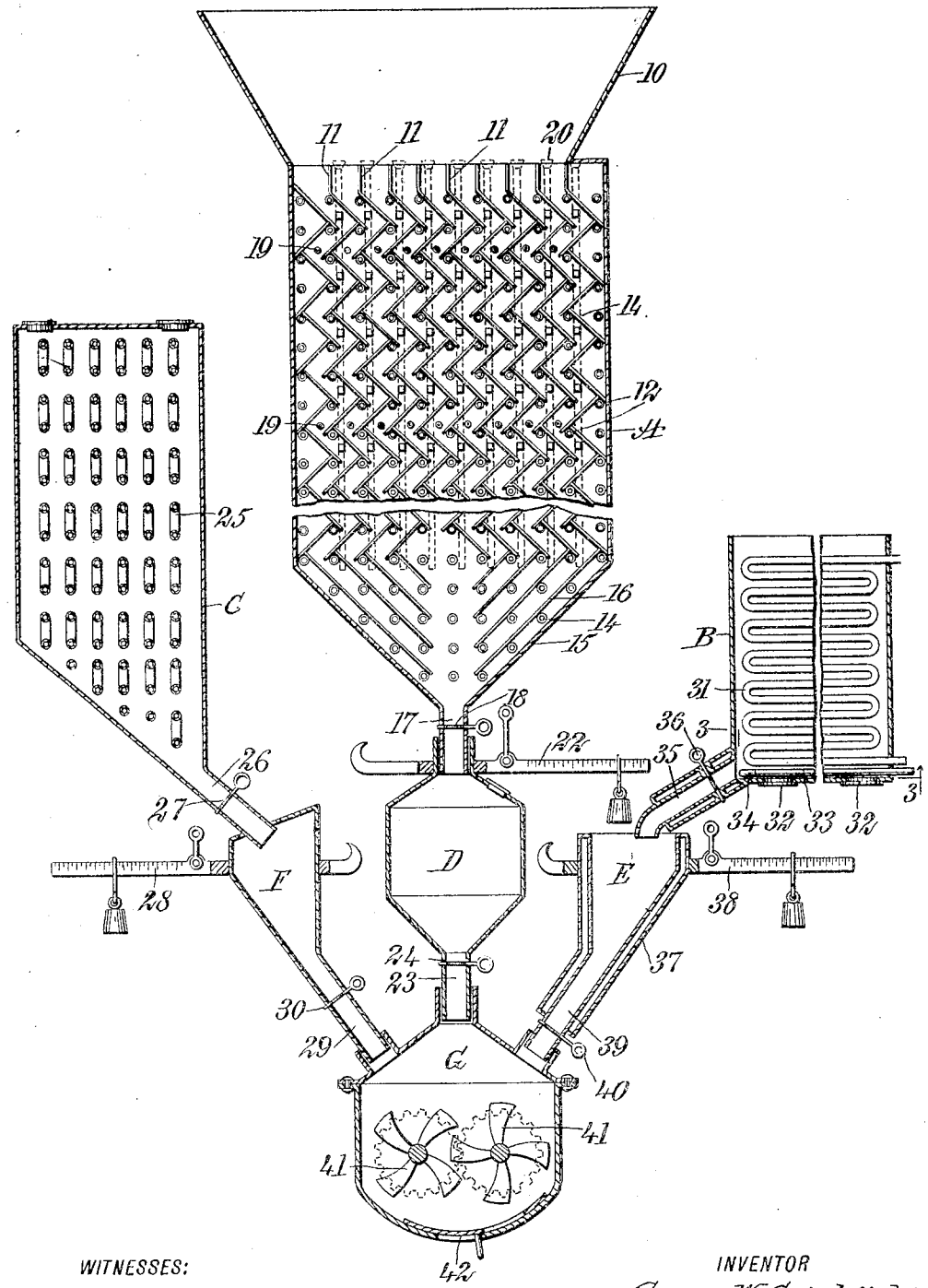



Fig. 1

WITNESSES:

J. A. Bopley

Isaac B. Owens.

INVENTOR

George W. Crichfield

BY Munn & Co.

ATTORNEYS

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2 SHEETS—SHEET 2.

Fig. 2

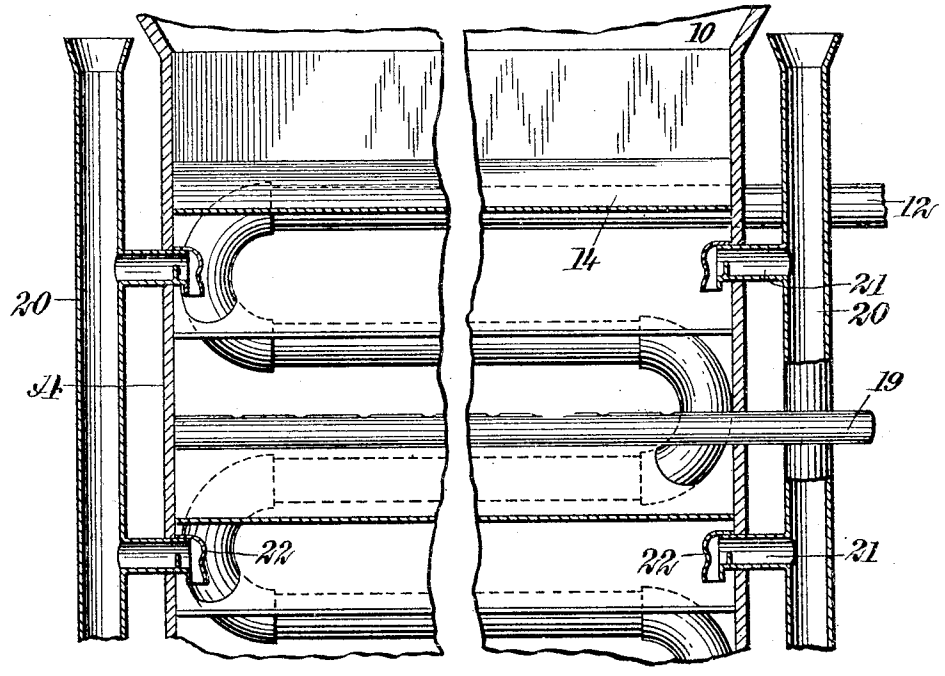
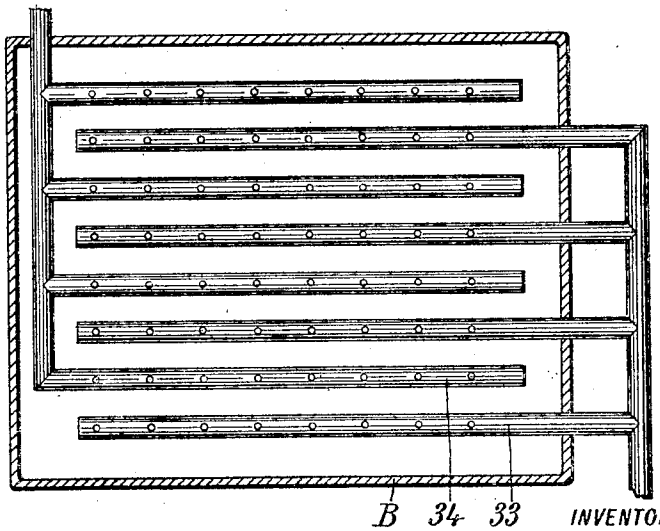



Fig. 3




WITNESSES:

J. A. Brophy

Isaac B. Owens

INVENTOR

George W. Crichfield

BY

ATTORNEYS

# UNITED STATES PATENT OFFICE.

GEORGE W. CRICHFIELD, OF JERSEY CITY, NEW JERSEY.

## APPARATUS FOR MIXING PAVING COMPOSITIONS.

No. 808,599. Specification of Letters Patent. Patented Dec. 26, 1905.

Application filed March 1, 1905. Serial No. 247,925.

*To all whom it may concern:*

Be it known that I, GEORGE W. CRICHFIELD, a citizen of the United States, and a resident of Jersey City, in the county of Hudson and State of New Jersey, have invented a new and Improved Apparatus for Mixing Paving Compositions, of which the following is a full, clear, and exact description.

The invention relates especially to an apparatus for preparing and mixing the various materials forming pavement compositions, although it may be employed in other connections as will suggest themselves to persons skilled in the art.

In the ordinary manufacture of pavements containing asphalt or asphaltic materials the mineral aggregate is heated directly in a revolving drum and the asphaltic material is heated in kettles and mixed with the aggregate. This system has disadvantages, particularly the danger of overheating, and therefore injuring the asphalt.

The underlying object of my invention, therefore, is to provide an apparatus for this purpose in which the heating not only of the asphalt or asphaltic material, but of the mineral aggregate combined therewith, may be accurately and automatically controlled so as to render it impossible to so overheat the material as to injure in any way the resulting paving composition.

It is also an object of the invention to render the various operations involved with the heating and mixing the materials as nearly continuous as possible and to avoid the dust and other unhealthful conditions incident to the methods ordinarily practiced.

A further object is to enable the various materials forming the paving composition to be weighed and passed directly into the mixing vessel, thus insuring a composition of accurate proportions and avoiding any loss of heat in transmission from the heating vessels to the mixer.

In attaining these ends I provide certain peculiarly-constructed receptacles in which the asphaltic material and mineral aggregate are charged and by which they are heated uniformly, this heating being effected by means of steam-pipes, and the pressure, and therefore the heat of the steam-pipes, controlled in such a way as to render it impossible to overheat the materials. Said heating-receptacles are arranged to discharge into peculiarly-arranged weighing vessels, which themselves discharge into the mixer where the various materials are united to form the paving composition.

Reference is now to be had to the accompanying drawings, which illustrate as an example the preferred embodiment of the invention, in which drawings like characters of reference indicate like parts in the several views, and in which—

Figure 1 is a sectional view with parts broken away, showing the various elements of the apparatus in operative relation. Fig. 2 is an enlarged sectional view with parts broken away, showing the heating-bin for the mineral aggregate and illustrating the steam-pipes, air-pipes, and vents; and Fig. 3 is a sectional view looking upwardly from the line 3 3 of Fig. 1 and showing the steam and air pipes in the asphalt-tank.

In Fig. 1, A indicates the bin or receptacle for the mineral aggregate, B the receptacle for the asphalt or asphaltic material, and C a receptacle in which carbonate of lime or other finely-divided material may be placed. The receptacles A, B, and C discharge into weighing vessels D, E, and F, respectively, and these vessels themselves discharge into the mixing vessel G.

The mineral-aggregate bin or receptacle A is open at its upper end and is provided with a feed-hopper 10. At the bottom of said hopper a number of vertical walls 11 are arranged, forming distinct passages leading downward into the bin and serving evenly to distribute throughout the bin the material passing from the hopper. Extending horizontally in the bin are a number of steam-pipes 12, over which are placed plates 14. These plates are arranged in staggered lines, as shown, forming a number of tortuous passages extending from the top to the lower portion of the bin. The lower portion or bottom 15 of the bin is tapered, as shown, and the steam-pipes 14 in this part of the bin are covered by metal plates 16, which are disposed parallel to each other and incline inwardly toward the center of the bin, thus directing the material to flow freely through the outlet-spout 17 of the bin. Said outlet-spout 17 is commanded by a valve or gate 18, which may be of any desired form. Entering the main part of the bin or hopper A and passing across the said tortuous passages therein are a number of perforated pipes 19, which are adapted to convey air into the bin, causing this air to pass through the material therein, drying the same and carrying off the

moisture. Arranged at each side of the bin, as shown best in Fig. 2, are a number of vertically-extending vent-pipes 20, which are open at their ends and which communicate with the bin at various points along the length thereof by means of branches 21. These branches are provided with hoods 22 at their inner ends within the bin, which hoods prevent the aggregate within the bin from entering the branches of the vent-pipes. These vent-pipes serve to carry off a part of the air discharged by the pipes 19 and other vapors collecting within the bin, the remaining portions of the air and vapor being carried off through the open upper end of the bin, as will be seen from Fig. 1.

The steam-pipes 12 are supplied with steam from a suitable source, and the pressure, and therefore the temperature of this steam, are regulated by a safety-valve or other means, so that the temperature within the bin will be kept at the proper point. This temperature should be about 300° Fahrenheit. If desired, the coils of steam-pipes adjacent to the top of the bin may be connected to the superheater, so as to raise the temperature at this point, thus overheating the aggregate as it is first introduced into the bin, and then as this aggregate falls into the pipes in the lower part of the bin the exactly correct temperature will be imparted thereto. The aggregate is charged into the bin and allowed to flow through the tortuous passages therein, it being continually subjected to the heating action of the metallic plates 14, which are themselves heated by the steam-pipes 12. Meanwhile the air from the pipes 19 is discharged into the bin, drying out the aggregate, and the air and vapors are withdrawn through the vent-pipes 20 and through the open upper end of the bin. In practice the bin will be made sufficiently large to contain considerably more aggregate than is used for a single mixing operation. For example, it may be made sufficiently large to hold sufficient aggregate to last during a twenty-four-hour run of the mixing plant. This allows ample time for heating the aggregate and insures that all parts thereof will be thoroughly heated up to the degree fixed upon as necessary or desirable.

The discharge-spout 17 opens into the weighing-receptacle D, and this weighing-receptacle is connected with any desired weighing device—for example, with a scale-beam 22. The weighing-receptacle D has a discharge-spout 23, commanded by a suitable valve or gate 24, and said discharge-spout opens into the mixing-hopper G.

The bin or receptacle C may be used or not, according to the nature of the pavement being produced. It is particularly intended for receiving carbonate of lime employed in some classes of paving composition, and said receptacle is provided with steam-pipes 25 for uniformly heating its contents. The receptacle has a discharge-spout 26, fitted with a suitable valve 27 and opening into the weighing-receptacle F. This weighing-receptacle is also in connection with a scale-beam 28 or other suitable means for determining the weight of the material in said receptacle F. The discharge-spout 29 of the receptacle F has a suitable valve 30 therein and empties into the mixing-hopper G, as before described.

The asphalt or asphaltic composition or material is heated in the tank or receptacle B. This is provided with a steam coil or coils 31, which extend throughout the interior of the receptacle to uniformly heat the asphalt. In this way all particles of the asphalt are heated to the proper temperature, and excessive temperature may be avoided by regulating the pressure of the steam in the coils. The tank is provided with manholes 32 in its bottom and, as shown in Figs. 1 and 3, steam-spray pipes 33 and air-jet pipes 34 extend along the bottom of the hopper. These pipes are perforated at their under sides and are intended to inject jets of steam and air into the body of the asphaltic material, the steam and air serving to agitate and thoroughly mix the material and to carry off therefrom unnecessary and objectionable oils, vapors, and other impurities. The receptacle B has a steam-jacketed discharge-spout 35, commanded by a suitable valve 36. This spout empties into the weighing-receptacle E, which is provided with a steam-jacket 37, as shown in Fig. 1, and which is sustained through a scale-beam or other means 38, by which the weight of the material within the receptacle may be determined. The discharge-spout 39 of the receptacle E has a valve 40 controlling the outlet, and said spout empties into the mixing vessel G, before described. The mixer G may be of any desired form, and as here shown it is provided with rotating paddles or agitators 41 and a gate-controlled discharge-opening 42.

In the organized operation of the apparatus steam is supplied to the various coils and pipes 12, 31, and 25 in case the receptacle C is employed. The mineral aggregate is charged into the bin or receptacle A and allowed to move through the tortuous passages thereof, so that said aggregate is uniformly heated up to the desired point, the air passing from the pipes 19 serving to dry the aggregate and carry off the moisture thereof through the vent-pipes 20 and open upper end of the bin. The asphaltic material is charged into the receptacle B and is heated to the desired point by the steam-coil 31, while the air and steam jets in the bottom of the tank or receptacle B agitate and purify the asphalt. If carbonate of lime or other material is charged into the receptacle C, it will be heated to the proper temperature by

the steam-coils therein. In this manner it will be observed that all of the materials forming the composition are uniformly heated and that this heating is so arranged as to avoid excessive heating not only of the asphalt itself, but of the aggregate as well. Overheating the aggregate must be avoided in order to prevent the overheated aggregate burning or injuring the asphalt when mixed therewith. When the materials are properly heated, the various gates 27, 18, and 36 should be opened, allowing parts of the heated materials to enter the receptacles F, D, and E, the desired amount being determined by the scale-beams 22, 28, and 38. When the proper amount of materials have been delivered to the receptacles, the gates 27, 18, and 36 should be closed and the materials charged from the weighing-receptacles into the mixer, where they are mixed, and the paving composition is ready for use. By means of this apparatus the materials forming the composition may be kept continually on hand heated to the proper degree and portions of this material withdrawn at the desired times mixed and delivered. This is of much advantage in the practical operation of asphalt-pavement plants where delays are frequent in the delivery of the mixed composition, owing to the absence of wagons or carts for carrying the material away, and by providing the bins or receptacles A, B, and C of the proper capacity the use of a plurality of bins as commonly employed is avoided.

Having thus described the preferred form of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a paving-composition plant, the combination of a mixer, a mineral-aggregate bin, a series of baffle-plates located in the bin in staggered relation forming tortuous passages from the upper to the lower portion of the bin, heating-pipes passing into the bin under said plates, vent-pipes communicating with the interior of the bin at various points therein, a weighing device comprising a vessel communicating with the aggregate-bin and discharging into the mixer, and a scale-beam supporting said bin, an asphalt-tank, a heating means coacting therewith, a weighing-receptacle comprising a weighing vessel receiving the asphalt from the asphalt-bin and discharging it into the mixer, and a scale-beam supporting said weighing-receptacle, a third bin adapted to receive finely-divided material, a heating means coacting therewith, a weighing device comprising a weighing-receptacle receiving said material from said third bin and discharging it into the mixer, a scale-beam supporting the weighing-receptacle, and valves controlling the movement of the materials into and from the weighing devices.

2. A paving-composition plant comprising a plurality of bins adapted to receive the materials of which the composition is formed, a means coacting with each bin for treating said materials to prepare them for admixture, weighing-receptacles receiving the materials from the bins, a mixer into which all of the said weighing-receptacles discharge, and a scale member supporting each weighing-receptacle.

3. In a paving-composition plant, the combination of a plurality of bins adapted to receive the materials of which the composition is formed, a means coacting with each bin to treat the material therein and prepare it for admixture, a weighing-receptacle receiving the material from each bin, a mixer into which all of said weighing-receptacles discharge, and a scale-beam supporting each weighing-receptacle.

4. A paving-composition plant comprising a plurality of bins adapted to receive the materials of which the composition is formed, one of said bins being adapted to receive asphalt and having a steam-jacketed discharge-spout, a means for heating the asphalt-bin, weighing-receptacles receiving the materials from the bins, a mixer into which all of said weighing-receptacles discharge, the weighing-receptacle of the asphalt-bin having a steam-jacket, for the purpose specified, and scale members supporting all of the weighing-receptacles.

5. In a paving-composition plant, the combination of a mineral-aggregate bin, means for heating the interior thereof, a second bin adapted to receive finely-divided material, means for heating the same, a third bin adapted to receive asphalt, means for heating the third bin, a weighing-receptacle for each bin, the weighing-receptacle receiving the materials from the bins, and the weighing-receptacle of the asphalt-bin having a steam-jacket, for the purpose specified, a scale member supporting said weighing-receptacle, and a mixer into which all of the weighing-receptacles discharge.

6. A paving-composition plant comprising a plurality of bins adapted to contain the materials forming the composition, a means coacting with each bin to treat the materials therein and prepare them for admixture, a mixer, and a weighing device in connection with each bin, the weighing devices receiving the materials from the bins and discharging them into the mixer.

7. A paving-composition plant having a plurality of hoppers, one of which is adapted to receive the mineral aggregate, and provided with a means for drying and heating the same, a mixer, and a weighing device for each bin or hopper, the said weighing devices receiving the materials respectively from the bins and discharging the same into the mixer.

8. In a paving-composition plant, the combination of a plurality of bins adapted to re-

ceive the materials of which the composition is formed, one of said bins being adapted to contain liquid asphalt and being provided with a means for heating the same, a mixer, and a plurality of measuring devices receiving the materials respectively from the bins and all of the measuring devices discharging into the mixer.

9. A paving-composition plant comprising the combination of a plurality of bins adapted to receive the materials forming the composition, one of said bins being adapted to contain liquid asphalt, a weighing device for each bin, the weighing devices receiving the materials from said bins, and the weighing device of the asphalt-bin comprising a steam-jacketed receptacle, and a mixer into which all of the said weighing devices discharge.

10. A paving-composition plant comprising the combination of a plurality of bins adapted to receive the materials forming the composition, one of said bins being adapted to receive the mineral aggregate and having a series of baffle-plates therein disposed in staggered relation to form tortuous passages through the bin, said bin also having heating-pipes passing through it under said plates, a mixer, means communicating with all of said bins and with the mixer to discharge the materials into the mixer, and valves controlling the movement of the materials into the mixer.

11. A paving-composition plant comprising a mineral-aggregate bin, a means for uniformly heating the same, a liquid-asphalt bin, a means for uniformly heating the same, a mixer, and a valve-controlled means communicating with each bin and discharging into the mixer, said valve-controlled means of the asphalt-bin being steam-jacketed to maintain the asphalt at the proper temperature in its passage to the mixer.

12. A paving-composition plant comprising the combination of a bin adapted to receive finely-divided material, a means for uniformly heating the same, a bin adapted to receive the mineral aggregate, a means for uniformly heating the same, a bin adapted to receive the liquid asphalt, a means for uniformly heating the same, a mixer, and a valve-controlled device for each bin receiving the materials from said bins and discharging them into the mixer.

13. A paving-composition plant comprising a plurality of bins adapted to receive the materials forming the composition, of which bins one is adapted to receive the mineral aggregate and is provided with a plurality of staggered baffle-plates forming tortuous passages through the bin, heating-pipes passing under said passages, a venting means communicating with the interior of the bin at different points therein, a valve-controlled means communicating with each bin and adapted to receive the material therefrom, and a mixer into which all of said valve-controlled means discharge.

14. A paving-composition plant comprising a bin adapted to contain asphalt, means for uniformly heating the same, a steam-jacketed discharge-spout from the bin, a steam-jacketed weighing-receptacle receiving the material from the discharging-spout, a scale-beam supporting the weighing-receptacle, and a mixer into which said weighing-receptacle discharges.

15. A paving-compositon plant comprising an asphalt-bin, means for heating the same, a weighing-receptacle receiving the material from the bin and having a steam-jacket, a scale-beam supporting the weighing-receptacle, and a mixer into which said weighing-receptacle discharges.

16. A paving-composition plant comprising the combination of an asphalt-bin, means for heating the same, a weighing device including a steam-jacketed receptacle receiving the material from the asphalt-bin, and a mixer into which the weighing-receptacle discharges.

17. A paving-composition plant comprising a mineral-aggregate bin having a series of baffle-plates disposed in staggered relation and forming tortuous passages vertically through the bin, and heating-pipes passing under said plates at intervals along said passages.

18. A paving-composition plant comprising a bin having therein a series of baffle-plates arranged in staggered relation and forming tortuous passages vertically through the bin, the ends of said plates overlapping to form shelves, and heating-pipes passing under said overlapped ends.

19. A paving-composition plant comprising a bin, an air-blast pipe passing into the interior of the bin, and a vent-pipe located outside of the bin and having a plurality of branches extending into the bin at different points to vent the bin.

20. A paving-composition plant comprising a bin, an air-blast pipe passing into the interior of the bin, a vent-pipe located outside of the bin and having a plurality of branches extending into the bin at different points to vent the bin, and a heating means extending into the bin.

21. A paving-composition plant comprising a bin adapted to receive the mineral aggregate and having therein a series of baffle-plates arranged in staggered relation to form tortuous passages, heating-pipes passing through the bin under said plates, an air-blast pipe discharging into the bin, and a means for venting the interior of the bin.

22. A paving-composition plant comprising a bin adapted to receive the mineral aggregate and having therein a series of baffle-plates arranged in staggered relation to form

tortuous passages, heating-pipes passing through the bin under said plates, an air-blast pipe discharging into the bin, and a means for venting the interior of the bin, said venting means comprising a vent-pipe located outside of the bin, and branch pipes extending from different points within the bin outward into the vent-pipe.

23. A paving-composition plant comprising a bin adapted to contain a mineral aggregate, a series of baffle-plates arranged in staggered relation in the bin and forming tortuous passages through the same, heating-pipes extending into the bin under the baffle-plates uniformly to heat the mineral aggregate within the bin, a liquid-asphalt bin, heating-pipes extending into the same for uniformly heating the contents thereof, a mixer, and means including measuring devices for discharging from said bin into said mixer.

24. A paving-composition plant comprising a bin adapted to contain a mineral aggregate, a series of baffle-plates arranged in staggered relation in the bin and forming tortuous passages through the same, heating-pipes extending into the bin under the baffle-plates uniformly to heat the mineral aggregate within the bin, a liquid-asphalt bin, heating-pipes extending into the same for uniformly heating the contents thereof, a mixer, means including measuring devices for discharging from said bin into said mixer, an air-blast means discharging into the mineral-aggregate bin, and a vent-pipe located outside of the bin and having branches extending into the bin at different points to vent the interior thereof.

25. A paving-composition plant comprising a bin adapted to contain a mineral aggregate, a series of baffle-plates arranged in staggered relation in the bin and forming tortuous passages through the same, heating-pipes extending into the bin under the baffle-plates uniformly to heat the mineral aggregate within the bin, a liquid-asphalt bin, heating-pipes extending into the same for uniformly heating the contents thereof, a mixer, and means including measuring devices for discharging from said bin into said mixer, a third bin adapted to receive finely-divided material, a means extending into the interior thereof for heating said material, and means including a measuring device for discharging from the additional bin into the mixer.

26. A paving-composition plant comprising a bin adapted to contain a mineral aggregate, a series of baffle-plates arranged in staggered relation in the bin and forming tortuous passages through the same, heating-pipes extending into the bin under the baffle-plates uniformly to heat the mineral aggregate within the bin, a liquid-asphalt bin, heating-pipes extending into the same for uniformly heating the contents thereof, a mixer, and means including measuring devices for discharging from said bin into said mixer, the said liquid-asphalt bin having a jacketed discharge-spout, and the measuring devices being jacketed, for the purpose specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE W. CRICHFIELD.

Witnesses:
ISAAC B. OWENS,
JNO. M. RITTER.