H. W. ASH.

HEATING AND MIXING PLANT.

APPLICATION FILED OCT. 18, 1910.

1,187,959.

Patented June 20, 1916

5 SHEETS—SHEET 1.

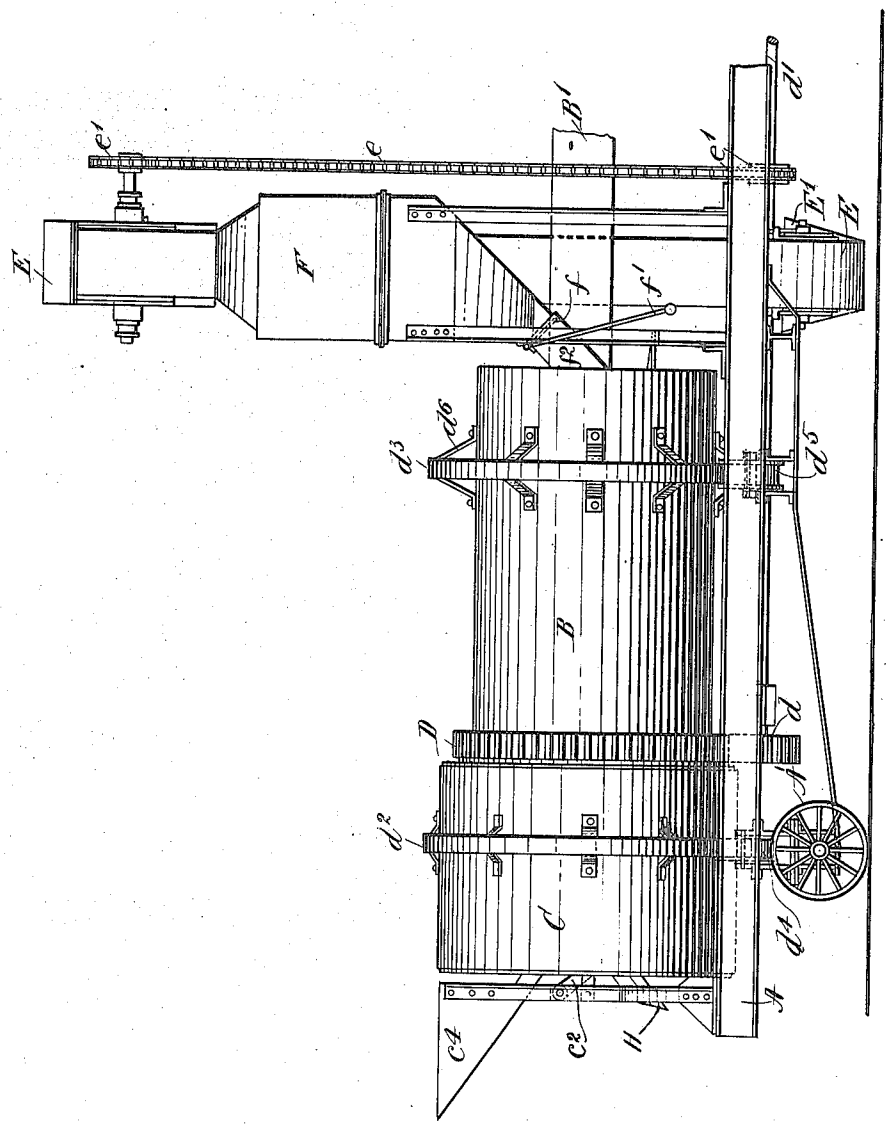


Fig. 1.

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5 SHEETS—SHEET 2.

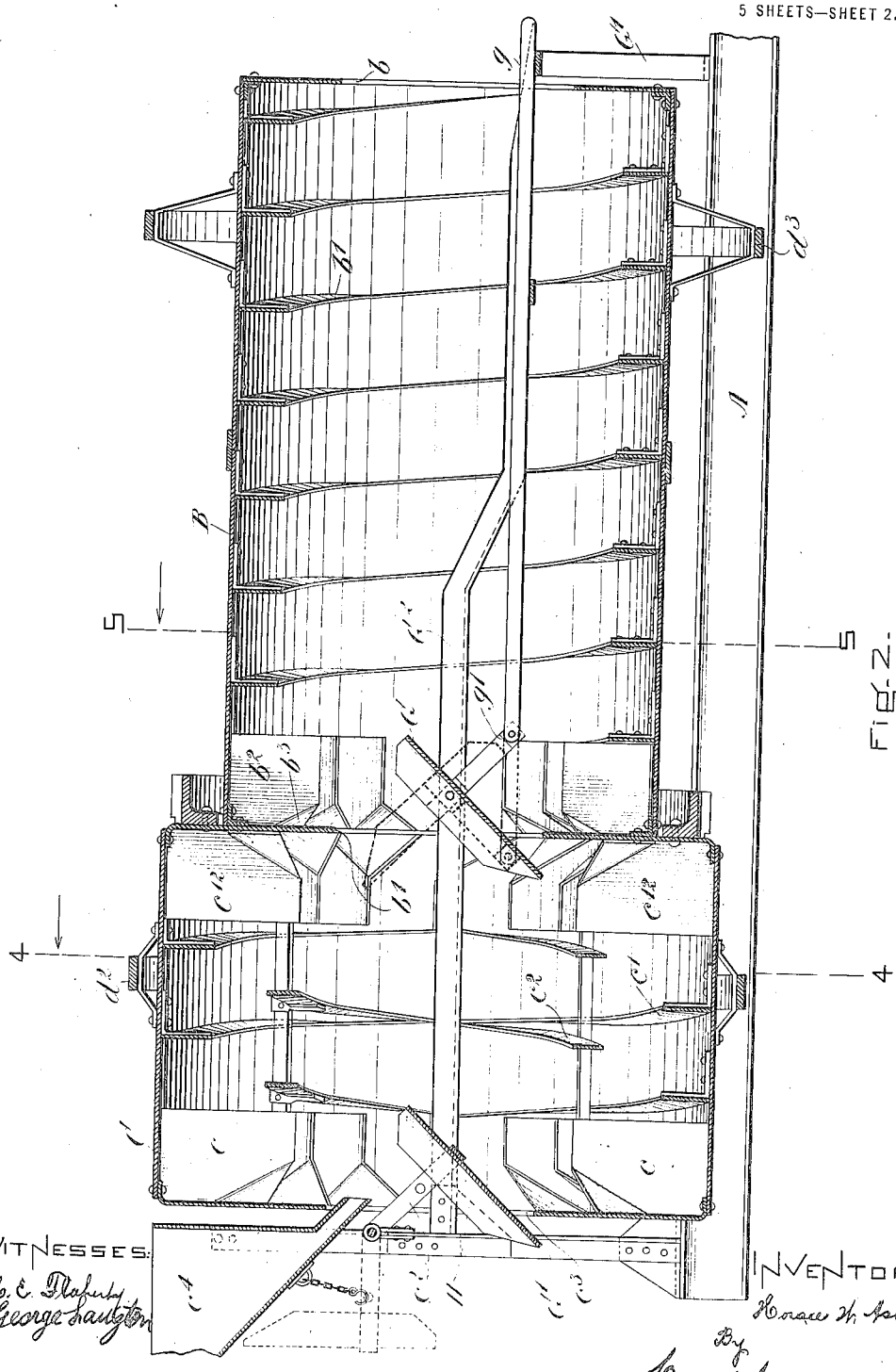


Fig. 2.

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5 SHEETS—SHEET 3.

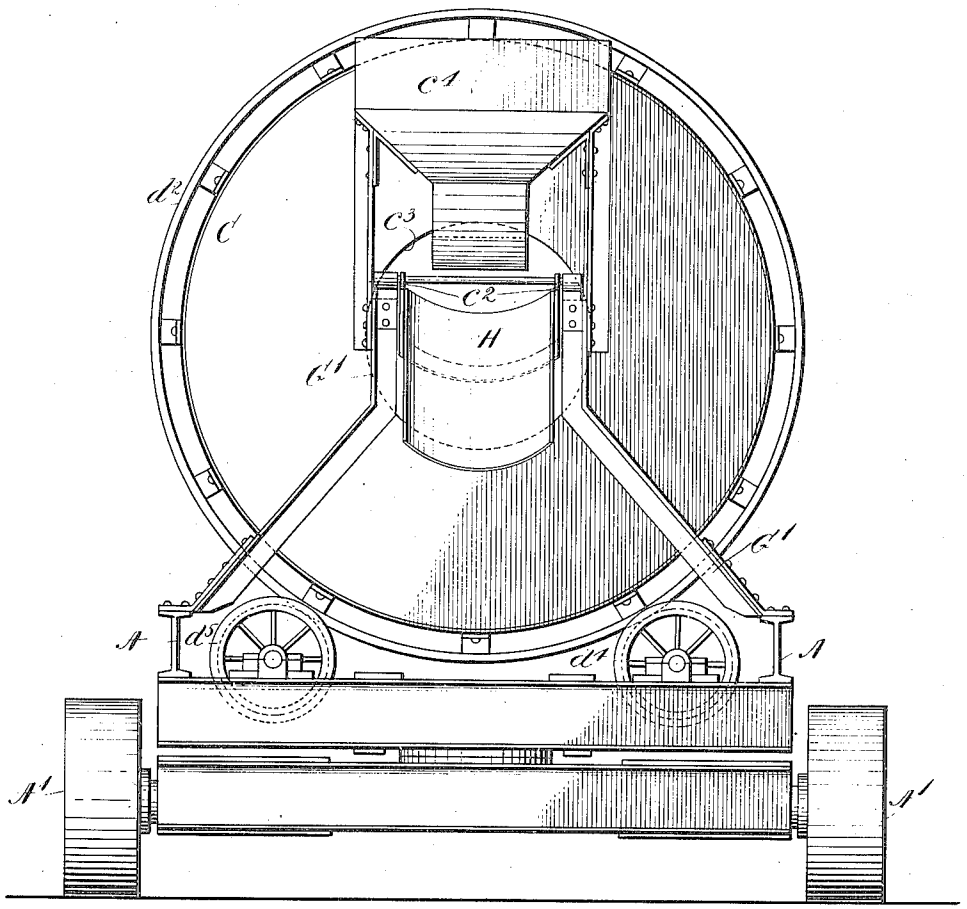


Fig. 3.

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5 SHEETS—SHEET 4.

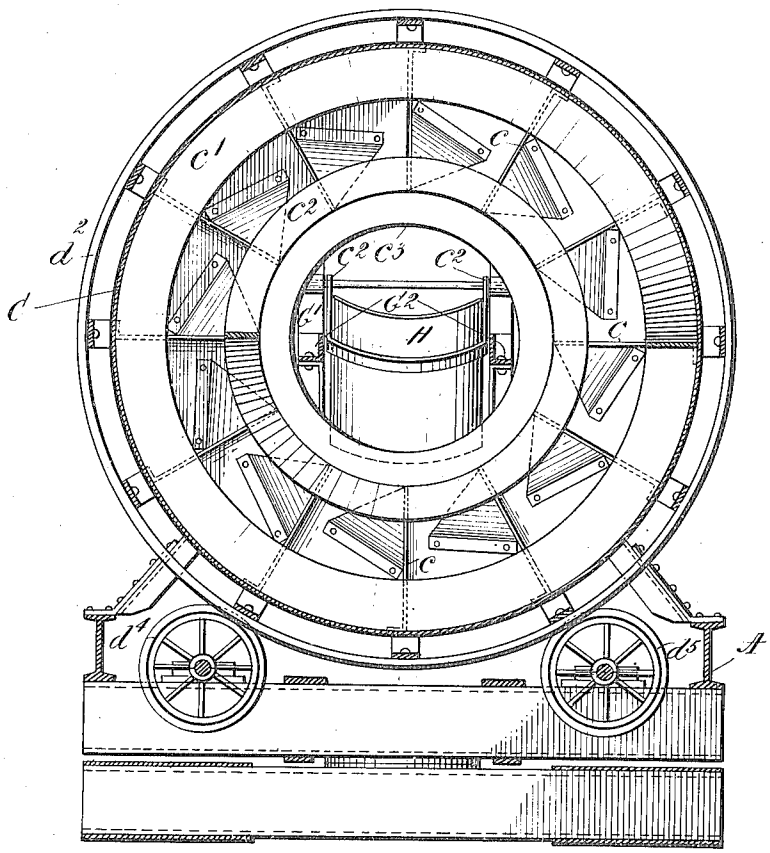


Fig-4-

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5 SHEETS—SHEET 5.

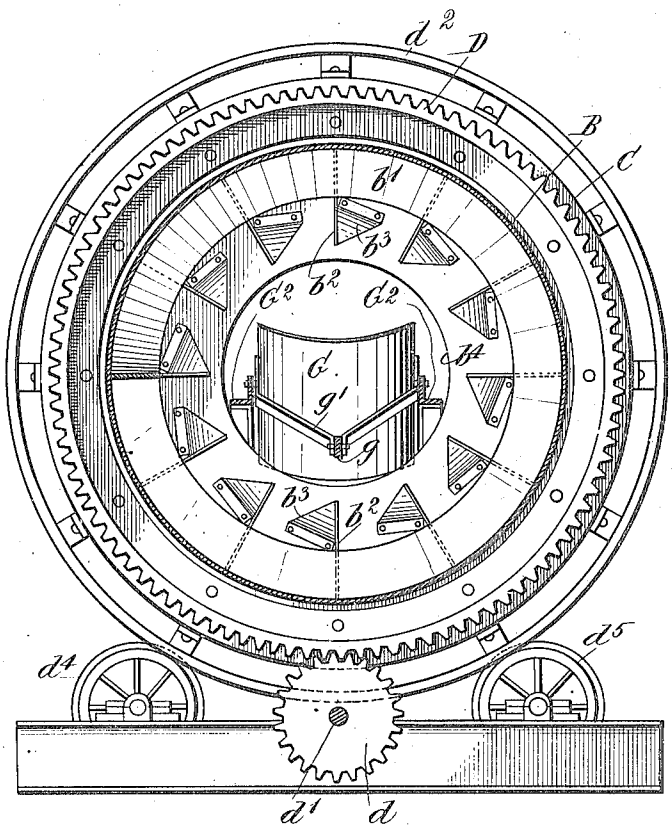


Fig. 5.

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UNITED STATES PATENT OFFICE.

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HEATING AND MIXING PLANT.

1,187,959. Specification of Letters Patent. Patented June 20, 1916.

Application filed October 18, 1910. Serial No. 587,708.

To all whom it may concern:

Be it known that I, HORACE W. ASH, of Winchester, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Heating and Mixing Plants, of which the following is a specification.

My invention relates to a heating and mixing plant and more particularly to a plant for heating the mineral ingredients or mineral aggregate as it is customarily called for bituminous pavements and for mixing the same with the bituminous cement, but it may be used for mixing hydraulic cement concrete or mortar. It comprises a rotary drum divided into two compartments; one compartment for drying and heating the mineral ingredients and the other compartment for mixing the heated mineral ingredients with bituminous cement; with this should ordinarily be used means for supplying the cylinder with heat; for feeding mineral ingredients into the drying cylinder; for discharging the heated ingredients into the mixing cylinder; for supplying the mixing cylinder with bituminous cement; for discharging the mixed ingredients after the operation is complete.

The conditions under which the drying and heating operation and mixing operation are conducted are so different that these two operations cannot always be most advantageously performed in a cylinder of the proportions particularly adapted to either one of the two and my invention provides for a cylinder of considerable length as compared with the diameter for drying and heating the mineral ingredients, whereby the exposed surface and the surface of the mineral ingredients in contact with the shell is very large in comparison with its bulk. This greatly facilitates the rapid evaporation of the moisture contained in the ingredients and also greatly lessens the time required to heat the ingredients to the required temperature. The mixing cylinder is of large diameter as compared with its length, which greatly facilitates the thorough admixture of the mineral ingredients with the bituminous cement and enables the ingredients to become thoroughly incorporated in a short space of time. By the combination of these two separate steps in the same machine, with both operations going on at the same time, the capacity of the machine is largely increased, the output is more nearly continuous, and the quality of the product is very considerably improved.

My invention will be understood by reference to the drawings in which—

Figure 1 is a side elevation of so much of a heating and mixing plant as is necessary to make my invention understandable. Fig. 2 is a longitudinal section of the heating and drying cylinders. Fig. 3 is an end elevation thereof, and Figs. 4 and 5 are cross sections on lines 4—4 and 5—5 of Fig. 2.

Such a plant as is contemplated comprises in addition to the matter shown in Fig. 1 an engine of some kind whereby the drum or drums may be revolved and the other moving parts of the apparatus operated together with a burner for oil or other fuel and a pump or other means for supplying the burner with the necessary oil, if oil be used to provide a sufficient flame to dry and heat the mineral aggregate. These details are shown in a companion application filed herewith and, as they may be said to be well known in the art, they need not be here described, nor need there be described the means for heating, weighing and dumping the bituminous cement which is used in making the material for which my plant is especially adapted. It will be noted that the right-hand end of the plant, in Fig. 1 is broken off and it is upon that end of the plant, which is supported by a suitable wheel base, that the engine, etc., above referred to is preferably located.

A then is a portion of the frame upon which the apparatus is supported and which in turn is supported upon wheels A^1.

B, C are two cylinders which are so connected as to form a drum and to be rotated by one source of power applied through the gear D, the gear meshing with a pinion d on the shaft d^1 which is operated by the engine.

The two cylinders are mounted on tires d^2, d^3 of equal diameter which rest upon friction wheels d^4, d^5, respectively. The tire d^3 is supported by struts d^6 on the cylinder B in order that the cylinder B may be concentric with the cylinder C in its rotation.

The cylinder B has an opening b at one end through which the mineral aggregate is fed into the interior of the cylinder.

B^1 is the end of the flue through which the flame or products of combustion from the burner (not shown) are led into the interior of the cylinder. A conveyer operated by means of a chain e and sprockets e^1 which derives power from the engine, runs in the casing E. At the lower end of the casing there is a suitable hopper or opening E^1 through which the mineral aggregate is fed to the conveyer. The construction of the conveyer is immaterial and such apparatus is well known so that it is unnecessary to show it in detail in the drawing. At its upper end the conveyer feeds the mineral aggregate into a bin F. At the lower end of this bin there is a gate f controlled by a handle f^1, the lower end of the bin leading into a chute f^2, the farther end of which enters the opening b in the cylinder B.

The interior of the cylinder B is provided with a spiral conveyer b^1 attached to its interior periphery which when the drum is rotated in the proper direction tends to convey the mineral aggregate from the right-hand end of the bin to the left-hand end. This spiral conveyer b^1 runs from the right-hand end of the cylinder B to a short distance from the left-hand end of the cylinder B where there is provided a series of trays b^2 one edge of each of which is preferably turned as shown particularly in Fig. 2 at b^3 so as to guide the material when falling off these trays back into the cylinder B. As a result the mineral aggregate is moved toward the left in the cylinder B until it is received by the trays. Each tray carries up its portion of the mineral aggregate as it rotates and dumps it back into the cylinder B (except as below stated), this operation continuing until the mineral aggregate is properly dried and heated.

As suggested above, heat is applied for the purpose of drying and heating by a flaming jet of oil or other fuel directed by the flue B^1 which enters the chamber within the cylinder B through the opening b. The flame and products of combustion are drawn through the drum and out through the opposite opening b^4 so it will be seen that the mineral aggregate in dropping from the trays b^2 will fall through the products of combustion and so be heated by actual contact therewith as well as by the temperature of the chamber.

I have also provided means for dumping the contents of the cylinder B into the cylinder C. This comprises a chute G which is suitably supported within the cylinder B on horizontal bars G^2 mounted on supports G^1 located at each end of the apparatus; the bars G^2 pass through the open center of the drum. The chute G is operated by means of a rod g provided with a suitable handle at its outer end pivotally connected to an arm g^1 which projects downward from the chute as shown in Fig. 2. In Fig. 2 this chute is in position to receive the mineral aggregate as it falls from the trays b^2. It may, however, be turned into a position as shown in dotted lines in Fig. 2 where, as will be seen, its tendency is to throw anything which strikes it back into the cylinder B. This is its position while the heating and drying operation is taking place.

The cylinder C is provided with two sets of trays c, c^{12} in all respects like the trays b^2 in the cylinder B so that there is a constant dropping of the material from the trays toward the center of the cylinder. The cylinder C is also provided with a spiral conveyer c^1 attached to the interior periphery of the cylinder between these trays by means of which the material is thrown in one direction and by a spiral conveyer c^2 of less diameter mounted on the conveyer c^1 by means of which the material is thrown in the opposite direction. Into this cylinder which has an opening at c^3 there is poured through the hopper c^4 the necessary quantity of bituminous cement and, the mineral aggregate being fed from the trays b^2 by means of the chute G into this cylinder C, the two are thoroughly mixed with the bituminous cement, being fed part of it in one direction onto the trays c and then thrown back into the cylinder and fed in the other direction perhaps upon the trays c^{12} at the opposite end of this cylinder.

It might be stated here that the result which I attain is due very largely to the fact that the cylinder B is long in proportion to its diameter, while the cylinder C is short in proportion to its diameter so that while the mineral aggregate in B is never very deep and consequently is easily dried and heated, when it is combined with the bituminous cement in the cylinder C the mass is quite deep so that it is acted upon as well by the conveyer c^2 as by the conveyer c^1 and the two together in connection with the trays c and c^{12} form an exceedingly efficient mixer. Moreover, as the products of combustion pass through this cylinder through the opening c^3 their heating keeps the mass in sufficiently plastic condition to make it capable of being thoroughly mixed.

Near the opening c^3 I provide a chute H by means of which the mixture when finished may be dumped into a cart or other receptacle for distribution, this chute being capable, also, of both being placed in receiving position or removed from within the cylinder C as is the case with the chute G.

It is of course very desirable that as little time as possible shall be lost in mixing a batch of material. In my previous applica-

tion above referred to I have shown a plant which is exceedingly effective, but in which the process of preparing the paving mixture is comprised of two distinct steps, one the heating and drying of the mineral aggregate and thereafter, second, the mixing of the bituminous cement with the mineral aggregate in the same mixer. In the present case, however, the two operations may go on together and the machine may be in operation comparatively continuously. To this end, a batch of mineral aggregate is fed into the cylinder B and is there thoroughly heated and dried and then by moving the rod *g* the chute G is brought into position as shown in full lines in Fig. 2, to receive the contents of the trays and feed it into the cylinder C. That cylinder in the meantime has been given its portion of bituminous cement and the mixing operation goes on. In the meantime, however, a second batch of mineral aggregate is fed into the cylinder B and the heating and drying operation goes on also and may be continued until the mixing operation in the cylinder C is completed when, its load being dumped, the contents of the cylinder B and the necessary amount of bituminous cement are fed into it as before. Thus it will be seen that the whole operation is, as I have said, substantially continuous although there may be some delay in special cases where extraordinary time is necessary to heat and dry the mineral aggregate or to mix the bituminous cement with the mineral aggregate.

I prefer to make the cylinders of substantially the proportions shown, that is, giving to the cylinder B or heating cylinder a diameter shorter than the length of the cylinder so that the material fed into it shall provide rather a thin layer, whereas the cylinder C on the contrary is short in comparison with its diameter so that the material lies in it deeper and by reason of the various mixing parts is much more thoroughly mixed. I also prefer that the cylinders shall form one drum-like structure as shown, as in this case the rotating mechanism can be easily applied to it. Other changes in construction than those suggested may be made without departing from the spirit of my invention, as it will be apparent to those skilled in the art that my invention may be embodied in various ways.

What I claim as my invention is:—

1. In a heating and mixing plant, a drum and means for rotating it, said drum comprising a heating chamber and a mixing chamber, said heating chamber having means for feeding a mineral aggregate from one end thereof approximately to the other end thereof, means comprising trays arranged radially within said heating chamber to receive said aggregate from said feeding means, each tray having a turned up edge sloping toward the middle of the chamber whereby the aggregate in falling from said tray will be guided back toward the middle of said heating chamber.

2. In a heating and mixing plant, a drum and means for rotating it, said drum comprising a heating chamber and a mixing chamber and a partition separating said heating and mixing chambers and having an opening therethrough connecting said chambers, said heating chamber having means for feeding a mineral aggregate from one end thereof to the other and having trays mounted radially at one end of said chamber and adapted to receive said mineral aggregate from said feeding means, each tray having a turned up edge sloping toward the middle of the chamber adapted to guide the said mineral aggregate when falling off said trays back toward the middle of said heating chamber, in combination with reversible means adapted to be extended into the heating chamber to receive the mineral aggregate as it falls from said trays and deliver it into said mixing chamber.

3. In a heating and mixing plant, a drum and means for rotating it, said drum comprising a heating chamber and a mixing chamber, an open passage connecting said chambers, said heating chamber having means for feeding a mineral aggregate from one end thereof to the other, means for receiving said mineral aggregate from said feeding means and throwing it back toward the middle of said heating chamber and means adapted to be moved through said passage into said heating chamber to receive said mineral aggregate from said receiving means and deliver it into said mixing chamber.

4. In a heating and mixing plant, a drum and means for rotating it, said drum comprising two chambers of different diameters, each chamber having a spiral conveyer adapted to convey the material in one direction and one of said chambers having a second conveyer adapted to convey the material in the opposite direction, said last named chamber having trays at each end thereof whereby the material received from either conveyer will be thrown back toward the middle of said chambers.

5. In a heating and mixing plant, a drum and means for rotating it, said drum comprising two chambers of different diameters, each chamber having a spiral conveyer adapted to convey the material in one direction and one of said chambers having a second conveyer adapted to convey the material in the opposite direction, said last named chamber having trays at each end thereof whereby the material received from either conveyer will be thrown back toward the middle of said chambers, said chambers being connected by a passage, in combina-

tion with means adapted to be moved into said passage to receive the material from the first named chamber and deliver it into said second named chamber.

6. In a heating and mixing plant, a drum and means for rotating it, said drum containing a chamber having a spiral conveyer with trays at one end thereof to receive material therefrom and deliver it back into said chamber, each tray having an inclined surface adapted to direct the material toward the middle of the chamber.

7. In a heating and mixing plant, a drum and means for rotating it, said drum comprising a chamber having a spiral conveyer adapted to convey the material in one direction, and a second conveyer adapted to convey the material in the opposite direction, and trays at each end of the chamber whereby the material received from either conveyer will be thrown back toward the center of the chamber.

8. In a heating and mixing plant, a drum and means for rotating it, said drum comprising a chamber having a spiral conveyer adapted to convey the material in one direction, and a second conveyer adapted to convey the material in the opposite direction, and trays at each end of the chamber whereby the material received from either conveyer will be thrown back toward the center of the chamber, in combination with means adapted to be moved into position to receive the material from each of one set of trays and discharge it from said drum.

9. In a heating and mixing plant, a rotary drum comprising a heating chamber and a mixing chamber and a partition separating said chambers, the ends of said drum and said partition having openings therethrough whereby products of combustion will pass through said drum to heat the entire contents thereof, said heating chamber having trays mounted radially on said partition, and a conveyer adapted to convey the material from the farther end of said drum to said trays, each tray having a turned up edge sloping toward the middle of the chamber adapted to guide the material resting thereon toward the middle of said heating chamber as the drum rotates, and said mixing chamber having means for conveying its contents from one end to the other thereof and back again, in combination with means adapted to be moved into the heating chamber through the opening in said partition, to receive the contents of said trays and deliver it to said mixing chamber, and means for discharging the contents of said mixing chamber.

10. In a heating and mixing plant, a drum and means for rotating it, said drum comprising a heating and mixing chamber, said heating chamber having means for feeding a mineral aggregate from one end of the chamber to the other and having a plurality of trays arranged radially to receive the mineral aggregate from said feeding means and throw it back toward the middle of said chamber.

11. In a heating and mixing plant, a drum and means for rotating it, said drum having a partition whereby its interior is separated into a heating chamber and a mixing chamber located in the same axial line, said partition having an opening therethrough, said heating chamber having means for feeding the mineral aggregate from one end to the other end thereof, in combination with trays mounted radially on said partition on the heating chamber side thereof and adapted to receive the mineral aggregate from said feeding means, each tray being provided with a turned up edge sloping toward the middle of the chamber whereby as the drum revolves the contents of each tray will be guided as it falls off from the tray toward the middle of said heating chamber.

12. A drier drum, a mixer drum, a common wall between said drums having a discharge opening therein, means to discharge material from said drier drum to said mixer drum through said opening, means to convey material from the feed end of said drier drum to a point adjacent said common wall, means to deliver said material from said point to said discharge means.

13. A receptacle adapted to dry material, said receptacle having a discharge opening in a transverse wall and an extended portion surrounding said opening, means whereby upon rotation of said receptacle material is conveyed from the feed end of said receptacle to a point adjacent said discharge opening, means adapted to discharge material through said opening into said extended portion, means to deliver said material from said point to said discharge means, means adapted to heat said receptacle, and means to rotate said receptacle and thereby mix material in the extended portion of said receptacle.

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Witnesses:
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