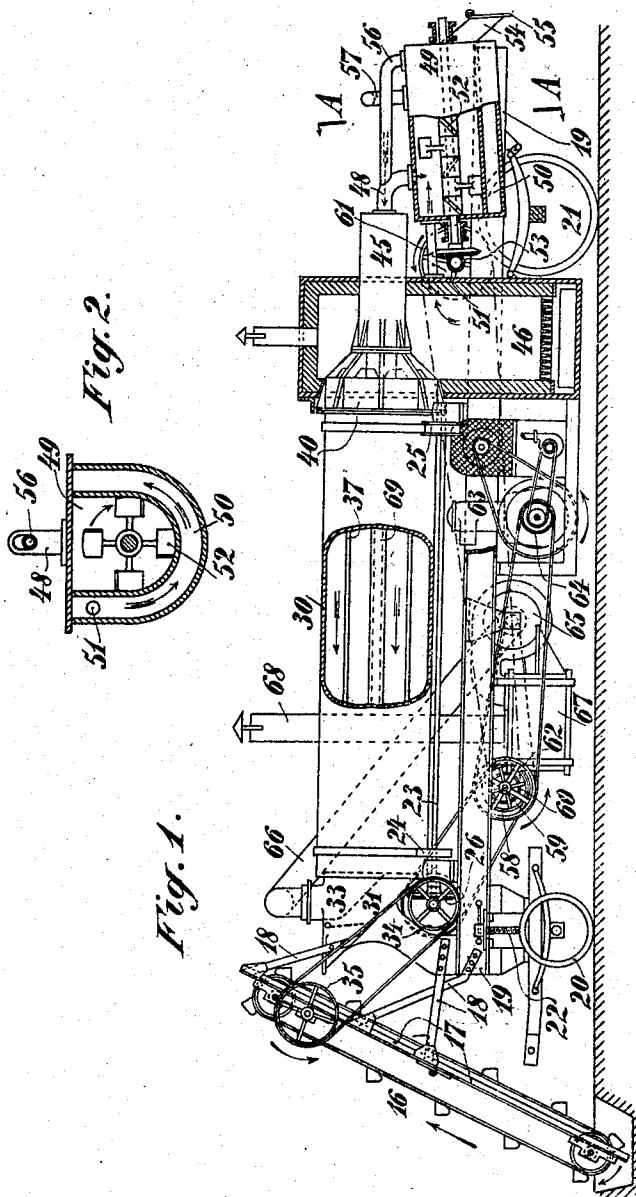


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APPARATUS FOR DRYING AND MIXING MATERIAL.
APPLICATION FILED JAN. 28, 1913.

Patented July 4, 1916.
2 SHEETS—SHEET 1.



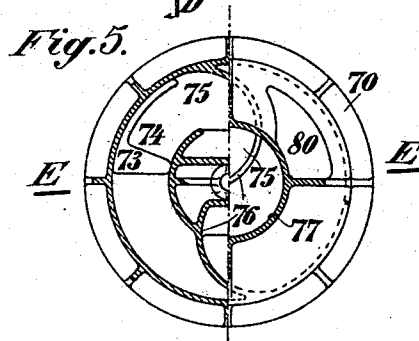
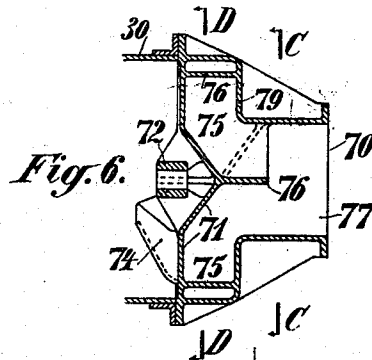
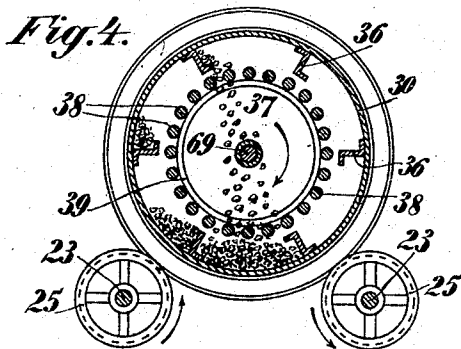
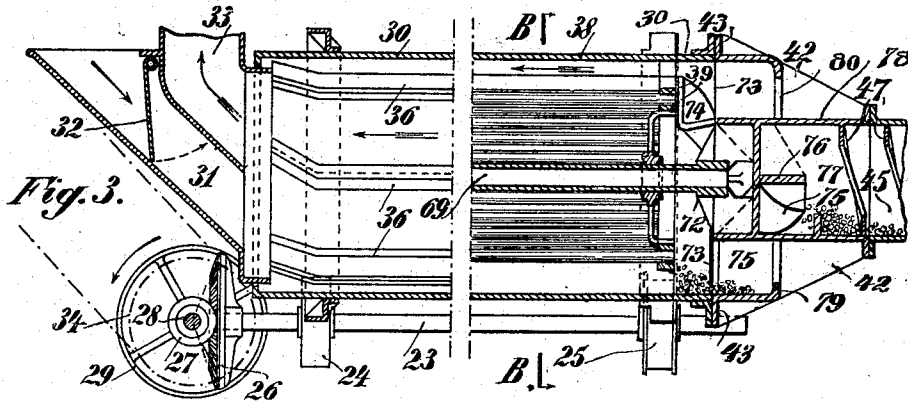
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UNITED STATES PATENT OFFICE.

ULRICH AMMANN, OF LANGENTHAL, SWITZERLAND.

APPARATUS FOR DRYING AND MIXING MATERIAL.

1,189,772.

Specification of Letters Patent.

Patented July 4, 1916.

Application filed January 28, 1913. Serial No. 744,681.

To all whom it may concern:

Be it known that I, ULRICH AMMANN, manufacturer, citizen of Switzerland, residing at Langenthal, Switzerland, have invented new and useful Improvements in Apparatus for Drying and Mixing Material, of which the following is a specification.

The present invention relates to an apparatus for drying and mixing various materials. The material to be dried may be coarse or fine granular material, while the material to be mixed with the first named material after the latter has been dried, may be either of a similar kind or may be in a liquid or semiliquid condition. The material to be dried is supplied by means of a suitable feeding device in measured quantities to a rotating drying cylinder or drum and is passed through the drum and subjected therein to the action of heated gases flowing in the opposite direction. The heated gases and the vapors obtained by the drying operation together with dust separated from the material to be dried are drawn off from the drying cylinder by a suitable ventilator and are passed on issuing from the ventilator through a dust separator from which they may be allowed to escape into the atmosphere. The dried material passes from the drying drum into a mixing device.

The accompanying drawings illustrate by way of example a machine embodying the features of the invention and particularly applicable for preparing material used for a road binder, such as, for instance, tar macadam.

Figure 1 is an elevation of the complete apparatus some parts being shown in section. Fig. 2 is a section on line A—A of Fig. 1 drawn to a larger scale. Fig. 3 is a longitudinal section through the front and through the rear end of the drying cylinder, Fig. 4 is a cross section through the drying cylinder on line B—B of Fig. 3, Fig. 5 is a cross section on lines C—C and D—D of Fig. 6, and Fig. 6 is a longitudinal section of the rear end of the drying cylinder of a modified form.

In the drawings, 16 designates a bucket elevator the frame 17 of which consists of an upper and a lower part which are hinged together so that when the machine is not used the lower part may be folded up against the upper part. The upper part of the frame is secured by means of arms or struts 18 to the frame 19 of the drying cylinder 30. The frame of the cylinder is mounted upon wheels 20 and 21 and is adapted to be adjusted in the vertical direction at its front end by means of set screws 22 arranged above the front wheels 20. This arrangement enables the rearward inclination of the cylinder to be adjusted as desired. Upon the frame 19 are rotatably mounted two shafts 23 (Figs. 1, 3 and 4) upon each of which are secured two rollers 24 and 25. Upon the front forward ends of the shafts 23 are mounted bevel gears 26 which engage with bevel gears 27 (Fig. 3) mounted upon a shaft 28 which is provided with a pulley 29 which receives its motion from another shaft 58. Upon the rollers 24 and 25 is mounted the drying cylinder 30 which upon the rollers being rotated receives a slow rotary motion. The drying cylinder 30 is open at its forward end (Fig. 3) into which projects a charging funnel 31 which is normally kept closed by an automatically closing flap valve 32. The discharge pipe 33 may be made integral with the charging conduit.

The bucket elevator 16 is driven from a pulley 34 mounted upon the shaft 28 which drives another pulley 35 mounted upon the frame 17. In the interior of the cylinder are mounted radial lifting blades 36 which extend practically over the whole length of the cylinder and have bent portions. Preferably concentrically with the cylinder is arranged a basket cylinder which extends in the axial direction of the drying cylinder and rotates with the cylinder. The inner basket cylinder which has the same length as the lifting blades 36 may be mounted in any desired manner, and consists of a large number of ribs 38 which are mounted upon rings 39 (Figs. 3 and 4 show

only one ring), which rings are mounted upon an axial shaft 69 arranged within the cylinder and are connected by a sleeve loosely mounted upon said shaft. The ribs 38 may preferably be made of wire rope or they may be made if necessary of chains or of figured iron. The intermediate or connection piece 40 and one part of the cylinder 45 are arranged within the heating apparatus 46 which is placed at the rear end of the frame 19.

In the interior of the cylinder 45 is provided a transporting screw 47 which moves the material through the cylinder 45. The material passes at the end of the cylinder through a pipe 48 into the mixing apparatus 49.

The mixing apparatus is partly surrounded by a heating chamber 50 which communicates through a pipe 51 with the interior of the heating apparatus 46.

In the mixing apparatus is provided a stirring device which comprises a number of transporting blades 52 driven by a bevel gear 53.

At the rear end of the mixing apparatus 49 is provided a discharge 54 which may be closed by means of a flap valve 55. The pipe 56 leading from the top of the mixing apparatus to the pipe 48 serves for leading away the waste gases from the mixing apparatus.

A liquid binding material for instance tar, may be supplied to the mixing apparatus through a pipe 57 arranged at the top.

The heating apparatus 46 is interiorly lined with bricks in order to prevent loss of heat. For the same purpose the drying cylinder 30 may be provided at its exterior with an insulating material which is not shown in the drawing.

The above mentioned belt pulley 29 is driven through a belt pulley 58 which is mounted upon a shaft 59 journaled in the frame 19. Upon this shaft is also mounted a pulley 60 which drives another pulley 61 and the bevel gear 53 connected to the latter. The belt pulleys 58 and 60 receive their movement from the belt pulley 62 mounted upon the common shaft 59 which receives its motion directly from a belt pulley 64 driven by a motor 63. A belt pulley of the same diameter as the pulley 62 is mounted upon the shaft 59 and drives a ventilator 65 mounted in the main frame 19 which ventilator is connected through a pipe 66 with the above mentioned exhaust pipe 33. The ventilator 65 communicates with a separator 67 which may be of any approved type, containing a liquid which is arranged to separate the dust from the waste and exhaust gases, which are passed through the separator to a flue or stack 68.

Instead of the discharge apparatus 40 shown in Figs. 1 and 3 a discharge apparatus of the construction shown in Figs. 5 and 6 might be used. In this case, the connection piece 70 has an end wall 71 which closes the rear end of the drying cylinder and is provided centrally with a recess. Within this recess is arranged a socket 72 which receives the rear end of the shaft 69. The wall 71 is provided with two diametrically opposite openings 73 in front of which there are arranged inclined buckets or blades 74 projecting into the drying cylinder. From the openings 73 extend two ports 75 which are separated from each other by a partition wall 76. These ports are spirally wound and extend toward the axial discharge opening 77 which is provided in the reduced portion 78 of the intermediate piece 70. This reduced portion 78 is to be connected to the discharge cylinder proper 45. In the wall 79 which is parallel to the wall 71 are arranged two diametrically opposite openings 80 through which the heated gases produced in the heating apparatus 46 pass into the ports 75 from which they pass through the openings 73 into drying cylinder 30. In the drawings I have shown these openings 73 uncovered, but I desire it to be understood that the same may be covered in any suitable manner if desired. Instead of providing two large openings, various different arrangements of openings may be made to give the desired result.

The moist material, such as gravel or broken stones, is fed to the elevator 16 and is conveyed into the charging funnel 31 which after the passing of a charge is automatically closed by the flap valve 32 whereby the escape of dust is prevented as far as possible. The material fed into the cylinder is upon rotation of the cylinder continuously lifted by the lifting blades 36, (see Fig. 4) and is dropped upon the inner basket cylinder 37 when the lifting blades reach their topmost position. The material is retained by the ribs or webs 38 of the inner cylinder for a certain time and is loosened and spread in passing through the inner cylinder. This lifting and spreading of the material occurs several times for each portion of the charge during its passage through the drying cylinder. The particles of the material are therefore subjected to a very intensive heating and drying action by means of the heated gases. As the material during its drop from the upper lifting blades to the lower surface of the cylinder is temporarily retained by the ribs or webs of the basket cylinder, the very unpleasant noise usually caused by such drying apparatus is entirely obviated, as the

material is not allowed to drop direct from the lifting blades to the lower surface of the cylinder. A further damping of the noise may be obtained by the before mentioned insulated layer arranged upon the exterior of the drying cylinder. During the passage through the directly heated cylinder 45 any moisture that might be still contained in the material is entirely removed. In the mixing apparatus which is inclined in the opposite direction to that of the drying cylinder, a liquid binding agent for instance tar is added to the material through pipe 57. By the rotating transporting blades 52 the material and the binding agent are intimately mixed and at the same time the material coated with the binding agent is transported toward the discharge 54 through which it passes outward or into suitable transporting devices. During the passage of the material through the machine the heated gases produced in the heating apparatus 46 pass on the one hand through the pipe 51 into the mixing apparatus 49 and from the latter through the pipes 56 and 48 into the cylinder 45 and from the cylinder 45 into the drying cylinder 30. At the same time the heating gases pass direct from the heating apparatus 46 through the openings arranged at the end of the drying cylinder 30 (as shown by arrows in Figs. 1 and 3) into the drying cylinder 30. The gases entering the drying cylinder are drawn off by the ventilator connected to the discharge pipe 33 and carry with them the dust which is separated from the material in the drying cylinder.

If an intermediate piece 70 of the construction shown in Figs. 5 and 6 is used, the material reaching the end of the drying cylinder 30 is caught by the blades or buckets 74 and is passed into the ports 75 through which it is guided to the discharge opening 77 and the cylinder 45.

The ribs 38 of the basket cylinder 37 may be arranged in any desired manner to accelerate or retard the movement of the material through the drying cylinder.

Instead of mounting the motor 63 upon the main frame the same might be arranged separately.

The machine may of course be stationary instead of being mounted upon wheels.

I claim:—

1. A machine for drying and mixing material comprising a rotary drying cylinder, a device for supplying the material to be treated to said cylinder, means for causing the material to be lifted and spread about the cylinder, means for passing heated gases into said cylinder in the opposite direction to the feed of the material to be dried, a mixing chamber, means for discharging the

material from said drying cylinder and transporting same to said mixing chamber and rotary stirring means in said mixing chamber for mixing the dried material with other material and for discharging the mixture, substantially as set forth.

2. A machine for drying and mixing material comprising a rotary drying cylinder, a device for supplying the material to be treated to said cylinder, lifting blades in said cylinder, a ribbed basket cylinder arranged within said drying cylinder, a mixing chamber, means for discharging the material from said drying cylinder and transporting same to said mixing chamber, means for heating said mixing chamber and for passing a current of heated gases through said drying cylinder in a direction opposite to that of the feed of the material, and means for discharging said material from said mixing chamber, substantially as set forth.

3. A machine for drying and mixing material comprising a rotary drying cylinder, a device for supplying the material to be treated to said cylinder, means for causing the material to be lifted and spread about in said cylinder, means for passing heated gases into said cylinder, a dust separator, means for drawing off the gases and the vapors obtained by the drying operation together with the dust separated from the material into said dust separator, a mixing chamber, and means for discharging the dried material into said mixing chamber, substantially as set forth.

4. A machine for drying and mixing material comprising a rotary drying cylinder, a device for supplying the material to be treated to said cylinder, a mixing chamber, a device for discharging the material from said cylinder to said mixing chamber, a heating chamber, means for passing the gases heated in said heating chamber into said discharging device and thereafter into said cylinder, and means for passing a current of heated gases through said mixing chamber, substantially as set forth.

5. A machine for drying and mixing material comprising a rotary drying cylinder, a device for supplying material to said cylinder, means for regulating said device, means for lifting and spreading said material in the cylinder, a mixing chamber, a device for discharging the material from said drying cylinder to said mixing chamber, a heating chamber, means for heating said mixing chamber and for passing heated gases from said heating chamber into said discharge device and thereafter into said cylinder, means for drawing off said gases and separating the dust therefrom, means for supplying other material to said mixing

chamber, and means for mixing both materials and discharging same, substantially as set forth.

6. In a device of the character described,
5 a drying cylinder, a mixing chamber, means for discharging the material from said drying chamber into the mixing chamber, a wall between said chambers, there being diametrically opposed openings in said wall, a
10 plurality of inclined blades in front of said openings and projecting into the drying cyl-

inder, there being spiral ports for leading the material from said openings to the axial discharge passage; substantially as described.

15

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

U. AMMANN.

Witnesses:

ERNST OLESCHBREUKER,
ALEX. DELLA MORIA.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."