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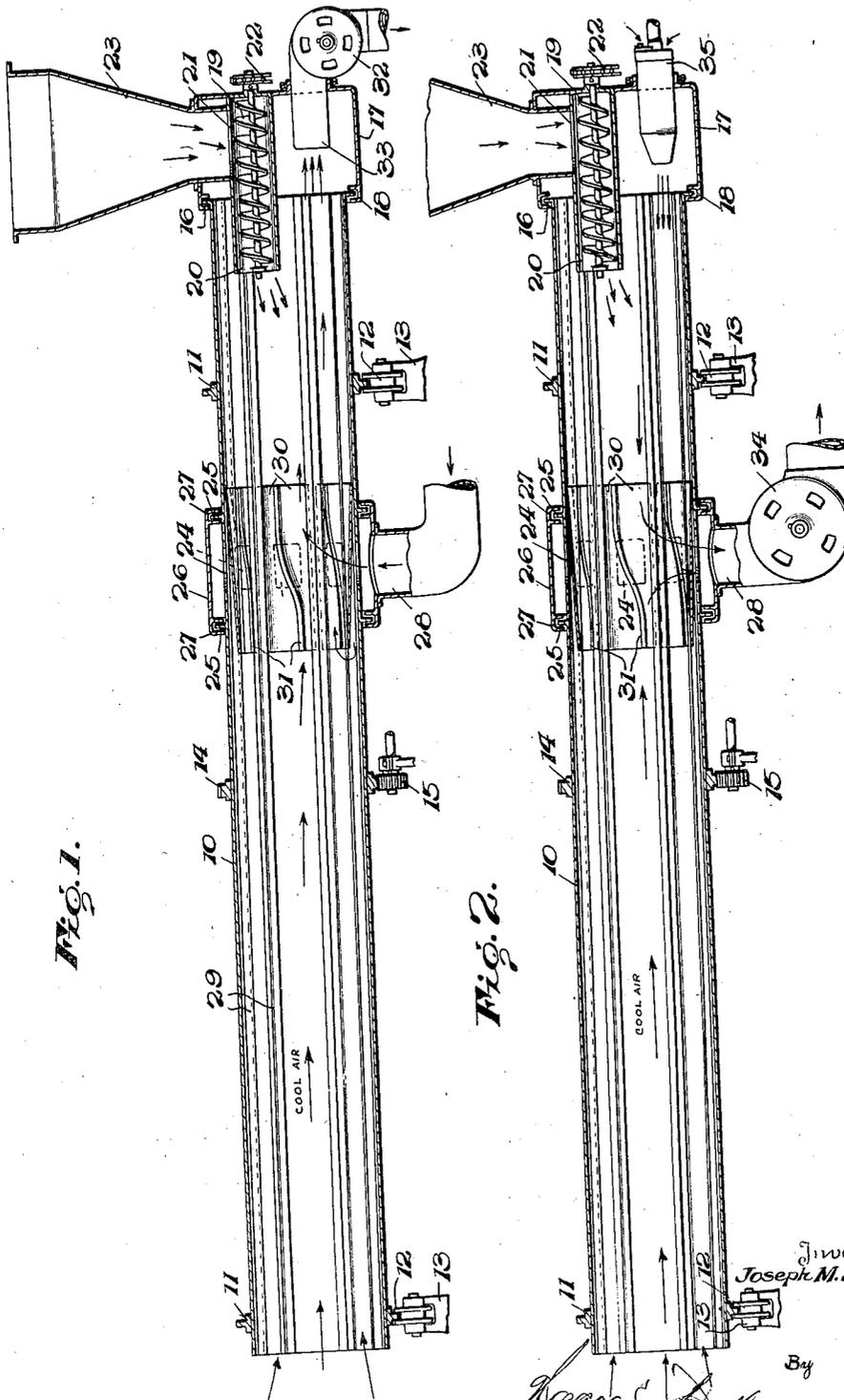
J. MacK. SPEARS

2,264,646

ROTARY DRIER

Filed March 17, 1939

3 Sheets-Sheet 1



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ROTARY DRIER

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3 Sheets-Sheet 2

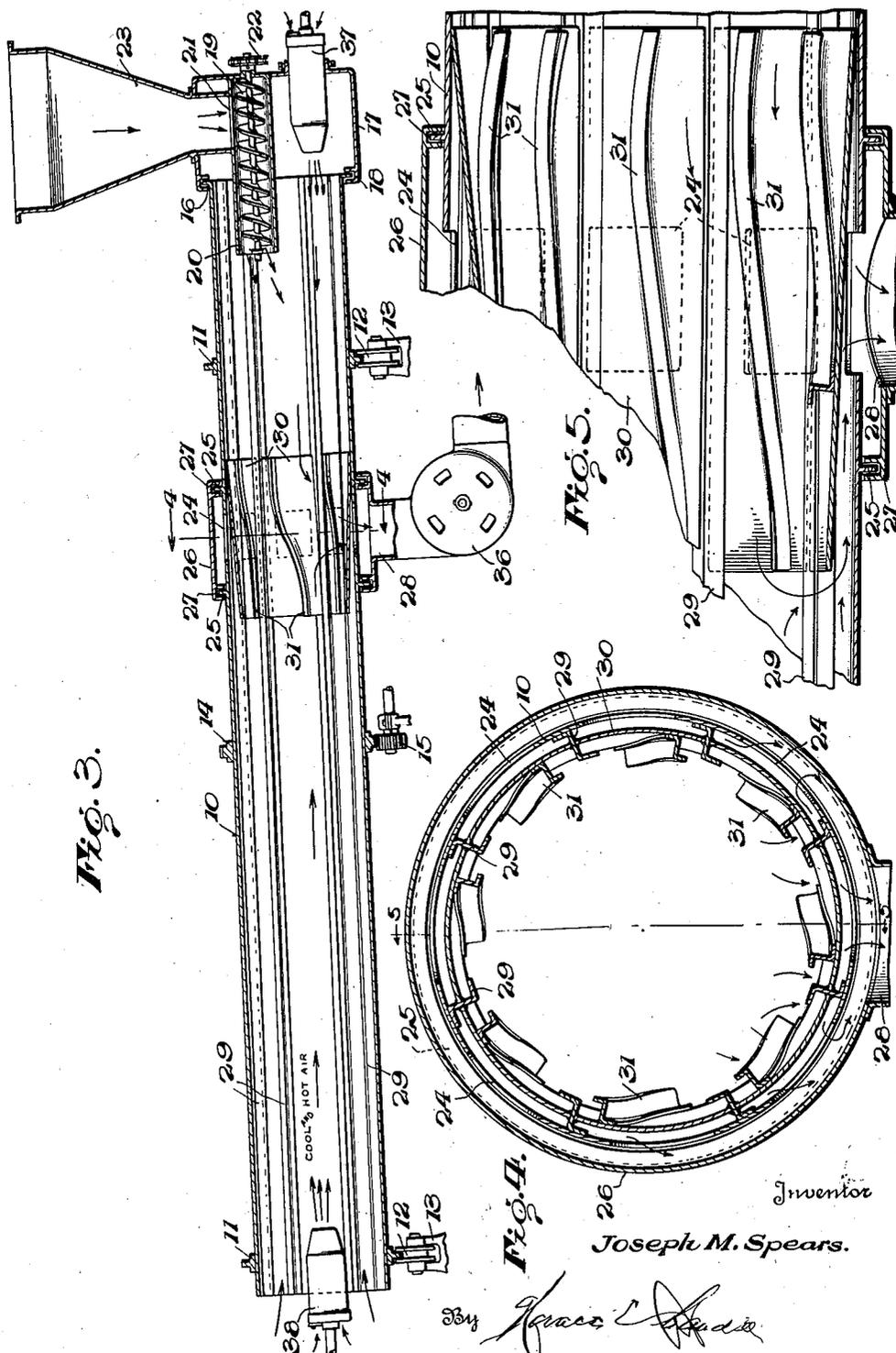


Fig. 3.

Fig. 4.

Fig. 5.

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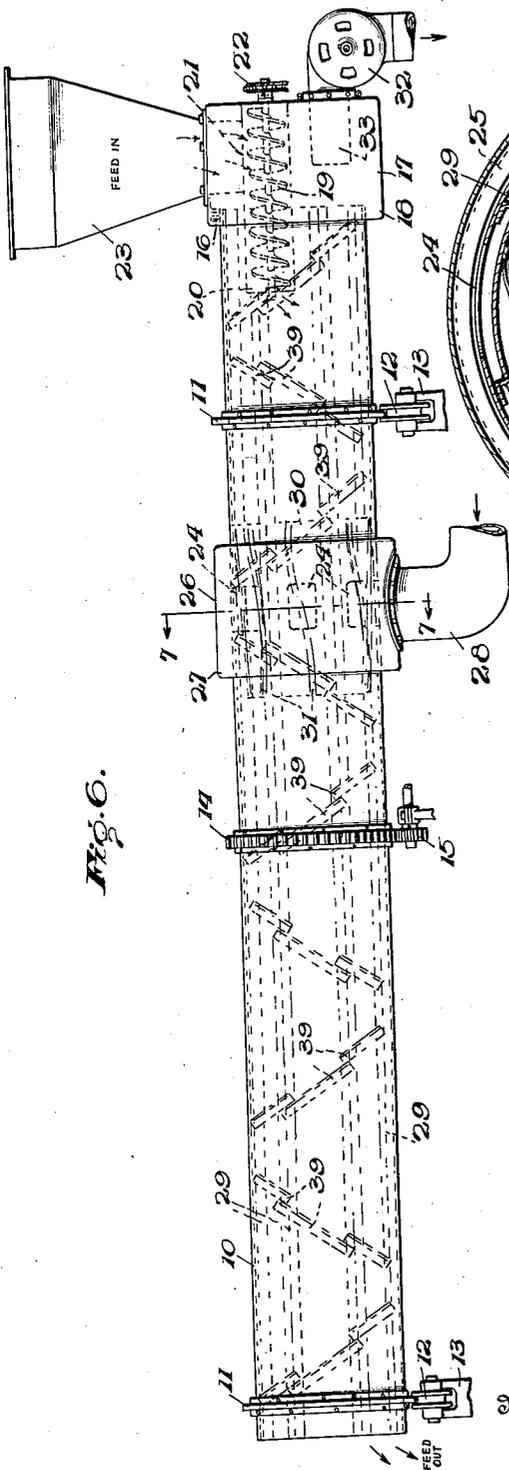


FIG. 6.

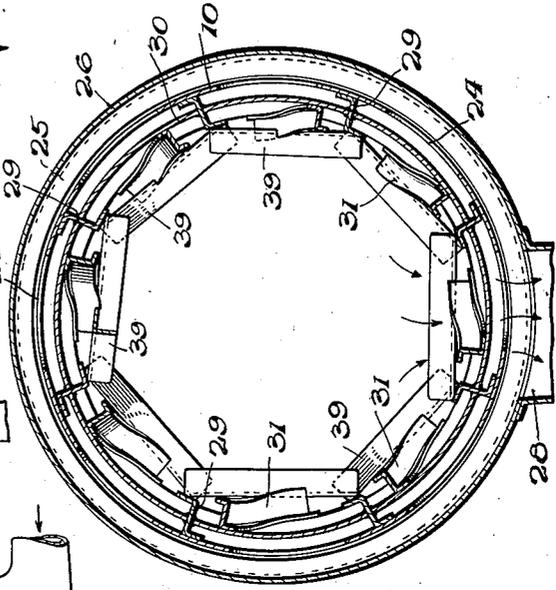


FIG. 7.

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UNITED STATES PATENT OFFICE

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ROTARY DRIER

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5 Claims. (Cl. 34—135)

This invention relates to rotary driers of the type used in connection with fragmentary or pulverant material and has special reference to driers for the aggregate used in forming asphaltic roadways, streets, and the like.

One important object of this invention is to provide a novel form of rotary drier having a cylindrical outer shell surrounded by a casing or drum intermediate its ends, the drier having openings in its outer shell freely communicating with this drum.

A second important object of the invention is to provide such a drier with a novel guard arrangement whereby the material will pass from one end of the drier shell to the other without possibility of any part of such material entering the air casing or drum.

A third important object of the invention is to establish air currents between the air casing or drum and at least one end of the outer shell.

A fourth important object of the invention is to provide a novel arrangement of means for supplying heated air to the drier shell.

A fifth important object of the invention is to provide at the guard portion of the drier a novel arrangement of means for agitating the material as it passes the guard.

With the above and other objects in view, as will be presently apparent, the invention consists in general of certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims.

In the accompanying drawings, like characters of reference indicate like parts in the several views, and—

Figure 1 is a vertical longitudinal section through one embodiment of the invention,

Figure 2 is a similar section through a second embodiment of the invention,

Figure 3 is a similar section of a third embodiment of the invention,

Figure 4 is an enlarged detail section on the line 4—4 of Figure 3,

Figure 5 is a fragmentary section on the line 5—5, of Figure 4.

Figure 6 is a side elevation of a modified form of the invention, and

Figure 7 is a section on the line 7—7 of Figure 6.

In each form of the invention here shown, there is provided a long cylindrical outer shell 10 having supporting rings 11 surrounding the shell at spaced intervals of its length. These rings are supported on rollers 12 carried by suitable sup-

ports 13. Also a suitable gear ring 14 surrounds the shell at a point intermediate its ends. A pinion 15 meshes with the gear ring 14 and is driven by suitable motor means (not shown). By this means the shell is rotated during the drying operation. The dried shell is thus supported to incline downwardly from one end, which may be termed the intake end, to the other or delivery end. At the intake end the shell is provided with an externally extended flange 16. A housing 17 is fixed at the intake end of the shell and this end of the shell projects into the housing 17 for a slight distance so that the flange 16 may fit in a channel 18 formed at the open end of the housing. A worm or screw conveyor 19 is mounted in the upper part of the housing 17 and has a casing 20 provided with an opening 21 in its upper side. This conveyor extends into the drier shell and is driven by any suitable means such as here indicated by the chain 22. Extending through the top wall of the housing 17 is a feed hopper 23 which, at its lower end, unites with the casing 20 to surround the opening 21 so that material placed in the hopper 23 will pass through the opening 21 and be fed by the conveyor 19 into the drier shell.

Intermediate its ends, but closer to the intake end than to the delivery end, the shell 10 is provided with a circumferentially extending series of spaced openings or vents 24. Spaced circumferential flanges 25 are carried by the exterior of the shell 10 and lie on opposite sides of the series of vents 24. Surrounding these flanges 25 and spaced concentrically to the shell 10 is a drum 26 having an interior channel 27 at each end for the reception of the flanges 25 whereby a relatively airtight connection is formed between the shell 10 and drum 26 so that the shell may revolve while the drum remains stationary. A duct 28 communicates with the drum 26. A series of Z-bar ribs 29 extend from end to end of the drier shell on the interior thereof and these ribs are located between the openings 24.

The guard for preventing the passage of the material being dried from the interior of the drier into the drum 26 through the openings 24 consists of a series of transversely arcuate plates 30 arranged between and welded to the ribs 29 to form a generally frusto-conical guard having its larger end fitting against and welded to the inner face of the shell 10 adjacent the openings 24 on the side adjacent the inlet end of the drier. The smaller end of this frusto-conical guard extends to a point between the openings 24 and the delivery end of the drier so that these openings are covered. Moreover, the lower or delivery end of

the guard is spaced concentrically from the shell wall 10 so that air may pass between this delivery end of the guard and the drier shell. Free communication is thus obtained between the interior of the drier shell and the drum. Z-bar ribs 31 are spirally disposed on the interior of the guard between the ribs 29.

The parts so far described are common to all forms of the invention, but the means for introducing heated air and causing air flow in the drier vary in the several forms. In Figure 1, the duct 28 is supplied with heated air from any suitable heater (not shown) and a suction fan 32 has its intake 33 opening into the housing 17. By this means a current of air is set up from the delivery end of the drier to the intake end thereof and hot air passes from the duct 28 into the drum 26 from whence it flows through the openings 24 into the space between the guard and shell 10. From there it passes beyond the delivery end of the guard to mix with the cold air entering the delivery end of the drier. In this form the material is subject to hot air in passing from the intake end of the drier to the guard and to cool air in passing from the guard to the delivery end of the drier.

In the form shown in Figure 2, the conditions are reversed, the duct 28 communicating with the intake of a suction fan 34 and a heater 35 introducing hot air into the housing 17. Here again the material is subjected to hot air in the upper portion of the drier and to cool air in the lower portion thereof, but the hot air does not mix with the cool air in the drier so that with equal increments of heat entering from the heaters the form shown in Figure 2 will supply more thermal units to the upper part of the drier.

In the form shown in Figure 3 the duct 28 communicates with a suction fan 36 and a heater 37 supplies hot air to the housing 17. These parts are like those of the second form, but a heater 38 is used to supply hot air to the center of the delivery end of the drier. In this form the hot air supplied from the heater 38 mixes with cool air drawn in around the heater. Here we have a heat zone at each end of the drier, but, due to the entry of the cool air, the zone between the guard and delivery end of the drier is cooler than that at the other end of the drier.

In all forms the Z-bar arrangement causes the material to be elevated and dropped during the rotation of the drier so that the air streams come into intimate contact with all parts of the surfaces of the material passing through the drier. With the use of the forms of the device shown in Figures 1 and 2, the drying operation will take place in the heated zone of the drier between its inlet end and the drum 26. When the aggregate passes beyond the drum, however, its temperature will become greatly reduced because of contacting the cool air entering at the delivery end. A construction such as illustrated in Figure 3, wherein heat enters at both ends of the drier, will be used in connection with excessively wet material.

In Figures 6 and 7 there is illustrated a modified form of the invention, wherein means is provided for accelerating the flow of aggregate towards the delivery end of the drier.

In this form of the invention relatively short angle-irons 39 are secured, at their ends, to the innermost faces of the Z-bars 29, so as to bridge the same and form a continuous conveyor flange extending within the drier from the housing 17 to a point adjacent the delivery end. This con-

veyor flange will catch material being dried as it falls from the Z-bars 29 and will function as a screw conveyor to urge that material towards the delivery end at a rate of speed greater than that brought about by the slant of the drier alone. Where angle-irons 39 cross the short Z-bars 31, the latter are slotted to receive the former.

What is claimed is:

1. In a drier of the kind described, a rotary drying shell having a circumferential series of spaced openings intermediate its ends, a fixed air drum encircling the shell at said openings and having slip-joint connection with the shell at each side of the series of openings to form a closed annular air chamber, an air duct communicating with said drum, said shell having an intake end and a delivery end, a frusto-conical guard member mounted in said shell and having its major end in contact with and fixed to the shell between the openings and intake end whereby material passing through the shell will enter the guard member, the guard member terminating at its minor end between said openings and the delivery end of the shell, and material-engaging ribs spirally arranged on the interior of said guard.

2. In a drier of the kind described, a rotary drying shell having a circumferential series of spaced openings intermediate its ends, a fixed air drum encircling the shell at said openings and having slip-joint connection with the shell at each side of the series of openings to form a closed annular air chamber, an air duct communicating with said drum, said shell having an inlet end and a delivery end, a series of circumferentially spaced longitudinally extending material-tumbling ribs fixed on the interior of the shell, and a series of guard plates fitted between said ribs each having one end fitted against the interior of the shell wall between an opening and the inlet end and extending over the opening to terminate between the opening and said delivery end in spaced relation to the shell wall.

3. In a drier of the kind described, a rotary drying shell having a circumferential series of spaced openings intermediate its ends, a fixed air drum encircling the shell at said openings and having slip-joint connection with the shell at each side of the series of openings to form a closed annular air chamber, an air duct communicating with said drum, said shell having an inlet end and a delivery end, a series of circumferentially spaced longitudinally extending material-tumbling ribs fixed on the interior of the shell, a series of guard plates fitted between said ribs each having one end fitted against the interior of the shell wall between an opening and the inlet end and extending over the opening to terminate between the opening and said delivery end in spaced relation to the shell wall, and spirally disposed ribs fixed on the inner faces of the plates.

4. In a drier of the kind described, a rotary drying shell having a circumferential series of spaced openings intermediate its ends, a fixed air drum encircling the shell at said openings and having slip-joint connection with the shell at each side of the series of openings to form a closed annular air chamber, an air duct communicating with said drum, said shell having an inlet end and a delivery end, a series of circumferentially spaced longitudinally extending material-tumbling ribs fixed on the interior of the shell, a series of guard plates fitted between said ribs each having one end fitted against the inte-

rior of the shell wall between an opening and the inlet end and extending over the opening to terminate between the opening and said delivery end in spaced relation to the shell wall, a spirally disposed rib fixed on the inner face of each of said guard plates, and means for establishing a current of air between said duct and at least one end of said drier shell.

5. In a drier of the kind described, a rotary drying shell having a circumferential series of spaced openings intermediate its ends, a fixed air drum encircling the shell at said openings and having slip-joint connection with the shell at each side of the series of openings to form a closed annular air chamber, an air duct communicating with said drum, said shell having an intake end and a delivery end, a frusto-conical

guard member mounted in said shell and having its major end in contact with and fixed to the shell between the openings and the intake end whereby material passing through the shell will enter the guard member, the guard member terminating at its minor end between said openings and the delivery end of the shell, material-engaging ribs spirally arranged on the interior of said guard member, a series of circumferentially spaced longitudinally extending material-tumbling ribs fixed on the interior of the shell, and relatively short angle irons secured at their ends to the innermost faces of and bridging said longitudinally extending ribs whereby to form a conveyor extending longitudinally within the shell.

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