C. B. SMITH.

DRIER.

APPLICATION FILED APR. 3, 1911.

1,046,664.

Patented Dec. 10, 1912.

2 SHEETS—SHEET 1.

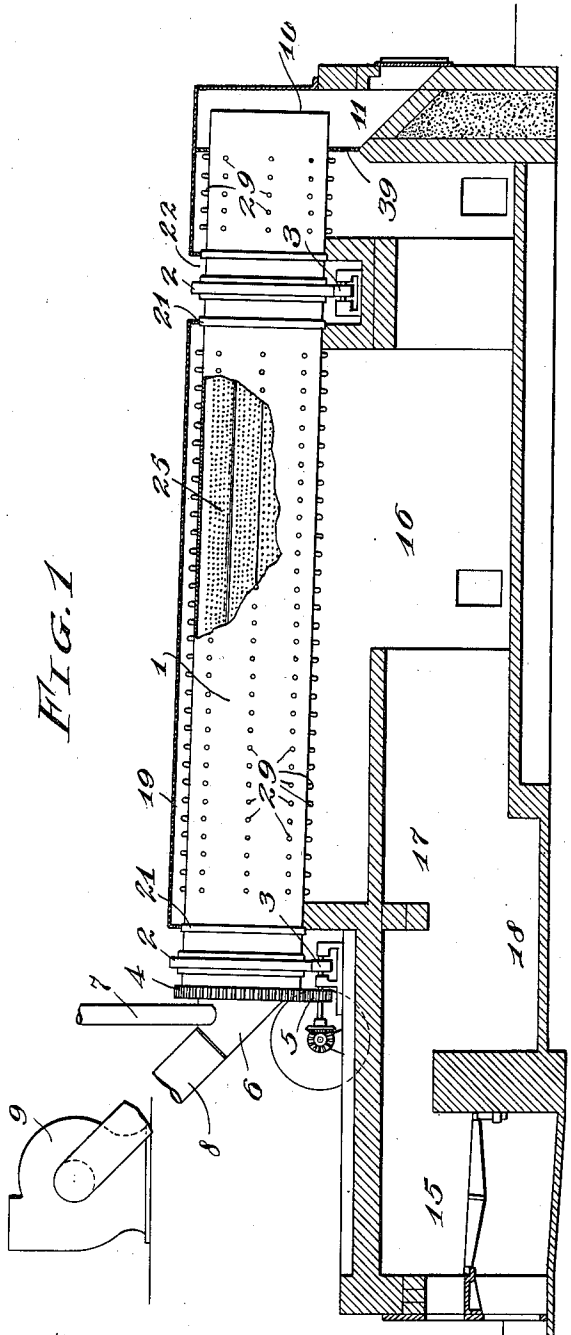

FIG. 1

WITNESSES:

Forman B. West.

Hugh B. McGill.

INVENTOR,

Cecil B. Smith

BY Hull & Smith.

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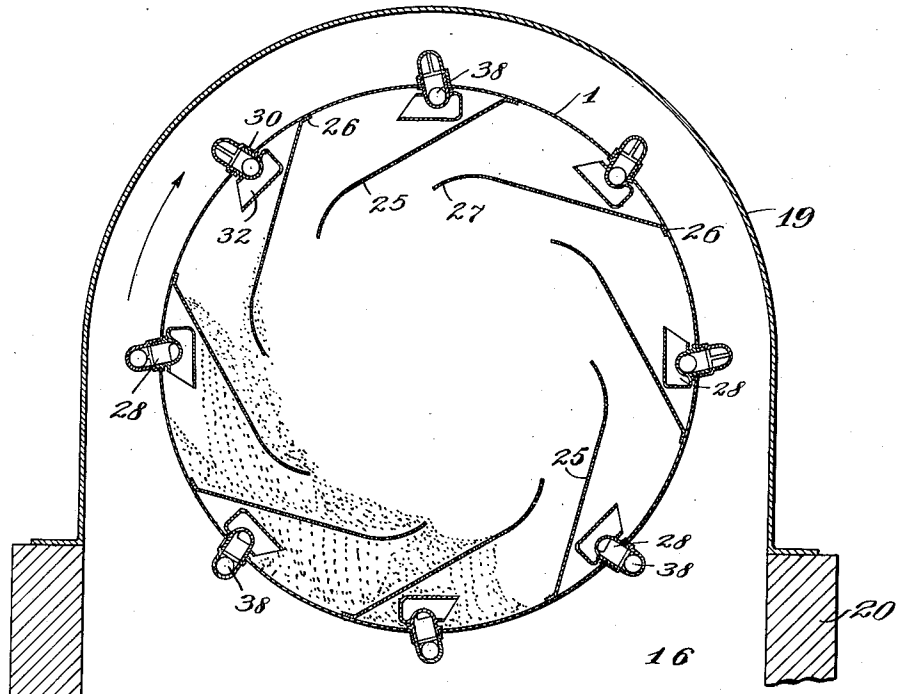

FIG. 2

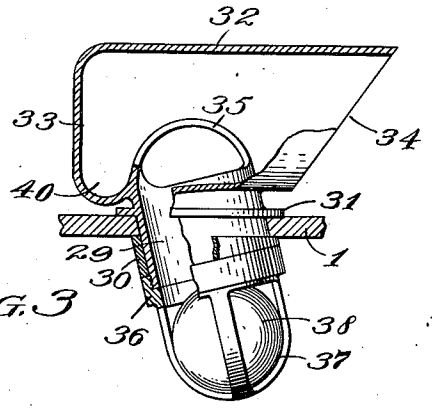

FIG. 3

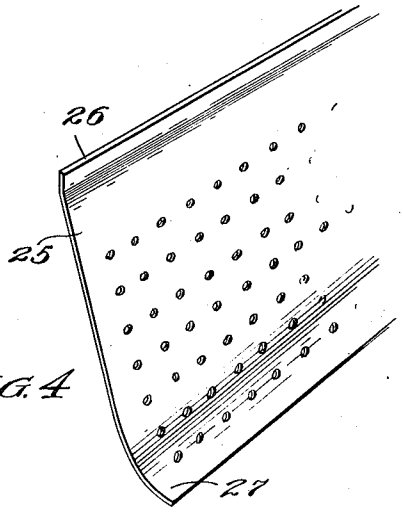

FIG. 4

WITNESSES:

Norman B. West

Hugh B. McGill

BY

INVENTOR,

Cecil B. Smith

Hull & Smith

ATTYS.

UNITED STATES PATENT OFFICE

CECIL B. SMITH, OF CLEVELAND, OHIO.

DRIER.

1,046,664. Specification of Letters Patent. Patented Dec. 10, 1912.

Application filed April 3, 1911. Serial No. 618,762.

To all whom it may concern:

Be it known that I, CECIL B. SMITH, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Driers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to driers, and particularly to that class of driers in which granular or pulverized material such as grain or sand is fed into one end of an inclined rotating cylinder and discharged from the other end in a continuous stream, being meanwhile acted upon by means of warm dry air or other gas drawn into the cylinder through suitable apertures in its walls, and is specifically designed as an improvement upon the device disclosed in the patent to Cummer, 888,474, May 26, 1908. In former machines of this type, during each rotation of the cylinder the material is carried upon the ascending side by means of lifting channels or similar devices previous to being spilled or cascaded across its sectional area, the bulk of the material being cascaded by the time the lifting blades reach the top center of the cylinder. In consequence, the descending side of the cylinder, is bare of material and the drying medium which is drawn through the openings in this side of the cylinder fails to come in contact with the material being dried. Furthermore, the openings at the bottom and at the ascending side of the cylinder are seriously impeded by the material undergoing treatment so that the larger part of the air actually entering the cylinder is drawn through the openings on the descending side and practically wasted.

According to my invention I provide the air inlet orifices formed in the sides of the cylinder with automatically operating valves which shall permit the admission of air only to the lower part of the cylinder which is normally covered by the material undergoing treatment and, in order to prevent the blocking of the air passages by this material, I provide means for loosening and showering the granular material so as to permit the passage of the air therethrough and so as to exhibit a large surface to the action of such air.

Othe features of my invention concern means for preventing the clogging of the valves by means of the material under treatment, while further objects and advantages will become apparent in the course of the following description and claims.

One embodiment of my invention is illustrated in the drawings accompanying and forming a part hereof, wherein—

Figure 1 is a longitudinal vertical cross section of a drier made in accordance with my invention, most of the cylinder being shown in elevation, and a part thereof being broken away to show the internal construction; Fig. 2 is a transverse vertical cross sectional view of the cylinder and a part of the furnace; Fig. 3 is a detail view of one of the air admission valves, partly in section and partly in elevation; and Fig. 4 is a perspective view of a portion of one of the perforated shelves.

Describing the parts by reference characters, 1 indicates a gently inclined metallic cylinder having tires 2—2 adjacent its ends and rotatably supported upon rollers 3—3 on which said tires run. This cylinder is rotated with a slow steady motion by means of a gear 4 secured to the cylinder and meshing with a pinion 5 which is driven in any convenient manner. At the upper end of the cylinder is secured a stationary hood 6 fitting closely against the mouth of the cylinder and provided with a conduit 7 through which the material to be treated can be fed thereto. This hood is also provided with an air exhaust pipe 8 secured to the inlet side of an exhaust fan 9 for the purpose of aspirating air into the cylinder. The farther end of the cylinder is open as at 10 and is disposed over the mouth of a discharge chute 11 through which the treated material is delivered. Any convenient means for supplying heated air or other gases to the exterior of this cylinder can obviously be employed, the present showing being largely diagrammatic. In the drawings I have illustrated a furnace having a fire box 15 and a hot air chamber 16 separated by a long bridge or arch 17 and formed with a dust chamber 18. The cylinder 1 is supported above the hot air chamber 16 and is surrounded by a hood 19 secured to the side walls 20 of the furnace. The joints between the rotating cylinder and hood 19 are made substantially air-tight by means of slip rings 21—21, and the hood is preferably divided

at 22 so as to expose the tire 2. Internally, the cylinder is provided with a plurality of angularly spaced perforated shelves 25, each of which has one edge rigidly secured to the wall of the cylinder, as at 26, and extends from thence at an acute angle to the radius to a point overlapping the adjacent shelf where it is bent inwardly, as at 27. For a distance from the edge 26 equal to a quarter or a third of the width of the shelf, the same is preferably imperforate, and beneath this portion of the shelves air inlet fittings 28 are placed. Each of these fittings consists of a cylindrical body portion 29 passing through a perforation in the shell of the cylinder 1 and preferably disposed at an angle to the radius as shown in Fig. 2. A peripheral flange 30 formed around this cylinder contacts the inside surface of the shell and forms a stop which is held against its seat by means of the washer 30 and cap 36. The inside end of the cylinder 30 is formed with a peripherally disposed box 32 forming an integral cap, having one end closed, as at 33, and the other end open and preferably formed at an acute angle, as at 34. The closed end 33 of this cap is positioned adjacent the shelf 25 under which the fitting is placed with the open end of the cap facing in the opposite direction. At its inner end inside this cap, the cylinder 30 is closed by a cage 35, and at its outer end it is closed by a cap 36 provided with an elongated cage 37.

Shiftably mounted within the cylinder 30 is a ball valve 38, adapted when at the inner end of the cylinder 30 to rest against the cage 35 and completely close the opening therethrough, as shown at the upper side of Fig. 2, but when moved to the outer end of said cylinder, to be received in the elongated cage 37 so as to open the passage therethrough.

Sand, grain, or other granular material is supplied to the cylinder 1 through the conduit 7, the fan 9 is started, and the cylinder rotated in the direction indicated by the arrow in Fig. 2. The material under treatment will be carried upwardly on the rising side of the cylinder and will be sifted or showered through the perforations in the shelves 25, and over the edges of said shelves, in such a manner as to permit the passage of air therethrough. The valve balls 38 at the lower part of the cylinder will be shifted into the elongated cages 37 so as to permit the passage of the heated air into and through the showering material, but the valve balls at the upper side of the cylinder will be moved to the inner ends of their casings so as to prevent the admission of air at this point. It is obvious that the sand or other material will be carried to a higher level on the ascending side of the cylinder than upon its descending side, and for this reason it is desirable that the position of the plane dividing the open valves from the closed valves be likewise shifted. This is effected by the inclination of the valve casings 30 as regards the shell of the cylinder 1, such inclination serving to prevent the movement of the balls 38 to closing position until after the horizontal center has been passed on the ascending side and preventing their opening until after the like center has been passed on the descending side. It is hardly possible to arrange the inlet fittings so that the open fittings shall correspond exactly with the surface of the material under treatment irrespective of the amount of material in the cylinder. In Fig. 2 the cylinder is shown as only partly loaded, but the region of open valves is made to coincide as nearly as possible with the region of material under treatment. These fittings are preferably disposed at intervals over the entire length of the cylinder so as to subject the largest possible surface to the action of the drying medium. In order to prevent the free access of air to the open lower end of the cylinder I preferably provide the web or plate 39 fitting closely around the periphery thereof and separating the discharge end 10 thereof from the chamber 16.

Between the open end of the casing 30 and the closed end 33 of the cap 32, I have illustrated a depression or pocket 40 adapted to prevent the entrance of the granular material into the valve casing. During the horizontal and upward movement of the air inlet openings, practically no granular material can enter the caps 32 because of the overhanging formation of their open ends, but during their downward movement it is found that a small amount of this material frequently spatters into them, being carried up and over in the perforations or angles of the shelves 25. This material is caught in the pockets 40 where it is held until the fitting has reached such a height on the ascending side as to cause the material to be discharged back through the open mouths of the caps and into the cylinder. In other words, the depth of this pocket is such as to prevent the discharge of the material therefrom until the angle of the fittings has become such that it cannot fall through the valve casing and interfere with the action of the valve. Furthermore, the fact that the shelves immediately above these fittings are imperforated tends to prevent a too sudden or too solid depositing of material around the air inlets, should the cylinder be overloaded.

While I have necessarily described my invention in detail, I do not propose to be limited to such detail, except as the same may be positively included in the claims hereto annexed, or may be rendered necessary by the prior state of the art.

Having thus described my invention, what I claim is:—

1. A cylinder for a drier for granular material having in its wall a plurality of air admission fittings, each of said fittings comprising a casing mounted in the cylinder wall, a cap surrounding the inner end of said casing, the advancing end of said cap being closed and the retreating end thereof being open and undercut so as to prevent the admission of said granular material thereinto, and a valve member in said casing adapted, when at the inner end thereof, to prevent the admission of air therethrough, and when at the outer end of said casing, to permit the admission of air therethrough.

2. A cylinder for a drier for granular material having therein a plurality of longitudinal shelves or blades adapted to shower or cascade the granular material from one to the next as the cylinder is rotated, air admission fittings beneath said shelves or blades, each of said fittings comprising a casing projecting through the cylinder wall and having at its inner end a cap, said cap being inclosed at its advancing end and open at its retreating end, and having a pocket between the edge of said casing and the inner face of its closed end, and a valve member in said casing adapted to close the passage therethrough when at the inner end thereof and to open the passage therethrough when at the outer end thereof.

3. A cylinder for a drier having longitudinal perforated shelves arranged about the internal surface thereof, one edge of each shelf being secured to the shell of the cylinder and the body of the shelf extending inwardly at an angle therefrom, the portion of the shelf adjacent its attached edge being imperforate, air admission fittings carried by the shell of said cylinder beneath the imperforate portions of said shelves, means for feeding granular material to one end of said cylinder, means for closing against the admission of air those fittings which are at the top and descending side of said cylinder, and means for rotating said cylinder so as to advance the imperforate edge of said shelves and sift or cascade said granular material from each shelf to the next.

4. A cylinder for a drier for granular material having therein a plurality of longitudinal perforated shelves arranged about the periphery thereof and adapted to cascade the granular material from one shelf to the next as the cylinder is rotated, and air admission fittings secured in the shell of said cylinder beneath said shelves, each of said fittings comprising a casing angularly mounted in the cylinder shell and inclined opposite to the direction of rotation thereof, a cap secured to the inner end of said casing and preventing the access of material thereto, and a valve member shiftably mounted in said casing and arranged to prevent the admission of air therethrough when at the inner end thereof and to permit the admission of air therethrough when at the outer end thereof.

5. A cylinder for a drier having longitudinal perforated shelves arranged about the internal surface thereof, one edge of each shelf being secured to the shell of the cylinder and the body of the shelf extending inwardly at an angle therefrom, the portion of the shelf adjacent its attached edge being imperforate, air admission fittings carried by the shell of said cylinder beneath the imperforate portions of said shelves, means for feeding granular material to one end of said cylinder, and means for rotating said cylinder so as to advance the imperforate edge of said shelves and sift or cascade said granular material from each shelf to the next.

6. A cylinder for a drier for granular material having therein a plurality of longitudinal shelves or blades arranged about the periphery thereof and adapted to cascade the granular material from one blade or shelf to the next as the cylinder is rotated, and air admission fittings secured in the shell of said cylinder beneath said shelves, each of said fittings comprising a cylindrical casing mounted in the cylinder shell, a cap covering the inner end of said casing and preventing the access of said material thereto, and a valve member mounted in said casing and arranged to prevent the admission of air when said casing is at the top or descending side of said cylinder.

7. A cylinder for a drier having therein a plurality of longitudinal shelves or blades adapted to shower or cascade the granular material from one to the next as the cylinder revolves, air admission fittings secured in the shell of said cylinder beneath said shelves or blades, each of said fittings comprising a cylindrical casing inclined rearwardly from the direction in which the cylinder rotates and having a movable ball valve therein adapted when at the inner end of the casing to prevent the admission of air thereto and when at the outer end of the casing to permit the admission of air thereto, and means for aspirating air through said fittings.

8. A cylinder for a drier for granular material having in its wall a plurality of air admission fittings, each of said fittings comprising a casing mounted in the cylinder wall and inclined rearwardly from the direction in which said cylinder rotates, a peripherally mounted cap surrounding the inner end of said casing, the advancing end of said cap being closed and the retreating end thereof being open, and a valve member

in said casing adapted, when at the inner end thereof, to prevent the admission of air therethrough, and when at the outer end of said casing, to permit the admission of air therethrough.

9. A drier comprising, in combination, a chamber provided with a source of heated air or other drying fluid, an inclined rotatable cylinder mounted in said member, inclined perforated shelves carried inside said cylinder, means for admitting granular material to the upper end of said cylinder, means for receiving the discharge material from the lower end of said cylinder, fittings for admitting heated air or other drying fluid through the sides of said cylinder beneath said shelves, means for limiting the admission of air to those fittings which are beneath the granular material, and means for creating a suction in said cylinder.

10. A cylinder for a drier having longitudinal perforated shelves arranged about the internal surface thereof, one edge of each shelf being secured to the shell of the cylinder, and the body of the shelf extending inwardly at an angle therefrom, the inner edge of each shelf spaced from and overlapping the adjacent shelf and having its edge bent inwardly, means for rotating said cylinder so as to cause the attached edges of said shelves to advance and cascade the material being treated from one shelf to the next, and means for admitting air or other drying fluid beneath said shelves.

11. A drier comprising, in combination, a chamber provided with a source of heated air or other drying fluid, an inclined rotatable cylinder mounted in said member, inclined perforated shelves carried inside said cylinder, means for admitting granular material to the upper end of said cylinder, means for receiving the discharged material from the lower end of said cylinder, means for admitting heated air or other drying fluid through the sides of said cylinder beneath said shelves, and means for creating a suction in said cylinder.

12. A cylinder for a drier having therein a plurality of longitudinal perforated shelves arranged about the periphery thereof, means for admitting air through the sides of said cylinder beneath said shelves and means for rotating said cylinder so as to shower the material being treated over and through said shelves and through the current of air entering through said air admission means.

13. A cylinder for a drier having longitudinal shelves arranged about the internal surface thereof, one edge of each shelf being secured to the shell of the cylinder, and the body of the shelf extending inwardly at an angle therefrom, the inner edge of each shelf spaced from and overlapping the adjacent shelf and having its edge bent inwardly, means for rotating said cylinder so as to cause the attached edges of said shelves to advance and cascade the material being treated from one shelf to the next, fittings in the wall of said cylinder beneath said shelves, for admitting air or other drying fluid, and means for preventing the admission of air through the fittings upon the top and descending side of said cylinder.

14. In a drier in combination, an inclined rotatable cylinder having perforated shelves secured about its internal periphery, means for feeding granular material to said cylinder, means for rotating said cylinder so as to shower and cascade said material from each shelf to the next, air inlet ports through the casing of the cylinder beneath said shelves, means for admitting air or other drying fluid beneath the shelves at the bottom and on the ascending side of said cylinder, means for preventing the admission of air beneath the shelves at the top and on the descending side of the cylinder, and means for creating a suction inside said cylinder.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

CECIL B. SMITH.

Witnesses:
HAROLD E. SMITH,
BRENNAN B. WEST.