C. B. SMITH.

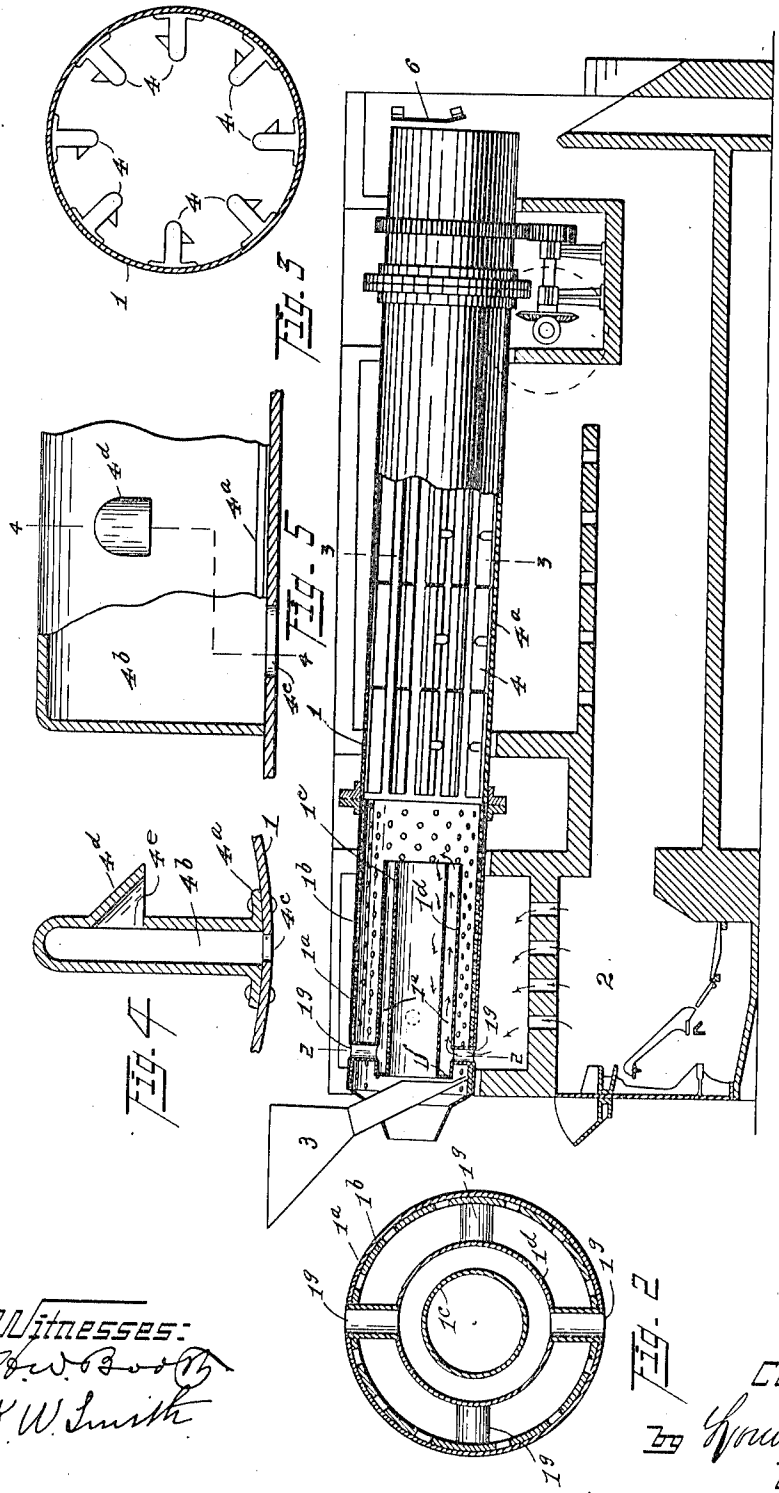
ROTARY DRIER.

APPLICATION FILED OCT. 28, 1912.

1,072,186.

Patented Sept. 2, 1913.

2 SHEETS—SHEET 1.



Witnesses:
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Inventor
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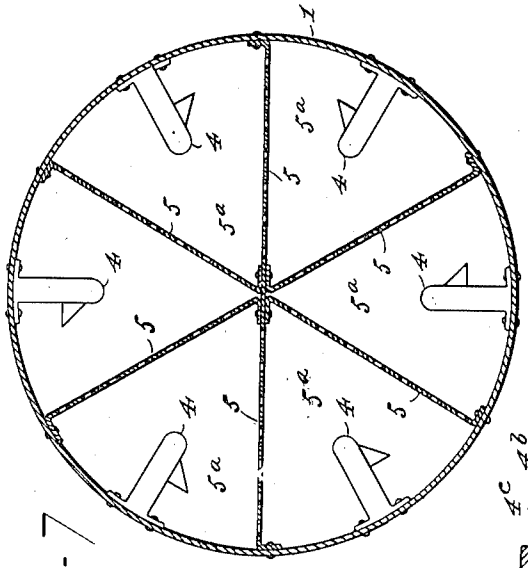


Fig. 7

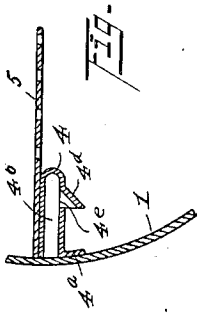


Fig. 8

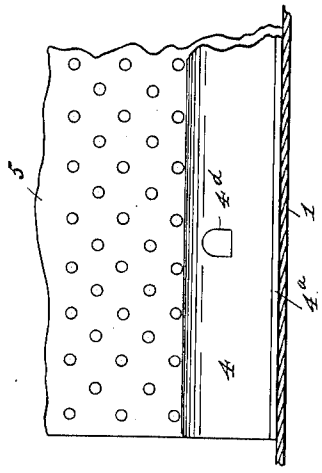


Fig. 9

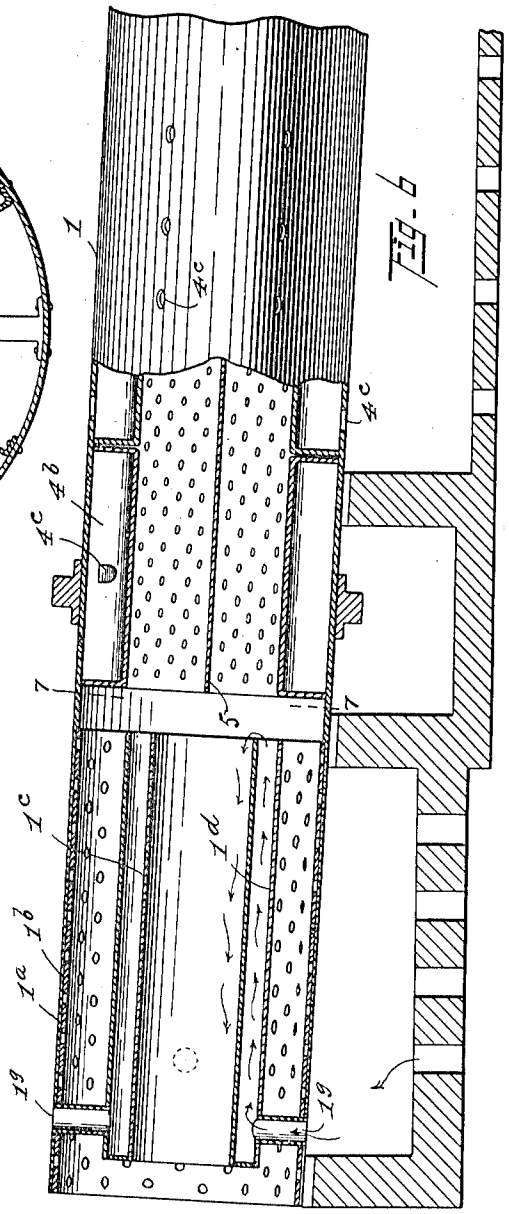


Fig. 6

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UNITED STATES PATENT OFFICE.

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ROTARY DRIER.

1,072,186. Specification of Letters Patent. Patented Sept. 2, 1913.

Application filed October 23, 1912. Serial No. 728,208.

To all whom it may concern:

Be it known that I, CECIL BASS SMITH, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Rotary Driers, of which the following is a specification.

My invention relates to the type of driers that are used for drying granulated or pulverized material, such as sand or cement, wherein the material to be treated is fed into one end of an inclined, rotating cylinder and discharged at the other end. In the travel of the material through the cylinder it is cascaded and agitated, permitting hot air from a heating medium to come in contact with, and impregnate the mass and thereby eliminate the moisture and thoroughly dry the material.

The objects of the invention are to provide a cylinder so constructed that the greatest quantity of heat is imparted to the material at the primary stage; the increasing of the heat distributing surface throughout the entire length of the cylinder and at the same time providing the means for bringing the heated air from the furnace into direct contact with the material in a most advantageous manner, thereby enhancing the efficiency of the drier by utilizing the heat so that the greatest benefit is obtained therefrom. By this construction it is possible to economize in the size of drier without decreasing the capacity, and at the same time obtain better results with less time required, by the employing of a vast amount of the heat energy that in former drier construction has been wasted.

In my invention I provide at the feed end of the drier an auxiliary heater or double cylinder so arranged that the mass of material, pregnant with moisture, is separated and subjected immediately to the direct heat from the furnace and to the heat imparted from the combined areas of the two cylinders, thereby giving to the material the greatest volume of heat at the time when it contains the most moisture. From this primary treatment the material passes into what may be called a secondary portion of the cylinder which is provided with a series of lifting blades containing chambers in open communication with the furnace, whereby the two sides of the blades are heated to substantially the same degree as the casing, thus increasing the heat radiating area and creating a greater efficiency from the heat, by retaining an even temperature throughout the entire cylinder.

The invention also includes the providing of a series of longitudinal, radial, perforated partitions that divide the interior of the cylinder into a number of longitudinal compartments, each of which is provided with the improved blades which co-act with the said partitions for cascading and agitating the material.

The embodiment of my invention is illustrated in the drawings forming a part of this specification in which—

Figure 1. is a longitudinal view of the drier and appurtenances, with the furnace and a portion of the cylinder in horizontal, vertical section. Fig. 2. is an enlarged cross-section on line 2—2 of Fig. 1, and Fig. 3. is a like view on line 3—3 of Fig. 1. Fig. 4 is a sectional view of one of the lifting blades on line 4—4 of Fig. 5. Fig. 5. is a fragmentary view of one of the said blades. Fig. 6. is a fragmentary view of the cylinder showing the perforated partitions. Fig. 7. is an enlarged sectional view on line 7—7 of Fig. 6. Figs. 8 and 9 are fragmentary views showing a lifting blade in juxtaposition to one of the partitions.

Similar characters of reference designate similar parts in the drawings and specification.

In the construction of the improved drier the ordinary furnace is used and the cylinder is mounted and rotated in any manner well known to those familiar with this art. While the casing of the cylinder 1 is preferably continuous and of the same diameter throughout its entirety, from the feed end to the discharge terminal, to facilitate the explanation it will be referred to in sections. I construct the feed end of the casing for a certain predetermined distance, with an outer shell 1^a of light gage sheet metal and a lining sheet 1^b of heavier gage and perforated as shown. Within the por-

tion of the cylinder thus formed and concentric therewith, is an auxiliary cylinder 1^c provided with a jacket 1^d, forming an annular chamber 1^e closed at the head end 1^f. The chamber 1^e is in open connection with the furnace chamber 2, through a series of tubes 1^g. The heat from the chamber 2 is drawn through the tubes 1^g into the chamber 1^e and forward through the interior of the auxiliary cylinder as shown by arrows. This is caused by the forced draft formed by means not shown, but which is common to all driers of this type. The mass of material being fed into the drier from the hopper 3 will naturally be divided, a part of it falling into the main cylinder and part into the auxiliary cylinder 1^c, thereby disintegrating the mass and permitting of quicker action of the heat. The perforations in the lining 1^b increase the radiating area, while the thin outer shell 1^a allows a higher degree of heat to penetrate to the interior, and the combination of the two shells gives strength and durability to this section of the casing. In this part of the cylinder the lifting blades are dispensed with, the material being agitated by rolling over on itself in close contact with the two concentric shells, the temperature of the heat being regulated according to the material to be treated. If the material should be of such a consistency that an extremely high degree of heat is desirable, which would in time burn that portion of the cylinder directly over the fire box, the entire cylinder is not rendered useless but can readily be repaired by substituting a new head section to conform to the unimpaired portion of the cylinder. It being feasible to attach the head portion of the remainder of the cylinder just beyond the fire zone.

Now proceeding to the construction of the cylinder, for what may be called, for convenience, the secondary treatment of the material, the cylinder 1, forward of the fire zone is provided with a series of lifting blades 4, the particular construction of which will presently be described, these blades are attached to the interior of the shell, extend longitudinally therein and, for the purpose of obtaining the best results they are equally spaced circumferentially. The construction of the lifting blades is such that they perform a three fold function in the efficiency of the drier, first the cascading and agitating the material during its continuous passage through the cylinder, secondly that of acting as heat distributers auxiliary to the shell of the cylinder and thirdly that of providing air ducts from the furnace to the interior of the cylinder, keeping the blades at a temperature that will facilitate the drying and at the same time admitting heated air into the cylinder throughout its length, and co-acting with the forced draft to keep the air traveling through the cylinder above the point of saturation and always in condition to absorb moisture.

The construction of the lifting blades is best shown in Figs. 4 and 5. To facilitate the manufacturing and assembling, the blades are made in sections or units, each of which is provided with a flange 4^a for attachment to the shell of the cylinder. An air chamber 4^b is provided in the body of the blade and has one or more ports 4^c opening into the cylinder. The ports 4^c are protected by hoods 4^d.

While in the construction of a cylinder as above described the drying properties are raised to a high degree of perfection, I propose to further increase the drying capacity by a series of perforated partitions 5 placed longitudinally in the cylinder and dividing said cylinder into a series of compartments 5^a. Each of said compartments contains one of the lifting blades 4. By the use of these partitions material is divided, and in the rotation of the cylinder a certain amount of said material is continually escaping from one compartment to another through the perforations, and while in suspension it is subjected to the action of the heated air entering at the lower part of the cylinder, and rising through the perforations in the plates. It will be seen that by the co-action of the lifting blades with the perforated partitions and the interior walls of the cylinder, and during the rotation of said cylinder, the cascading, dropping and agitating of the material in conjunction with the counter currents of heated air combine to form a drier of great efficiency. The lifting blades may be placed midway of the compartments 5^a or they may be placed in juxtaposition to the partitions 5 as shown in Fig. 8. The prevention of the inrush of air at the top of discharge end of the cylinder is provided for by a stationary plate 6 which blinds a portion of the discharge opening.

While I have described my invention as shown in drawings the detailed construction may vary in many respects, being limited only so far as included in the claims and made necessary by the prior state of the art.

Having described my invention, what I claim and desire to secure by Letters Patent is:—

1. In a rotary drier, an auxiliary cylinder located within the main cylinder near the feed end thereof, an annular air chamber surrounding the auxiliary cylinder, said air chamber being closed at the feed end and open at the opposite end and air connection from the exterior of the main cylinder to the air chamber.

2. In a rotary drier an auxiliary cylinder

located within the main cylinder near the feed end thereof and concentric thereto, in combination with a cylindrical casing surrounding said auxiliary cylinder, an annular air chamber between said cylindrical casing and the auxiliary cylinder, said air chamber being closed at the feed end and open at the opposite end, and air connections from the exterior of the main cylinder to the annular air chamber.

3. In a rotary drier, that portion of the feed end of the cylinder extending over the fire zone of the furnace, provided with a perforated lining, in combination with an auxiliary cylinder located within the lined portion of the main cylinder, and concentric thereto, a cylindrical casing surrounding the auxiliary cylinder, an annular air chamber between said cylindrical casing and the auxiliary cylinder, said air chamber being closed at the feed end and open at the opposite end, and air connections from the exterior of the main cylinder to the annular air chamber, whereby heated air from the furnace circulates through the auxiliary cylinder.

4. In a rotary drier, in combination with the main cylinder, an auxiliary cylinder located within the main cylinder, concentric thereto and at the feed end thereof, over the fire zone of the furnace, a hopper adapted to feed material to both the main and auxiliary cylinders, an annular air chamber surrounding the auxiliary cylinder, said air chamber being closed at the feed end and open at the opposite end, and air connections from the exterior of the main cylinder to the annular air chamber near the feed end thereof, whereby heated air from the furnace circulates through the said air chamber and the auxiliary cylinder.

5. In a rotary drier, a cylinder having a plurality of longitudinal shelves or blades therein, air chambers in the body of said blades, openings from said air chambers through the cylinder shell to the exterior thereof, and openings from the air chambers to the interior of the cylinder.

6. In a rotary drier, a cylinder having a plurality of longitudinal shelves or blades therein, said blades being attached to the cylinder shell, air chambers in the body of said blades, openings from said air chambers through the cylinder shell to the exterior thereof, openings from the air chambers to the interior of the cylinder, whereby heated air is circulated from the furnace through the blades to the interior of the cylinder thereby heating said blades, and means for protecting the openings from the air chambers to the interior of cylinders to prevent the admission of material to said air chambers.

7. In a rotary drier, a cylinder provided with a series of longitudinal, radial, perforated partitions, whereby said cylinder is divided into a series of compartments, longitudinal shelves or blades attached to the shell within said compartments, air chambers in the body of said blades, openings from said air chambers through the cylinder shell to the exterior thereof, openings from the air chambers to the interior of the cylinder, whereby heated air is circulated from the furnace through the blades to the interior compartments, thereby heating the blades and distributing the heat, and means for protecting the openings from the air chambers to the interior of cylinder to prevent the admission of material to said air chamber.

8. In a rotary drier a cylinder having a plurality of longitudinal shelves or blades therein, air chambers in the body of said blades, openings from said air chambers through the cylinder shell, openings from the air chambers to the interior of the cylinder, and a stationary shield adapted to close the upper portion of the discharge opening of the cylinder, whereby the inrush of air to top of cylinder is prevented.

9. In a rotary drier, the combination of a main cylinder, an auxiliary cylinder located within the main cylinder concentric therewith and at the feed end thereof, over the fire zone of the furnace, a hopper adapted to feed material to both the main and auxiliary cylinders, an annular air chamber surrounding the auxiliary cylinder, said air chamber being closed at the feed end and open at the opposite end, air connection from the exterior of the main cylinder to the annular air chamber, a plurality of longitudinal shelves in the main cylinder forward of the fire zone, air chambers in the body of said shelves, openings from said air chambers through the cylinder shell, openings from the air chamber to the interior of the cylinder and means for protecting the openings from the air chambers to the interior of the cylinder to prevent the admission of material to said air chamber.

10. In a rotary drier, the combination of a main drying cylinder, an auxiliary cylinder located within the main cylinder concentric therewith and at the feed end thereof extending over the fire zone of the furnace, an annular air chamber surrounding the auxiliary cylinder, said air chamber being closed at the feed end thereof, air connections from the exterior of the main cylinder to the annular air chamber, a series of longitudinal, radial, perforated partitions arranged in the main cylinder forward of the fire zone and dividing the cylinder into a series of compartments, longitudinal shelves attached to the shell within said compartments, air chambers in the body of the

shelves, openings from said air chambers through the cylinder shell, openings from the air chambers to the interior of the cylinder, means for protecting the openings from the air chambers to the interior of the cylinder to prevent the admission of material into said air chamber, and a stationary shield adapted to prevent the inrush of air at the upper part of the discharge opening of the cylinder.

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