R. K. MEADE.

DRIER.

APPLICATION FILED DEC. 15, 1908.

937,255.

Patented Oct. 19, 1909.

2 SHEETS—SHEET 1.

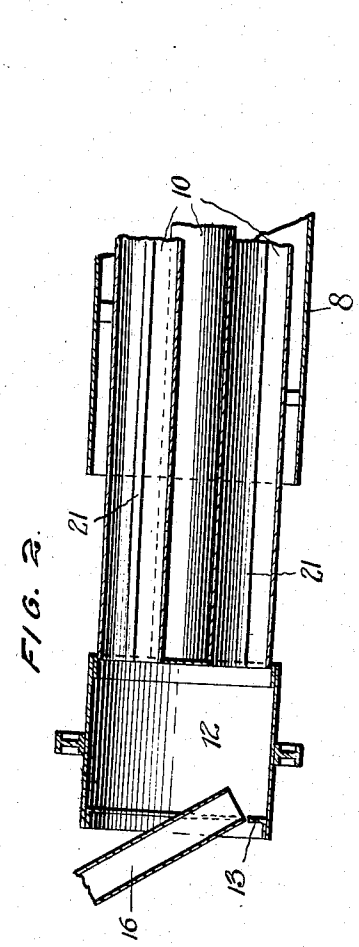



FIG. 2.




FIG. 1.

WITNESSES

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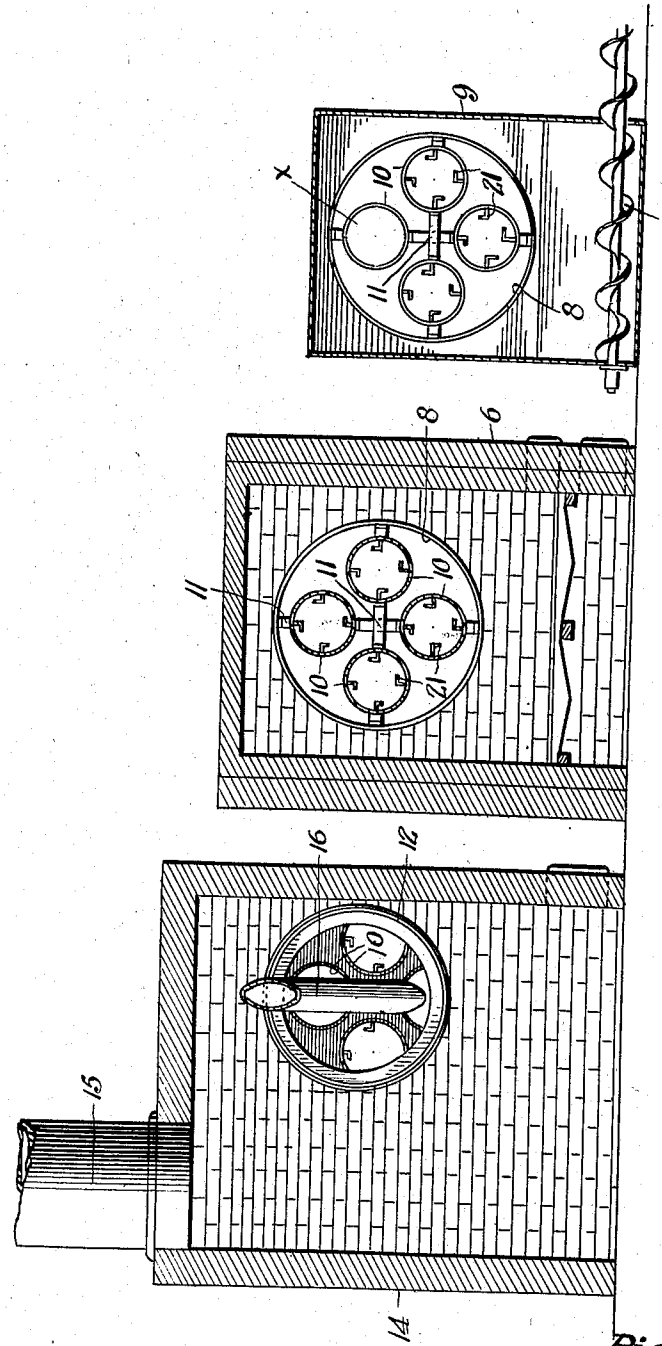



FIG. 5.

FIG. 4.

FIG. 3.

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# UNITED STATES PATENT OFFICE.

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## DRIER.

937,255. Specification of Letters Patent. Patented Oct. 19, 1909.

Application filed December 15, 1908. Serial No. 467,673.

*To all whom it may concern:*

Be it known that I, RICHARD K. MEADE, a citizen of the United States, residing at Nazareth, in the county of Northampton and State of Pennsylvania, have invented certain new and useful Improvements in Driers, of which the following is a specification.

The present invention relates to driers, and more particularly to those of the rotary type.

The primary object of the invention is to provide a novel, simple, and practicable structure in which the material to be dried is protected from direct contact with the heating medium, while the latter is at its highest temperature, and when the temperature of such heating medium has been reduced to a safe limit on account of the absorption of heat, by the material acted upon, then said medium is brought into direct contact with the material and acts as a conveyer to carry off the moisture extracted from the material.

A further and important object is to provide a structure in which the material acted upon is divided up into a number of comparatively small streams, thus insuring more effective treatment than one body of comparatively great bulk could possibly have and securing great economy in operation.

Still another object is to provide a structure in which the products of combustion from a fire are employed as a heating and drying medium, to so arrange said structure that a proper draft for said products of combustion is at all times, assured.

An embodiment of the invention that is at present considered the preferred form of construction, is illustrated in the accompanying drawings, wherein—

Figure 1 is a side elevation of the same. Fig. 2 is a longitudinal sectional view through the upper portion of the structure, and Figs. 3, 4, and 5 are respectively vertical, transverse, sectional views on the lines *a*—*a*, *b*—*b*, and *c*—*c*, of Fig. 1.

In the embodiment of the invention disclosed, a furnace 6 is employed, that may be of any desired character and has a circular opening 7 in one wall thereof. One end of a revoluble drum 8 is located in said opening, the other end being revolubly engaged in a non-rotatable hood 9. This drum is open-ended, and is preferably disposed at an inclination. Its ends are so arranged in the walls of the furnace and hood that practically none of the products of combustion from the furnace can escape past them; in other words, said ends are substantially sealed in the walls, consequently, the products of combustion from the furnace must pass longitudinally through the drum.

Located longitudinally within said drum, and revoluble therewith, are a plurality of material conveying tubes, 10, any number of which may be employed as desired. These tubes are preferably spaced from one another, and also spaced from the drum by suitable holding devices 11. The tubes 10 are also open-ended, thus communicating at their lower ends with the interior of the hood 9, their upper end portions projecting from the upper end of the drum 8, extending across the interior of the portions and being connected with a feeding chamber 12, arranged exteriorly of the furnace. This feeding chamber is common to all the tubes and has an open rear or upper end in which is preferably placed a retaining flange 13. The open end of the chamber 12 enters the base 14, of a stack 15 or other device to carry off the products of combustion as hereinafter explained. Suitable means are employed for delivering material to be dried into the chamber 12. In the present embodiment, this means is shown in the form of a chute 16, that extends downwardly into the base 14 of the stack, and projects into the chamber 12. Any other desired means may be employed. The rotatable member of the drier consisting of the drum 8, the tubes 10, and the chamber 12, is suitably supported, for instance, by rollers 17 which run upon tracks 18, secured to the end portions of said member. The drum is also provided with a suitable girth gear 19, with which any suitable driving mechanism, (not shown), may mesh. In the lower portion of the hood 9 is located a delivery screw 20, or other device of an analogous character.

The operation of the drier may be briefly described, as follows: It is revolved at a slow rate of speed and the material to be dried is fed downwardly through the chute 16, into the feed chamber 12. This material thus finds its way into the tubes 10, and gradually passes through said tubes, finally being deposited in the hood 9 from whence it is removed by the conveyer 20. The interior of the tubes may or may not be provided with

agitators 21. The heat to dry the material is generated by the combustion of suitable fuel in the furnace 6, and the hot gases and products of combustion passing longitudinally through the drum 8, exteriorly of the tubes 10, completely surround the same as will be evident. When however, the said products of combustion enter the hood 9, their direction is reversed, and they pass backwardly through the interiors of said tubes 10, through the feeding chamber 12, and to the open air through the stack 15.

In passing along the exterior of the tubes, the hot gases give or transmit a certain amount of their heat through the walls of the tubes, to the material within the same. This serves to partially dry the material, and also to cool somewhat the heated gases, consequently when such gases come into contact with the material, particularly when such material is of an inflammable character, such as coal, there is no danger of igniting the latter. In this structure it will be evident that the material is completely surrounded by the products of combustion after entering the tubes and because said tubes and drum are both revoluble, the heating and drying medium is more effectively presented to all portions of the material. The material is furthermore divided by the inner tubes into as many small separate streams as there are tubes, thus spreading it more thoroughly and permitting a more thorough application of the heat. This insures economy in operations by allowing the closest contact between the material and the heating medium.

There is another feature of very considerable importance. It will be evident that in the structure as disclosed, the passage of the heating medium through the drum and tubes, is secured solely by the natural draft. I have discovered that in order to secure the most effective draft, it is very essential that the combined cross sectional areas of the bores of the tubes be at least as great as the cross sectional area of the space within the drum, exteriorly of said tubes, so that the channel through which the products of combustion pass, is substantially the same from the furnace to the feeding chamber.

A further feature of importance is the fact that, by the rotation of the drum, the hot gases are caused to pass therethrough in a spiral flow, which produces uniform simultaneous heating of the tubes. Otherwise the hottest gases from the furnace would rise to the top of the drum, and the tubes would be heated one after the other.

Having fully described my invention, I claim:

1. In a drying apparatus of the character set forth, the combination with a furnace of a rotatable drier drum, having one end communicating with the furnace and receiving the products of combustion therefrom, a material feeding tube located longitudinally within the drum, and rotatable therewith, said tube having no direct communication with the furnace, but having one end in connection with the end of the drum opposite to that which communicates with the furnace, and means for delivering material into the end of the tube and opposite to that that is in communication with the drum.

2. In a drying apparatus of the character set forth, the combination with a furnace, of a rotatable drier drum, having one end communicating with the furnace and receiving the products of combustion therefrom, a material conveying tube located longitudinally within the drum, and rotatable therewith, said tubes having no direct communication with the furnace, but having one end in communication with the end of the drum opposite to that which communicates with the furnace, the other end portion of said tube projecting from the drum and extending through the furnace, and means for feeding the material into the latter end of the tube.

3. In a drying apparatus of the character set forth, the combination with a furnace, of a hood spaced therefrom, an open-ended revoluble drum located between the furnace and hood, and having its ends respectively inserted thereinto, a plurality of material conducting tubes, located longitudinally within and rotatable with the drum, said tubes at one end communicating with the interior of the hood, and at the other end projecting from the drum and extending through the furnace, and means for feeding material into the latter end of the tubes.

4. In a drying apparatus of the character set forth, the combination with a furnace of a hood spaced therefrom, an open-ended revoluble drum, located between the furnace and hood, and having its ends respectively inserted thereinto, a plurality of material conducting tubes located longitudinally within and rotatable with the drum, said tubes at one end communicating with the interior of the hood, and at the other end projecting from the drum and extending through the furnace, a feeding chamber common to all of the tubes and connected to the other projecting ends extensively of the furnace, said chamber being revoluble with the drum and tubes, means for feeding material into the chamber, means for carrying the products of combustion away from said chamber, and means for removing the dried material from the hood.

5. In a drying apparatus of the character set forth, the combination with a drum, of a plurality of material conveying tubes, extending longitudinally therein, the cross sectional area of the space within the drum outside of the tubes, being substantially equal to the combined cross sectional areas of the tube bores, means for feeding material into

the tubes, and means for directing a heating medium through the drum, exteriorly of the tubes, and directing such heating medium from the exterior to the interior of the tubes after its passage through the drum.

6. In a drying apparatus of the character set forth, the combination with a furnace, of a rotatable drier drum, having one end communicating with the furnace and receiving the products of combustion therefrom, a material conveying tube located longitudinally within the drum, and rotatable therewith, said tube having no direct communication with the furnace but having one end in communication with the end of the drum opposite to that which communicates with the furnace, and means for feeding material into the latter end of the tube.

7. In a drying apparatus of the character set forth, the combination with a furnace, of a drum having one end communicating with the furnace and receiving the products of combustion therefrom, a plurality of material conveying tubes extending longitudinally within said drum, means for introducing a heating medium into the end of said drum adjacent said furnace exteriorly of said material conveying tubes, means for conveying said heating medium rearwardly from said furnace interiorly of said drum and exteriorly of said tubes, means for rotating said drum to cause the heating medium to follow a spiral path throughout its rearward journey, substantially as described.

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

RICHARD K. MEADE.

Witnesses:

LESTER C. HAWK,

CLARENCE F. FEHNEL.