No. 888,475. PATENTED MAY 26, 1908.

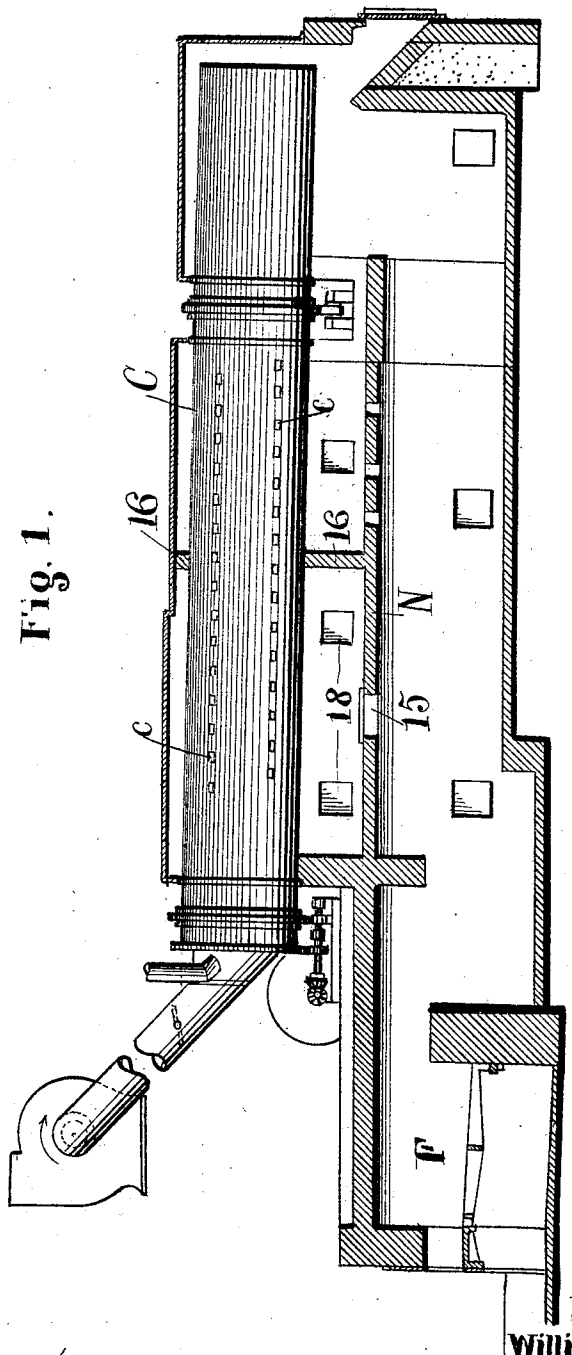
W. M. CUMMER.

MECHANICAL DRIER.

APPLICATION FILED SEPT. 4, 1907.

2 SHEETS—SHEET 1.

Fig. 1.



ATTEST.
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2 SHEETS—SHEET 2.

Fig. 3.

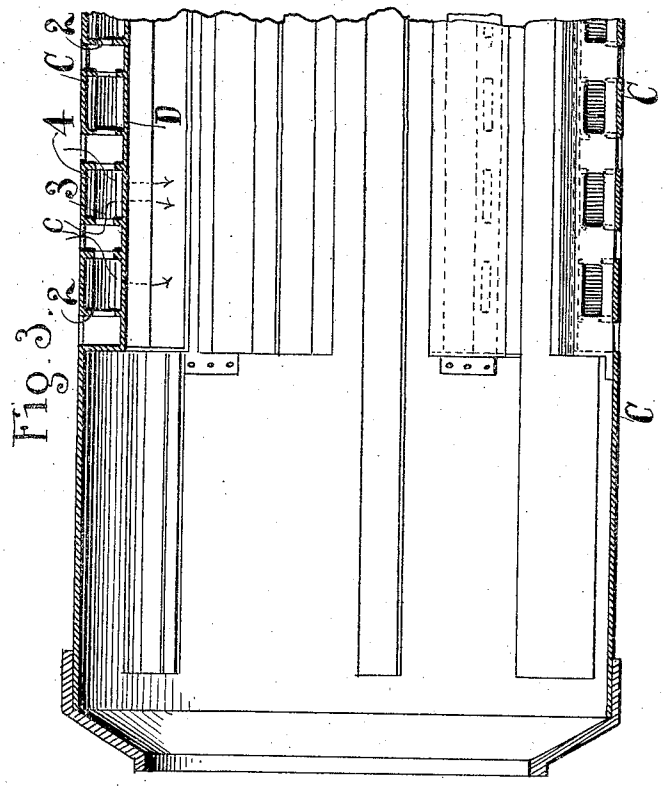


Fig. 6.

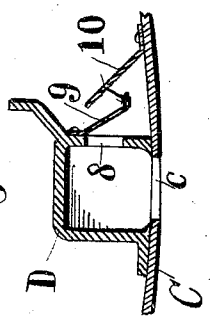


Fig. 5.

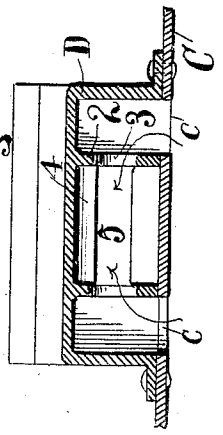


Fig. 2.

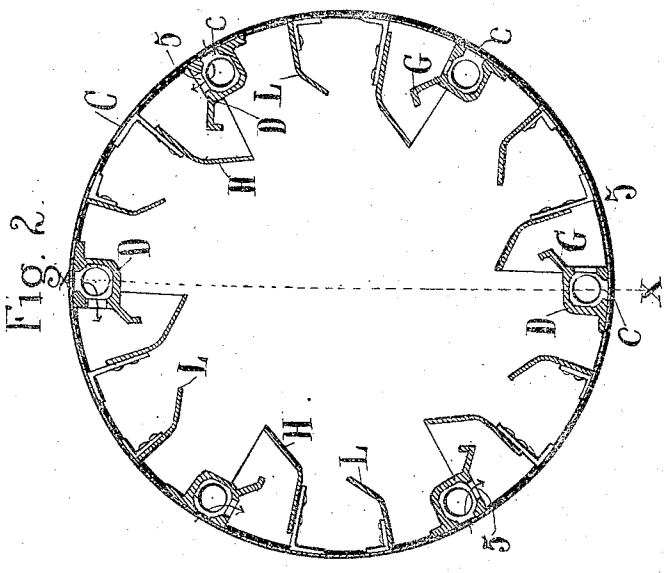
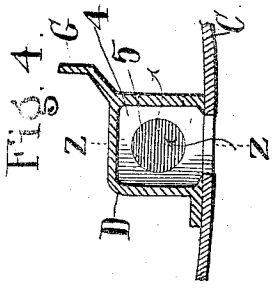


Fig. 4.



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UNITED STATES PATENT OFFICE.

WILLIAM M. CUMMER, OF CLEVELAND, OHIO.

MECHANICAL DRIER.

No. 888,475. Specification of Letters Patent. Patented May 26, 1908.

Application filed September 4, 1907. Serial No. 391,391.

To all whom it may concern:

Be it known that I, WILLIAM M. CUMMER, 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 Mechanical Driers, and do declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to mechanical driers having rotatable drying cylinders and passage-ways for the products of combustion and heated air of peculiar and original formation through the wall of the cylinder to facilitate the drying operations, all substantially as shown and described and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical longitudinal sectional elevation of the drier setting, showing the cylinder in side elevation. Fig. 2 is an enlarged cross section of the cylinder alone, showing one form of inlets and guards therefor, and cascading devices as related to said guards. Fig. 3 is a longitudinal section of the front portion of the cylinder on the line of one of the air inlet ducts or chamber. Figs. 4 and 5 are enlarged cross and longitudinal sections respectively, of a modification of the air inlet chamber, and Fig. 6 is a cross section of still another modification of said chamber as hereinafter fully described.

The main object of my invention is to provide a mechanical drier wherein a current of heated air is freely and fully circulated throughout the length and diameter of the drying cylinder, and wherein the material to be dried is caused to repeatedly fall through the air currents passing through the cylinder. As a condition to making a drier of this nature practically and commercially operative it must be so constructed as to render it impossible for material to actually spill or leak out of the peripheral openings of the cylinder. This applies to all grades of material whether of an elastic nature which may be inclined to bound out through the peripheral openings, or material of an adhesive or sticky nature, which will bind or cling to the interior of the shell or cylinder, from whence it is liable to drop at any time, so that precaution must be taken against such materials coming into actual contact with a surface opposite an opening. Otherwise it would be apt to drop out through the opening. Then again, the method employed is commercially and practically inoperative if it causes a positive obstruction to the travel of the material along the length of the cylinder, such as would be the case if a form of draft inlet were adopted which would be more or less continuous around the entire shell of the cylinder and thus obstruct the travel of the material. For example, it is not unusual to have a single drier used for as many as three different kinds of material, such as sand, stone, and clay. The sand with its characteristic quality to flow out of any opening or aperture, the stone with its elasticity to bound through any opening or aperture, and the clay with its tendency to adhere to any surface with which it may come in contact. Each of these three materials present three different conditions which must be taken care of by a drier claiming real practical merit. Then again, material should, as far as possible, be kept out of any opening or aperture that does not form an actual part of the cascading and tumbling portion of the cylinder, for the reason that, the action of the material tumbling and cascading keeps surfaces clean that it falls and rolls upon, whereas material allowed to accumulate in the actual air chambers is deprived of the benefit of the cascading material as a cleaning agency. So the aim is that when pieces or lumps get through an air inlet to make proper provision for their return, and to have any shield facing an air-hole so constructed that the bulk of material will be compelled to roll over it in constant agitation to cleanse it from the slow accumulation of deposit.

Having reference now to the particulars of construction which makes my invention practical, C represents the cylinder which, in this instance, has a continuous shell or wall broken only by series of holes or openings *c* of any desired shape adapted to pass products of combustion through them from furnace F to the interior thereof, where said products serve as a drying medium in a manner now well known in this art. The said openings are disposed in straight lines, in this instance, but they may run spirally if preferred, and a walled chamber or duct D, preferably rectangular in cross section, is built upon the inner side of the cylinder over each of the several series of openings and at minimum elevation so as to leave the interior

of the cylinder as free from obstruction as possible. The said chambers or ducts may cover the entire length of a given series of holes and be in open communication from end to end internally, as in Fig. 3, or they may be subdivided into sections covering say two openings, as in Fig. 5. In both cases the said chambers or ducts are provided with cross walls —2— at opposite sides of opening *c*, and said walls have holes or passages —3— through which the products of combustion pass into the so-called pocket or space —4— between two given inlet openings *c* and their corresponding walls —2— and thence into cylinder C through slot or opening —5— in what may be regarded as the rear side of said pocket, viewed from the direction of rotation. The opposite side and top of duct or channel D is closed tight the full length thereof. In a sense this construction forms a box over or about each opening *c* which constitutes a receiving or entering chamber through which the products of combustion pass first into pocket —4— and thence through slot —5— into the cylinder, making a staggered draft passage that safe-guards the material against escape.

Fig. 6 illustrates a modification of the invention in that channel D has outlets —8— into the cylinder directly opposite inlet *c* in the rear side wall of said channel or duct. This construction necessitates special guards of its own over holes —8—, and such guards are provided in or by plates —9— and —10— projected respectively from opposite directions and overlapping each other with a free draft space between. Plate —9— is fixed above over hole —8—, while plate —10— is fixed to the cylinder and extends in a sheltering relation inward toward the fixed edge of plate 9. This in effect is the equivalent of the construction shown in Figs. 2 and 5. These constructions lead up to another important advantage obtained by this construction over the prior art familiar to me, which is the discharge of the products of combustion directly at or near the inner periphery of the cylinder where the enter and permeate the material and promote drying in a manner impossible when the draft ducts or devices extend far into the interior of the cylinder and discharge over the material where the suction fan draws them off before they have done their work. My construction is such that although the material is being cascaded and tumbled about and over the draft inlets there is no possibility of leakage and hence no waste of material on this account and the drying agent reaches the material in all portions of the cylinder and is diffused amidst the same.

When blades G and H are in the lower position during the rotation of the cylinder they act as guards to prevent the falling and cascading material from flowing into, or closing up the draft openings —5—. When past the center of rotation on the ascending side they become lifting or cascading blades, the material first being carried by blade G till such a point of rotation is reached that it rolls off onto blade H and, possibly, more or less falling into pocket —4— through slot —5—. Meanwhile, during the continuance of rotation of the cylinder, blade H comes into action as a lift blade, carrying the material up to a point where it will be cascaded. This point is determined at will, according to the inclination given to blades H. A different inclination is necessary for some materials than for others. By reason of this relativity of inclination of blades I can cause the material to be cascaded more effectively across the area of the cylinder without incurring the possibility of carrying some of the material around before cascading, and thus depriving this portion of the material of a proper amount of exposure through the circulating air.

The construction shown in Fig. 5 provides practically two separate chambers in communication with each other, the immediate inlet space about or over opening *c* constituting an inlet chamber and the chamber 4 next thereto an outlet chamber into the cylinder, and the two together constitute the draft passage for the products of combustion into the cylinder. Any suitable guards for the material may be employed with this construction, but those shown serve the purpose.

The setting of the drier cylinder likewise contains novel features of construction in that the draft passage from the furnace is provided with an arch or covering N provided with one or more damper controlled inlets 15 through said arch and having the cylinder chamber over the arch subdivided between its ends, or approximately at its middle in this instance by a cross wall 16, closely surrounding the cylinder and forming a separate chamber as to which the temperature and volume of heat admitted can be perfectly controlled. Fresh air openings 18 are also provided. The entire front end of the cylinder is thus placed under separate temperature control. Obviously, any material working into pockets through openings 15 will be trapped in said pockets and be thrown back into the cylinder through said opening when the cylinder has turned far enough forward.

The within construction of drying cylinder is in a sense also a drying screen in that the products of combustion are discharged into the cylinder at its surface practically as would occur in a perforated screen and all the interior area or space is utilized for drying purposes, in contradistinction to a construction in which the products of combustion discharge practically into the center of

the cylinder in the direct line of atmospheric suction through the same and by which the larger proportion of heat is carried off before it can reach the material to be dried.

What I claim is:—

1. In drying apparatus, a drying cylinder having a series of draft openings at intervals between its ends and walled chambers over said openings inside the cylinder and provided with draft inlets through their rear side next to the inner surface of the cylinder.

2. A drying cylinder provided with draft openings through the wall thereof and walled channels over said openings closed over the top and one side and open to the interior of the cylinder on the other side in position to discharge at the inner side of the cylinder wall.

3. A drying cylinder having draft openings running in series between its ends, and walls about said openings inside the cylinder having inlets to the cylinder at right angles to the openings therein and immediately at the inner surface thereof, whereby an indirect draft passage is afforded adapted to discharge at the surface of the cylinder.

4. A drying cylinder circular in cross section and provided with openings in series lengthwise through its wall, and covered draft channels over said openings provided with draft pockets between adjacent openings.

5. A drying cylinder circular in cross section and having draft inlet openings, and a covered draft channel inside over said openings having sub-dividing cross walls at intervals provided with draft holes.

6. A drying cylinder having draft openings in series lengthwise and a walled channel over each series sub-divided into inlet and outlet chambers side by side lengthwise of the cylinder.

7. A drying cylinder having draft openings through the same, a walled channel over said openings provided with inlet chambers having side openings and outlet chambers having outlet openings at right angles to said side openings.

8. A drying cylinder having draft openings in succession front to rear through its side, in combination with a cover inside over said openings co-extensive therewith and having a draft channel through the same for each opening comprising two chambers open to each other and to the interior of the cylinder.

9. A drying cylinder having draft openings through the same between its ends and a plurality of draft chambers through which said openings communicate with the interior of the cylinder, and guards for said chambers.

10. A drying cylinder having draft openings through the same in series lengthwise and a plurality of chambers forming a draft passage for each opening into the cylinder, the said chambers having an inlet to the cylinder at the inner surface thereof, and guards for said inlet.

11. A drying cylinder having draft openings through the wall thereof in series, a substantially rectangular channel in cross section over said openings inside and provided with draft holes in its rear wall next to the surface of the cylinder and a plurality of guard plates to protect said holes.

12. A drying cylinder having draft openings in series, a walled chamber over each series sub-divided into inlet and outlet chambers successively, a guard plate mounted on said channel wall and another guard plate mounted on said cylinder.

13. In a drying cylinder, inlet openings through the wall thereof and guards for said openings set apart from the surface of the cylinder to provide a way of escape for material beneath said guards back into the cylinder.

14. A drying cylinder having a succession of draft openings through the wall thereof, and covers therefor having openings at an angle to the openings through said wall and adapted to discharge in a plane substantially parallel to said wall and immediately over the same.

In testimony whereof I sign this specification in the presence of two witnesses.

WILLIAM M. CUMMER.

Witnesses:
E. M. FISHER,
T. C. MUSSUN.