(No Model.)

H. H. WING.

ROTARY DRIER.

No. 600,959. Patented Mar. 22, 1898.

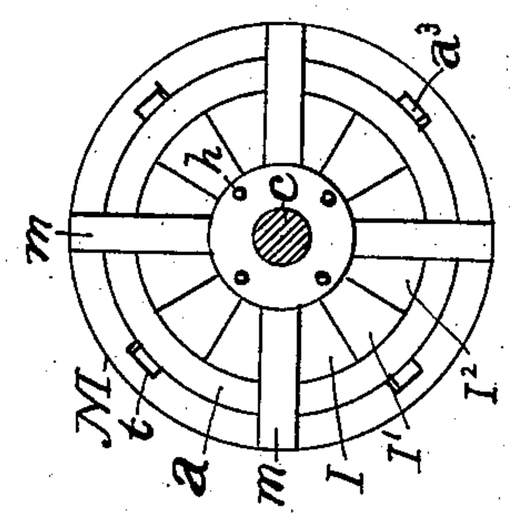

Fig. 3

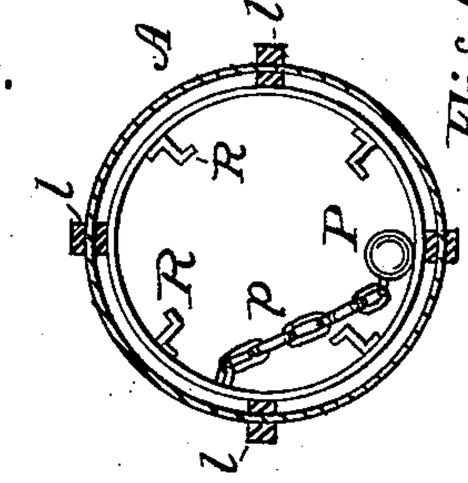

Fig. 2

Fig. 1

Witnesses
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UNITED STATES PATENT OFFICE.

HERBERT H. WING, OF BUFFALO, NEW YORK.

ROTARY DRIER.

SPECIFICATION forming part of Letters Patent No. 600,959, dated March 22, 1898.

Original application filed December 12, 1895, Serial No. 571,908. Divided and this application filed August 21, 1897. Serial No. 649,022. (No model.)

To all whom it may concern:

Be it known that I, HERBERT H. WING, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Rotary Driers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in mechanical drying apparatus of the class of rotary cylinder driers designed for the rapid and economical drying of all kinds of materials which are to be treated in a fragmentary, granular, or comminuted condition.

The object of my invention is to increase the efficiency and secure the most economical operation of the apparatus.

To this end the invention consists in the novel features of construction, combination, and arrangement of the various features of the apparatus, as hereinafter fully described, and pointed out in the claims.

In the drawings hereto annexed, Figure 1 represents, mostly in central longitudinal section, a drying apparatus in which my invention is embodied. Fig. 2 represents a transverse section of the drying-cylinder, taken on the line $x\ y$ of Fig. 1. Fig. 3 represents an end elevation of the lower or discharge end of the cylinder.

Heretofore there has been found in the use of revolving cylinder driers considerable difficulty in securing an even and continuous discharge of the dried material through and out of the cylinder, owing to the fact that in nearly all such driers the interior surface of the cylinder is more or less obstructed by rigid internal constructions—such as stirring devices, air-inlets, hoods, transverse ribs, or shoulders—against or upon which portions of the material being treated lodge from time to time, the presence of which is apt to cause temporary accumulation of the material and an intermittent and irregular discharge.

One of the objects of the present invention is to provide a construction of drier in which the passage of the material along the same shall be uninterrupted, while at the same time providing ample means for inletting the hot air and products of combustion by means of which the drying is largely effected. Another important end in view is the more efficient regulation and control of the supply of air and drying-gases admitted to the drying-cylinder, the purpose being to evenly distribute the heat and prevent the excessive heating of the material in certain parts of the apparatus and to prolong the life of the apparatus itself.

I have found that in drying certain classes of material when a perfectly plain rotating cylinder is used the capacity of such apparatus was limited within certain very definite limits and that to evenly dry and not overheat any portion of the material required extreme care, and that when running such a drier at its utmost capacity it was impossible to prevent at times the excessive heating of the discharged material, whereby some of the product was injured, or to prevent at times some portions of the material from being discharged before it was sufficiently dry. On the other hand, when using a drying-cylinder containing internal structures such as before referred to there was found great liability of the material to lodge and accumulate in certain parts of the apparatus, whereby the drying of such masses was rendered incomplete and the subsequent discharging of such masses of material occurred in a sudden rush, whereby imperfectly-dried material was discharged and the conveyer overloaded, causing very great annoyance and delay. Another difficulty which has presented itself in the use of driers of the rotating-cylinder class has been due to the fact that the entrance of the hot drying-gases at the discharge end of the cylinder has been freer than at the other portions of the cylinder, the result of which has been that as the material at this end is thoroughly dry or intended to be it is the more easily overheated and burned or injured, while from the same cause the discharge end of the cylinder and the metal parts of the apparatus adjacent thereto have been too highly heated, so as to cause in many cases breakage or derangement of the apparatus. In order to overcome the foregoing and other diffiulties, I have devised the construction shown in the drawings, wherein—

A represents the shell or drying-cylinder, of

any suitable form, supported by spiders B C at the feed end and discharge end, respectively, the spiders being supported, respectively, upon heavy trunnions or shafts *b c*, supported in suitable bearings *b' b²* and *c' c²*, which I prefer to locate entirely outside of the chamber in which the drying-cylinder is located. By this means I avoid the possibility of the bearings being heated and the operation of the cylinder interfered with from that cause. The cylinder A is set with the discharge end so much lower than the feed end as to give the proper slope thereto, according to the nature of the materials being dried. In drying any material containing an unusual amount of moisture the slope of the cylinder A may with advantage be made less than when drying material containing a less percentage of moisture, which is more or less pulverulent when nearly dried. The cylinder is suspended within a chamber D, which is closed to the external air, but in open connection with a furnace E, located at one end or the other of the chamber D, wherein by the combustion of any suitable fuel or by the use of hot waste gases from any source the heat for drying the material in the cylinder is obtained. The upper or feed end of the cylinder communicates directly with a stack F, conveniently located. In a short horizontal pipe *f* at the bottom part of the stack a suction-fan G is placed, by means of which a draft through the cylinder is maintained and can be very exactly regulated. Beneath the discharge end of the cylinder is located a conveyer H, transverse to the axis of the cylinder, which conveys away the material falling from the cylinder and delivers it at any suitable point of discharge.

The spider C, which supports the discharge end of the cylinder A, is so constructed as to carry a damper I, which is capable of nearly closing the discharge end of the cylinder when shut. The damper I may be placed within the spider; but I prefer to place the same external to the spider, as shown in Fig. 1, where it is more readily accessible. The spider C, having radial arms *m* and annular rim M or equivalent, engages the outside of the cylinder, fitting upon a ring *a*, secured to the discharge end of the cylinder, and which ring, by lugs a^3 or recesses therein, engages corresponding lugs or recesses *t* on the inner side of the rim M, so as to secure the rotation of the spider C with the cylinder. The damper I may be of any preferred construction, but, as shown, consists of stellate or cruciform plates I I' I², &c., seated upon the shaft *c* outside the arms *m* and having segmental slots *i*, through which pass bolts *h*. The plates I I' I², &c., slide freely one over the other, but so snugly that they will remain in the position in which they are placed. In Fig. 3 they are shown as arranged to close the entire end of the cylinder, leaving only an annular space about equivalent to that between the sections of the shell, and by turning them so that they coincide in position the end is left nearly uncovered. The spider B has also radial arms which terminate in an annular rim N, which engages, in the same manner as spider C, a ring a^2, secured to the feed end of the cylinder, and thus effects the rotation of the cylinder when the spider B is turned by means of suitable gear, as K, affixed to the shaft *b* and actuated by any suitable power, as K'.

The shell A may be of any suitable construction, that shown in the drawings being very efficient and being composed of sections secured together in such manner that, beginning at the feed end, each section enters within the succeeding one to a distance of several inches, leaving an annular space between the two sections, which may be about two inches, more or less, in radial width. The sections of the shell, which may be of any desirable number, are secured together by any suitable means, as by external bars *l l*, placed at intervals around the cylinder, as shown in Fig. 2, thus forming an exceedingly rigid cylinder provided with ample inlet-openings between the several sections, which, however, offer no obstruction to the downward passage through the cylinder of the material being dried. The sections of the cylinder are preferably provided with longitudinal inward-extending ledges R, firmly secured to the shell.

In the operation of the drier the material to be dried is fed into a hopper O at the feed end of the machine and, falling upon the inclined hood *n*, which closes the feed end of the cylinder and communicates with the stack F, is discharged into cylinder A and is caught upon the upper end of the first ledge R of the rotating shell A and being carried up the ascending side of the cylinder falls back to the bottom thereof at a point lower down, encountering the current of hot combustion-gases from the furnace E, which, entering the cylinder at the annular spaces between the sections and at the narrow peripheral spaces at the discharge end, fill the cylinder already heated by the external contact therewith throughout its whole surface of the hot combustion-gases, which fill the chamber D and rapidly extract from the material the moisture contained therein, which, being drawn out by the fan G, escape through the stack F. The material to be dried drops from the ledges R continuously through the hot current of gases and meeting as they drop from section to section of the shell the incoming current of hot or dry gases have no tendency or opportunity to lodge or accumulate in masses, but pass evenly and continuously down the smooth inner surface of the cylinder and escape in a continuous discharge at the lower end thereof. To prevent the adhering to and, as it were, baking or sticking upon the interior surface of the shell of moist or sticky material, I provide a jarring arrangement to dislodge any such adhering material, to which end I attach to the interior of the cylinder one or more balls P by means of chain *p*, which ball, being carried up by the

ledges R, drops upon the lower part of the shell with sufficient force to jar loose any adhering material which may have baked or stuck upon the interior of the cylinder and causes the same to drop to the bottom thereof. A continuous jarring is thus effected which prevents the adherence of any of the material to the hot shell of the cylinder.

The door *d* (shown in Fig. 1) is secured to a large iron plate, and through it the damper I can be easily adjusted. If thought best, bricks can be laid in loose behind the plate and can be removed when the damper is to be regulated or when the iron plate to which this door is attached is removed to make any repairs or when the inside of the drier is to be inspected.

I do not herein claim the special construction of the drying shell or cylinder nor the combination of such specially-constructed shell with the other elements of the structure, the same forming the subject-matter of my pending application, Serial No. 571,908, filed December 12, 1895, of which this application is a division; but,

What I do claim as my invention herein, and desire to secure by Letters Patent, is—

1. In a rotary drying apparatus the combination with the drying-chamber having internal longitudinal ribs, of a ball or weight attached to the interior of the cylinder by a chain or equivalent, substantially as described.

2. In a rotary drying apparatus the combination with the drying-cylinder of a damper arranged across the discharge end of the cylinder and adapted to nearly close the same, substantially as described.

3. In a rotary drying apparatus the combination with the drying-cylinder having internal longitudinal ribs, of a damper arranged across the discharge end of the cylinder and adapted to nearly close the same, substantially as described.

4. In a rotary drying apparatus the combination with the drying-cylinder having internal longitudinal ribs and intermediate inlets for drying gases, of a damper arranged across the discharge end of the cylinder and adapted to nearly close the same, substantially as described.

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

HERBERT H. WING.

Witnesses:

MARVINE GORHAM,

CHAS. L. KIRTLAND.