No. 685,243. Patented Oct. 29, 1901.

L. ATWOOD.

DRYING APPARATUS.

(Application filed Jan. 5, 1900.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 2.

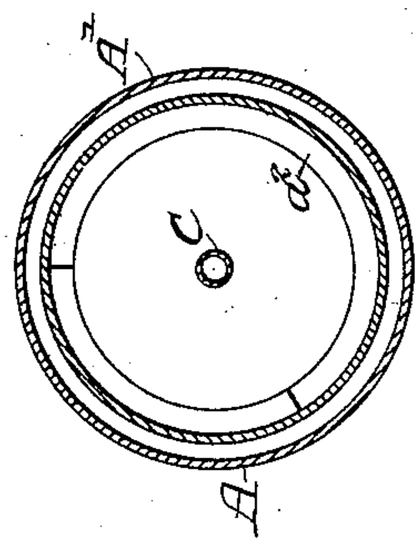

Fig. 1.

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Fig. 3.

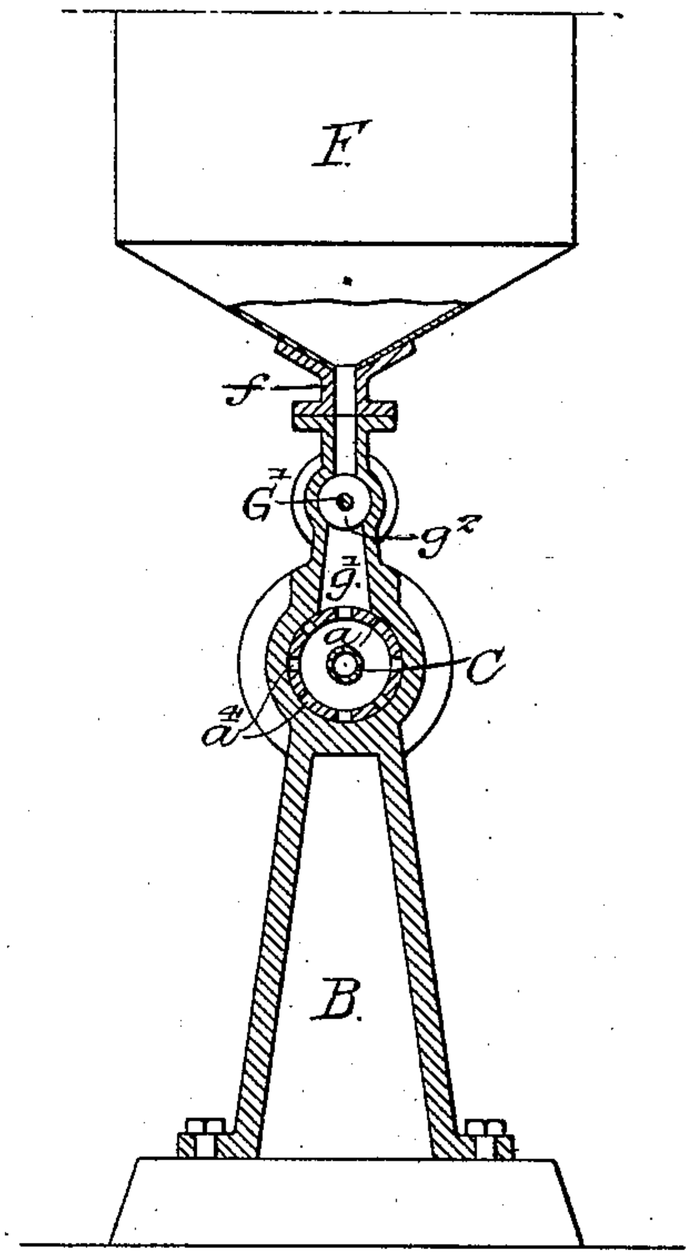
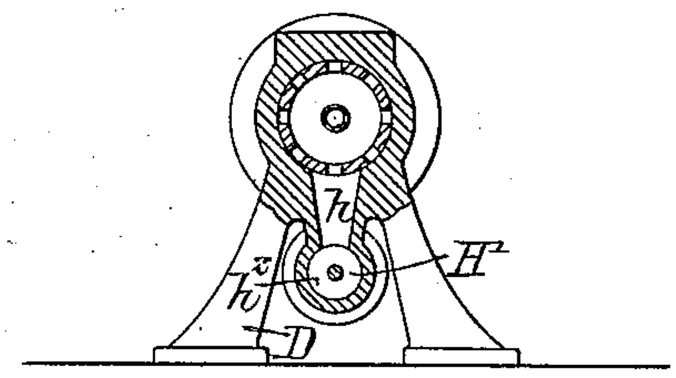


Fig. 4.



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UNITED STATES PATENT OFFICE.

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DRYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 685,243, dated October 29, 1901.

Application filed January 5, 1900. Serial No. 458. (No model.)

To all whom it may concern:

Be it known that I, LEONARD ATWOOD, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Drying Apparatus, of which the following is a specification.

The main object of my invention is to dry granular material under a partial vacuum in such a manner that the damp material will be exposed to a large drying-surface during the first part of the process and the surface will gradually decrease as the material is dried.

A further object of the invention is to provide means whereby the material will be fed into and discharged from the drying-cylinder in small quantities.

In the accompanying drawings, Figure 1 is a longitudinal sectional view of my improved apparatus. Fig. 2 is a sectional view on the line 2 2, Fig. 1. Fig. 3 is a sectional view on the line 3 3, Fig. 1, and Fig. 4 is a sectional view on the line 4 4, Fig. 1.

A is a tapered drum mounted in an inclined position, with the large diameter at the upper end.

B and D are bearings to which are adapted the journals a and a' of the drum. These journals are less in diameter than the drum and are hollow, so that the material can be fed to and from the drum through the journals. Packing-glands b and d are provided, so as to make the joints perfectly tight, yet will allow the drum to revolve freely in the bearings.

Surrounding the drum A is a casing A', forming a steam-jacket by which the drum is heated. A steam-pipe c passes through a packing-box d' in a cap d^2, adapted to the bearing D. This pipe is connected to a steam-supply pipe c' and communicates in the present instance with the small end of the steam-jacket, as shown clearly in Fig. 1.

c^2 represents valves to relieve the pressure in the jacket or to drain the jacket of water of condensation.

E is a worm-wheel secured to the drum A and gearing with a worm e on the driven shaft E', so that the drum will revolve slowly. Other forms of gearing may be adopted for imparting motion to the drum without departing from my invention. In the present instance within the drum is a spiral rib a^2 for imparting a slow forward motion to the material within the drum, and I preferably arrange ribs a^3 within the journals a, so as to feed the material from the inlet-opening to the body of the drum.

Passing through the head b', which is provided with a stuffing-box, is a vacuum-pipe C, which is preferably perforated on its under side, as shown in Fig. 1, and extends well into the body of the drum. This pipe C is coupled to a vacuum-pump or other means of causing a partial vacuum in the drum.

F is a hopper for the material to be dried. This hopper communicates through a neck f with a feed-casing G, having passages g g'. The passage g' is tapered and communicates with the bearing of the journal a of the drum. The piston-valve G' has a tapered passage-way g^2, and on the reciprocation of the valve the material is conveyed from the passage g and discharged into the passage g'.

In the journal a are a series of slots a^4, through which the material is fed from the passage g' into the body of the drum. The object of providing these narrow passages is to allow for the complete distribution of the material in small quantities, so that all the material will come in contact with the heated surface of the drum.

At the discharge end of the apparatus is a valve-casing H, in the present instance forming part of the bearing D. This casing has discharge-passages h h', and the valve H' has a tapered passage h^2, so that on the reciprocation of the valve H' the material as it is discharged from the drum will pass through the passage h and into the valve-chamber h^2 and will be conveyed and discharged through the discharge-passage h'. The journal a' at the outlet end of the drum is also slotted similar to the journal at the feed end of the drum; but this is not absolutely essential, although preferable.

In order to operate the valves G and H' in unison, I connect the valves to a lever M, which is pivoted at m to the frame of the machine and is driven by a driving-shaft N through a connecting-rod n, attached to the lever and to the crank on the shaft N. The rod of the valve G' is connected to a link m', which in turn is coupled at m^2 to the slotted

arm of the lever M. By moving the pivot-point m^2 toward or from the pivot-point m of the lever M more or less movement can be given to the valve G', so as to regulate the passage of material to the drum.

The movement of the valve H' need not be regulated and is simply set to open the full width. The valve-rod is connected by a link p to a lever P, pivoted at p' to a suitable standard. The other arm of the lever P is connected to the lever M by a long rod m^3 in the present instance, so that as the shaft N revolves the valves will open and close the supply and discharge passages, allowing for the steady flow of small quantities of material to and from the drum.

My invention is especially adapted for drying brewers' grain, although it may be used for drying any material which can be traversed through the drum and which it is desired to dry.

By having the drum tapered, with the inlet at the large end of the drum, and by feeding small quantities of material to the drum I am enabled to thoroughly dry the grain or other material by its coming in direct contact with the heated surface of the drum, as it is spread out over the extended surface at the large end of the drum, and as the material dries it is fed toward the small end of the drum and accumulates at that end until discharged, and thus it will not be readily parched. There are suitable stays placed between the jacket A' and the casing of the drum, so as to not only keep the jacket in position in respect to the drum, but also to strengthen the entire structure.

It will be understood that the valve-operating mechanism may be modified, and the details of construction may also be modified, without departing from the main feature of my invention.

I claim as my invention—

1. The combination of a tapered, jacketed drum mounted in an inclined position, bearings therefor, means for feeding material to and from said drum, means for creating a partial vacuum in said drum and means for revolving the drum, substantially as described.

2. The combination of a tapered, jacketed drum mounted in an inclined position, hollow trunnions on said drum, bearings for said trunnions, conduits leading to said heating-jacket and means for conducting material to and from said drum, a vacuum-pipe communicating with the interior of the drum, the conduits leading to the heating-jacket, the inlet and outlet passages for the material and the vacuum-pipe all entering through said trunnions, substantially as described.

3. The combination of a tapered jacketed drum having trunnions at each end, bearings therefor, means for feeding material to and from said drum, a vacuum-pipe entering the drum through one trunnion and a steam-pipe entering the drum through the other trunnion, said steam-pipe communicating with the jacket of the drum, substantially as described.

4. The combination in a drying apparatus, of a drum consisting of a hemispherical section attached to a section having the shape of a frustum of a cone, trunnions thereon and a steam-jacket surrounding said drum, a spiral rib for giving a forward motion to material within the drum, slotted openings for inlet and outlet of material, and steam and exhaust pipes in said trunnions, and piston-valves for controlling the passage of material through the drum, substantially as described.

5. The combination of an inclined tapered drum, a jacket therefor, hollow trunnions on the drum communicating with the interior thereof, said trunnions being slotted, bearings for the trunnions of the drum, passages in said bearings and valves for controlling the flow of material through the passages to and from the drum, substantially as described.

6. The combination of a drum for drying materials, means for heating the drum, trunnions on the drum through which the material is fed, valves having tapered passages therein and passages in the valve-casings communicating with the trunnions, driving mechanism for reciprocating the valves, with means for adjusting the inlet-valve to regulate the flow of material therethrough, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LEONARD ATWOOD.

Witnesses:
WILL. A. BARR,
JOS. H. KLEIN.