No. 808,081. PATENTED DEC. 26, 1905.

A. W. FRENCH.

APPARATUS FOR COOLING AND DRYING OIL CAKE.

APPLICATION FILED NOV. 14, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

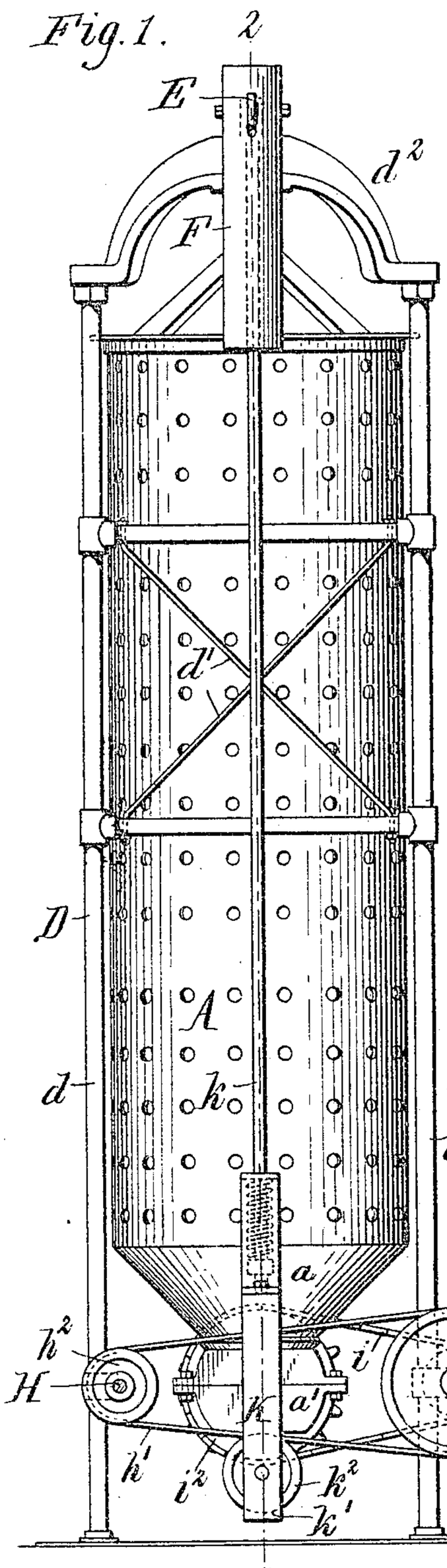
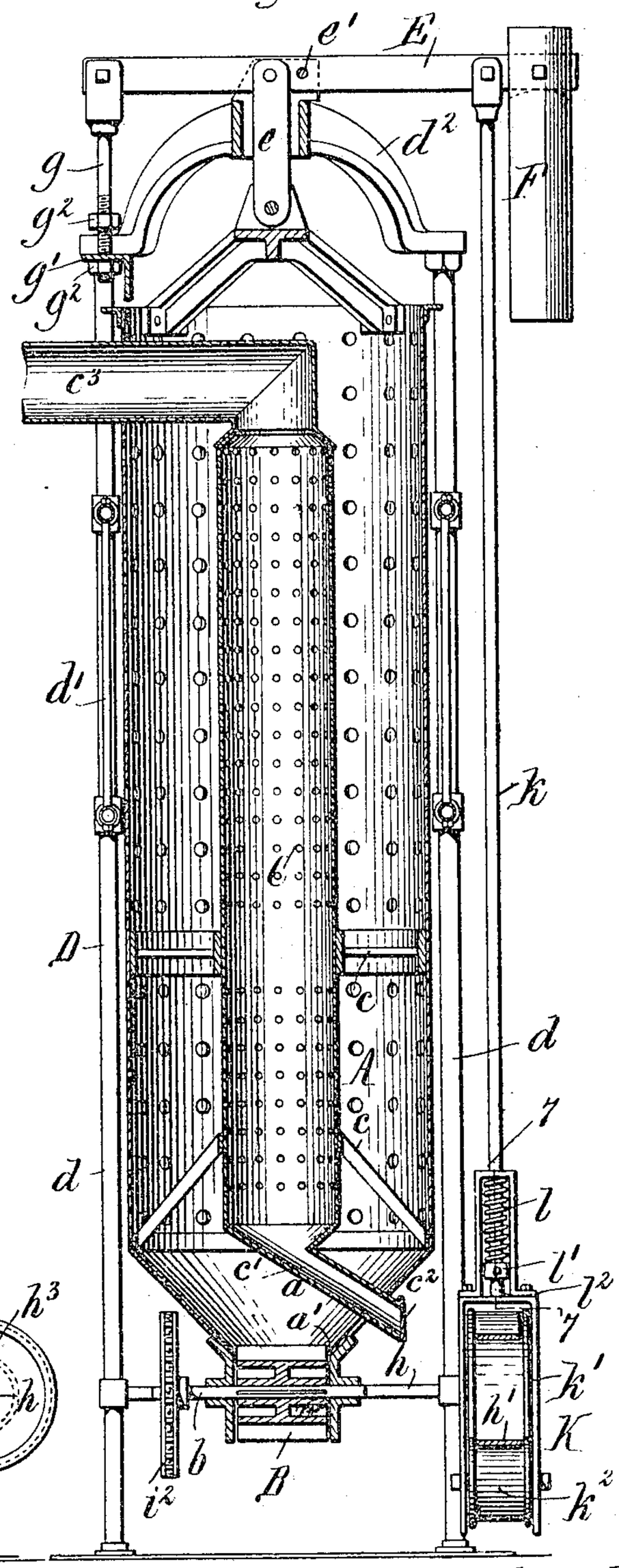


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

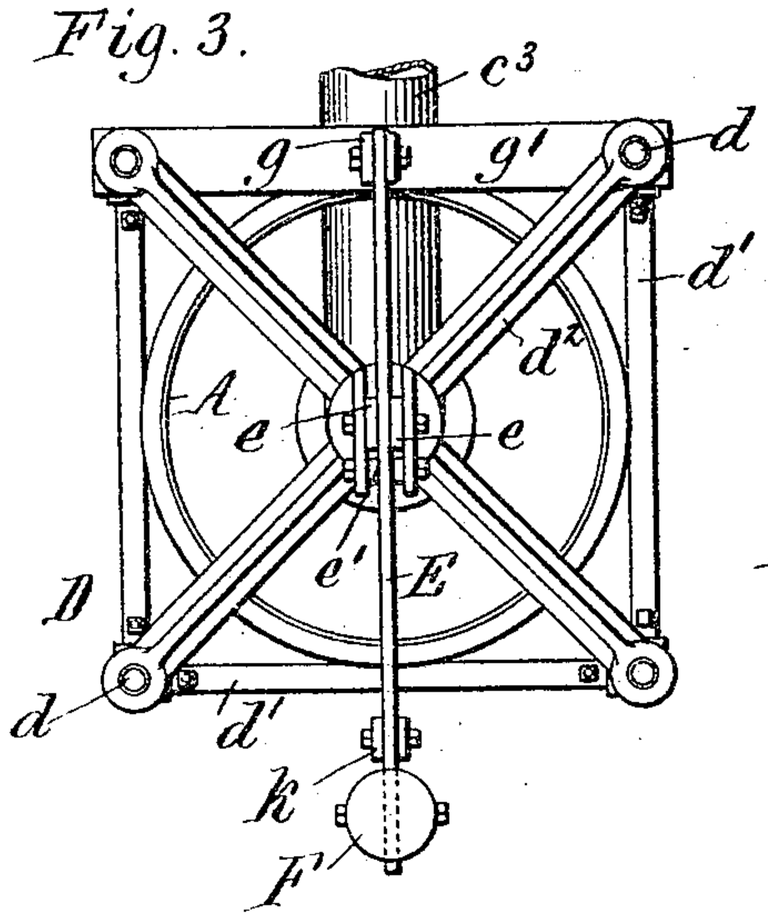


Fig. 4.

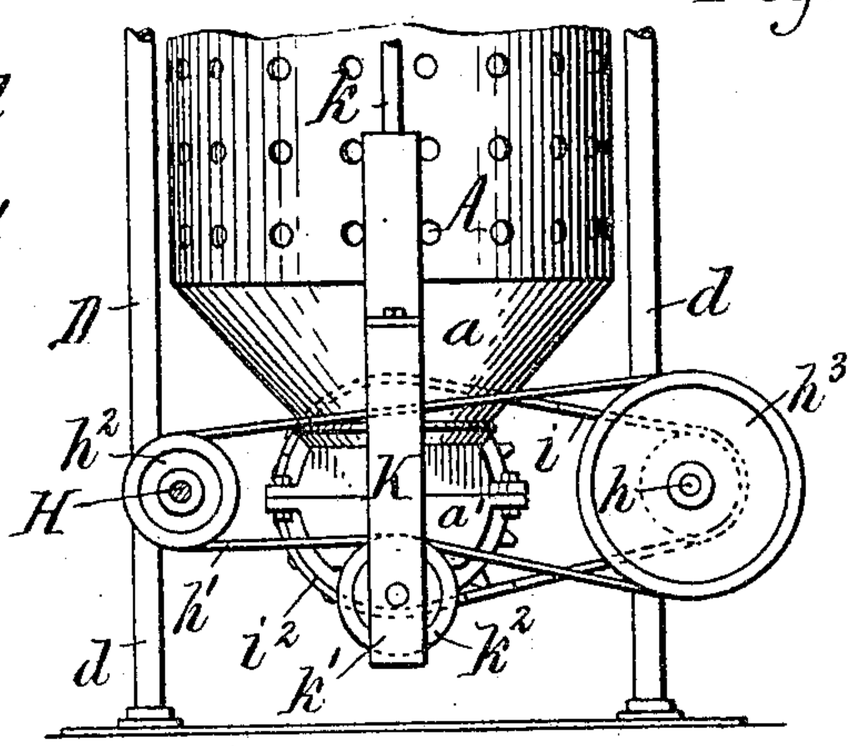


Fig. 5.

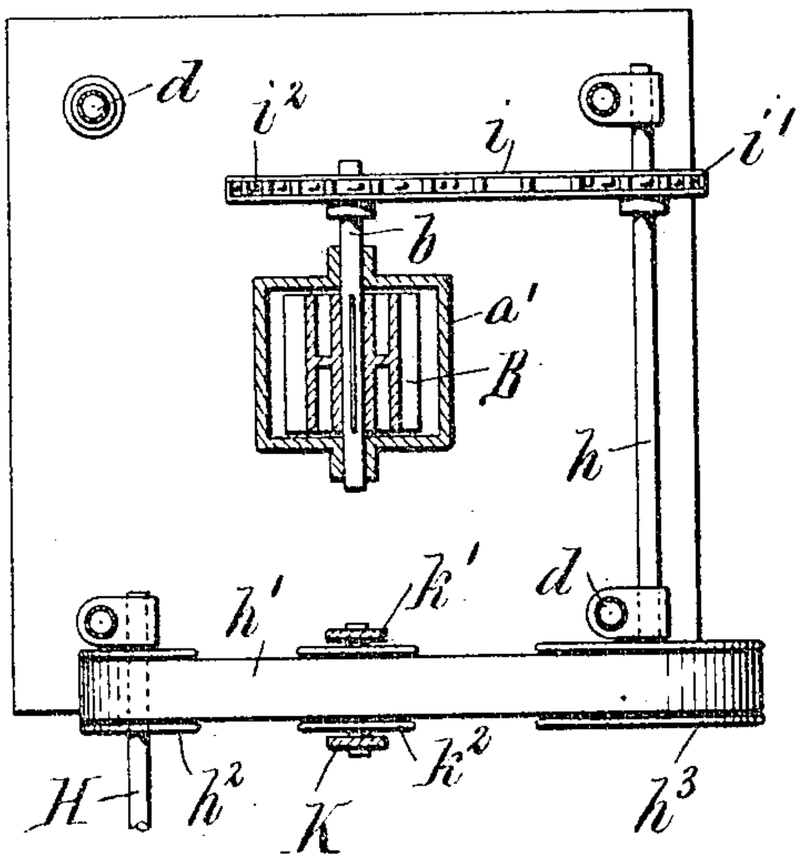


Fig. 6.

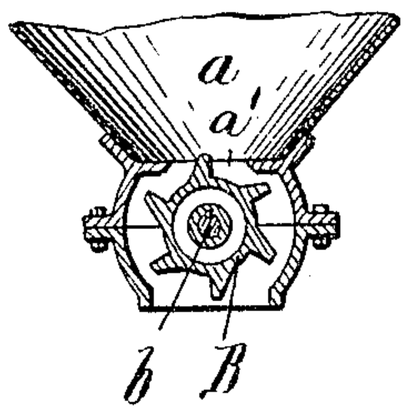
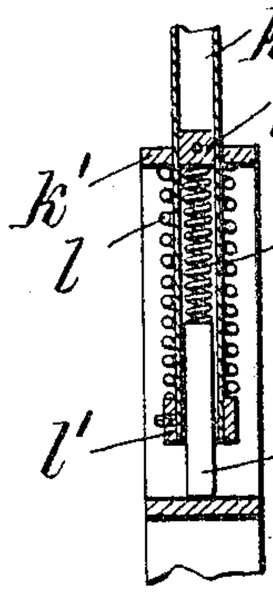


Fig. 7.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR COOLING AND DRYING OIL-CAKE.

No. 808,081. Specification of Letters Patent. Patented Dec. 26, 1905.

Application filed November 14, 1904. Serial No. 232,578.

To all whom it may concern:

Be it known that I, ALFRED W. FRENCH, a citizen of the United States, residing at Piqua, in the county of Miami and State of Ohio, have invented a new and useful Improvement in Coolers and Driers for Oil-Cake and other Materials, of which the following is a specification.

This invention relates to cooling and drying machines for divided solid material in which the material to be treated is spouted or delivered into a cooling and drying chamber and is removed therefrom by an automatic discharge mechanism in such manner that the material is retained in the apparatus and subjected to the cooling and drying operation for a predetermined period of time necessary to reduce the temperature and moisture of the material under treatment to the desired degree.

The cooler and drier forming the subject-matter of this application is designed especially for cooling and drying broken or crushed hot oil-cake to prepare it for reduction to meal in the attrition-mill; but the apparatus is also capable of use for cooling and drying other divided or granular solid material and also for otherwise treating such material to alter its physical properties or condition.

In the accompanying drawings, consisting of two sheets, Figure 1 is an elevation of a cooling and drying machine embodying the invention. Fig. 2 is a sectional elevation thereof in line 2 2, Fig. 1. Fig. 3 is a top plan view thereof. Fig. 4 is a fragmentary elevation thereof, showing the discharge mechanism in operative relation. Fig. 5 is a plan view, partly in horizontal section, of the discharge mechanism. Fig. 6 is a section of the discharge-throat of the cooling-receptacle and discharge device. Fig. 7 is a detail section, on an enlarged scale, in line 7 7, Fig. 2, of the cushioning device for the belt-tightener.

Like letters of reference refer to like parts in the several figures.

A represents an upright cooling and drying receptacle, into the upper end of which the material to be treated is introduced and from the bottom of which the material is discharged from time to time in a more or less continuous manner when properly cooled and dried to make room for new material in the receptacle. The latter preferably consists of a hollow perforated metal cylinder or shell having an open upper end and a conical bottom *a*, provided with a contracted discharge-throat *a'*, in which is a discharge device consisting in the present instance of a rotatable toothed or ribbed roller B, carried by a shaft *b*, which is journaled in suitable bearings on opposite sides of the discharge-throat.

C represents a perforated tube or cylinder for distributing air or other suitable cooling medium through the material in the receptacle. The distributing-tube is supported centrally in the receptacle A by arms or the like *c*, connecting it with the receptacle, and preferably terminates at its lower end in a contracted chute *c'*, which projects through the bottom of the receptacle and is closed by a gate c^2, enabling the discharge of any fine material which collects in the distributing-tube. The upper end of the tube is connected by a pipe c^3 and flexible or movable pipe (not shown) with some means for passing air through the distributing-tube and material in the receptacle. The material will be cooled by contact with the cooler air and by the evaporation of its moisture which is taken up by the air. The air passing through the material finds vent through the perforations and open upper end of the receptacle.

While the construction described is deemed preferable, receptacles of other known construction and other known means for circulating a cooling medium therethrough could be employed.

The receptacle is mounted to move vertically on a suitable supporting structure or frame D and by such movement controls the action of the discharge device. The supporting-frame D shown in the drawings consists of upright columns *d*, rising from a suitable base, diagonal braces *d'* for the upper portions of the columns, and a top casting d^2, rigidly connecting the upper ends of the columns. Any other suitable frame may be employed. The receptacle is preferably suspended by links or the like *e* from a lever E, which is fulcrumed in any suitable manner at *e'* on the top of the frame D and is provided at one end with a weight F, which is just heavy enough to balance the weight of the receptacle and attached parts when the receptacle is filled with material to a predetermined desired height. Means are provided for limiting the vertical movement of the receptacle, consisting in the construction shown of a rod *g*, Fig. 2, which is connected to the lever E and passes through a hole in a horizontal bar *g'* of the stationary frame and is provided on opposite sides of said bar with adjustable stops or nuts g^2.

The drive mechanism for the discharge device B and the start-and-stop means therefor operated by the movement of the receptacle are preferably constructed as follows: H, Figs. 1, 4, and 5, represents a drive-shaft, which is suitably journaled at the lower portion of the frame D and driven by means not shown, and *h* a counter-shaft journaled in bearings on the frame D and driven from the drive-shaft H by a belt *h'*, running on pulleys h^2 h^3 on the drive and counter shafts, respectively. The counter-shaft and shaft *b* of the discharge-roller are connected by a sprocket-chain *i*, running on sprocket-wheels i' i^2 on said respective shafts. The drive-belt *h'* normally runs loose, and the counter-shaft is not driven thereby until the belt is tightened. This is accomplished by a start-and-stop device or belt-tightener K, consisting of a vertical rod *k*, connected at its upper end to the weighted lever E, adjacent to the weight and provided at its lower end with a frame *k'*, in which is journaled beneath the drive-belt *h'* a belt-tightening pulley k^2. As long as the drying and cooling receptacle is not filled to the desired maximum extent the weighted lever holds it in its raised position and holds the belt-tightening pulley down out of contact with the drive-belt *h'* or so low that the belt runs loosely on its pulleys. When the receptacle is filled to the desired extent, it descends under the weight of the material and lifts the weighted end of the lever E and the belt-tightener, thereby tightening the drive-belt *h'* and driving the discharge device.

The operation of the cooler and drier is as follows: The hot crushed oil-cake or other material to be treated is spouted or otherwise fed into the drying and cooling chamber of the receptacle A around the air-distributing pipe until the desired amount is admitted. The air passes from the perforated inner distributing-cylinder into and through the cake, drying and cooling it, and escapes through perforations and the open top of the receptacle. When more cake enters the receptacle, the latter descends under the added weight, thereby raising the weighted end of the lever E and belt-tightener K, tightening the drive-belt *h'* and starting the discharge device, as above explained. The discharge device is not simply a gate, but acts to positively feed or draw the cake out of the receptacle. It continues in action until the loss in weight of material in the receptacle allows the weighted end of the lever E to descend, lifting the receptacle and lowering the belt-tightener, so as to stop the discharge device. The operation when properly regulated keeps the cake at a constant level in the receptacle, discharging and admitting equal amounts from time to time, and thus making the action practically continuous after the receptacle is once filled. The capacity of the apparatus and rate of discharge are such that the cake is retained therein sufficiently long to be properly dried and cooled. To prevent undue strain on the drive-belt for the discharge device, a suitable cushioning device is interposed between the weighted lever and belt-tightener wheel. The device shown for this purpose consists of a coil-spring *l*, Figs. 2 and 7, surrounding the belt-tightener rod *k* between a collar *l'* thereon and an extension of the frame *k'* for the belt-tightener pulley, and a plunger l^2 in the lower end of the rod *k*, which is pressed outwardly against a cross-bar of the frame *k'* by a spring l^3 in the rod *k* between the plunger and a fixed stop l^4. The opposing action of the two springs *l* and l^3 relieves the belt-tightener from sudden jars and strains in both directions. Other means actuated by the rise and fall of the receptacle could be employed for starting and stopping the discharge device or roller.

I claim as my invention—

1. The combination of a receptacle into which the material to be treated is fed, means for changing the physical condition of the material in the receptacle, a discharge device for positively removing the material from the receptacle, drive mechanism for said discharge device, and means controlled by the weight of the material in the receptacle for regulating the action of the drive mechanism for said discharge device to maintain a substantially constant weight of material in the receptacle, substantially as set forth.

2. The combination of a movably-supported receptacle into which the material to be treated is fed, means for changing the temperature of the material in the receptacle, a discharge device which operates to positively remove the material from the receptacle, and means controlled by the movements of said receptacle due to changes in weight of the material therein for operating said discharge device to maintain a substantially constant weight of material in the receptacle, substantially as set forth.

3. The combination of a receptacle into which the material to be treated is fed, means for changing the temperature of the material in the receptacle, a lever which carries the weight of the material in the receptacle, a discharge device, means for operating said discharge device to positively remove the material from the receptacle, and means controlled by said lever for regulating said operating means, whereby said discharge device maintains a substantially constant weight of material in the receptacle, substantially as set forth.

4. The combination of a receptacle into which the material to be treated is fed, means for changing the temperature of the material in the receptacle, a weighted lever carrying said receptacle, a rotary discharge-roller which positively removes the material from the receptacle, and means controlled by said weighted lever for driving said discharge-

roller to maintain a substantially constant weight of material in the receptacle, substantially as set forth.

5. The combination of a receptacle into which the material to be treated is fed, means for changing the temperature of the material in the receptacle, a weighted lever supporting the receptacle, a rotary discharge device for the receptacle, mechanism for rotating said discharge device including a loose belt, and a belt-tightener connected to said lever and actuated thereby to control the operation of said discharge device, substantially as set forth.

6. The combination of a receptacle into which the material is fed, means for changing the physical condition of the material in the receptacle, and means for maintaining a substantially constant weight of material in the receptacle comprising a weighted lever supporting the receptacle, a rotary discharge device mounted on the receptacle, a shaft connected to said discharge device, a loose drive-belt for said shaft, and a belt-tightener connected to said weighted lever for tightening said drive-belt, substantially as set forth.

7. The combination of a receptacle into which the material is fed, a weighted lever supporting the receptacle, a rotary discharge device mounted on the receptacle, a shaft connected to said discharge device, a loose drive-belt for said shaft, a belt-tightener connected to said weighted lever for tightening said drive-belt, and a cushioning device between said weighted lever and belt-tightener for relieving the same and the belt from sudden strains, substantially as set forth.

Witness my hand this 24th day of October, 1904.

ALFRED W. FRENCH.

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