No. 676,681. Patented June 18, 1901.

C. MALLINSON.

CONDITIONING OR DRYING APPARATUS.

(Application filed Sept. 25, 1900.)

(No Model.) 2 Sheets—Sheet 1.

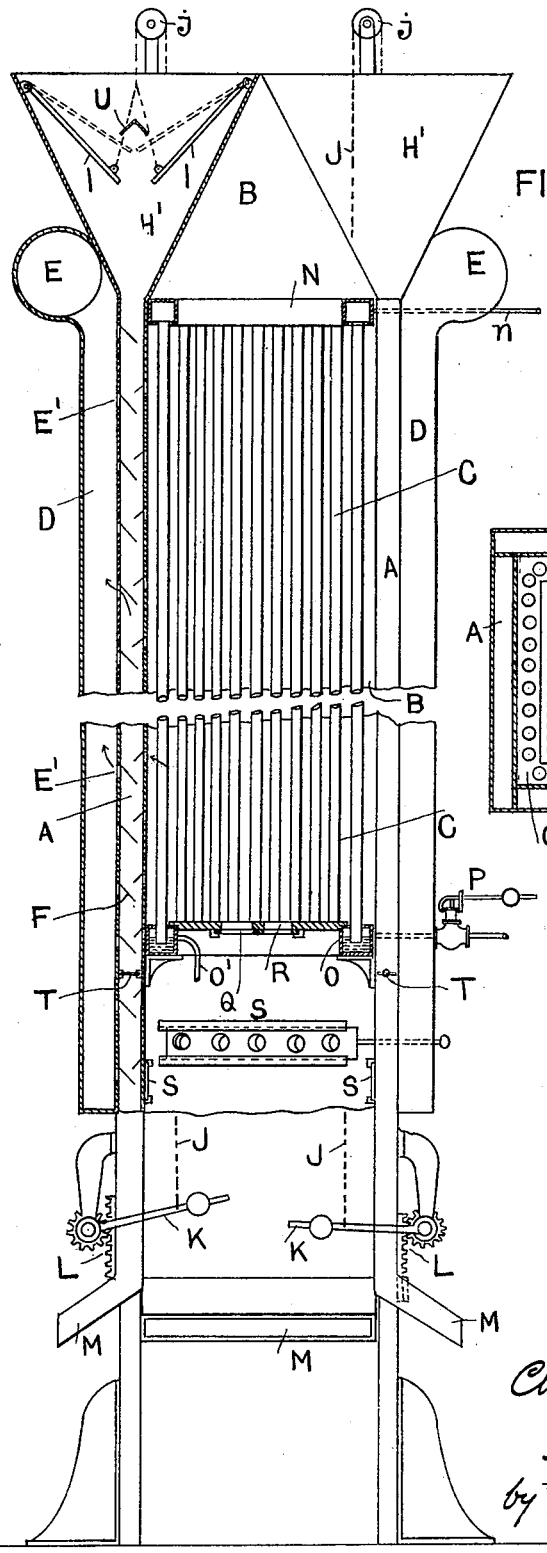

FIG. 1.

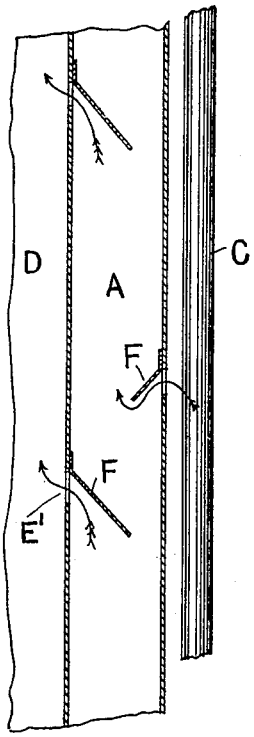

FIG. 3.

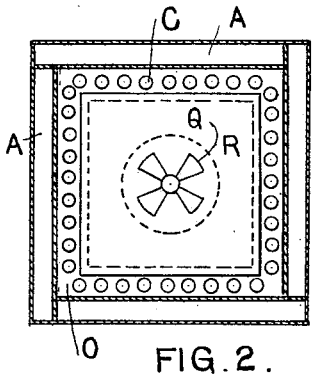

FIG. 2.

Witnesses
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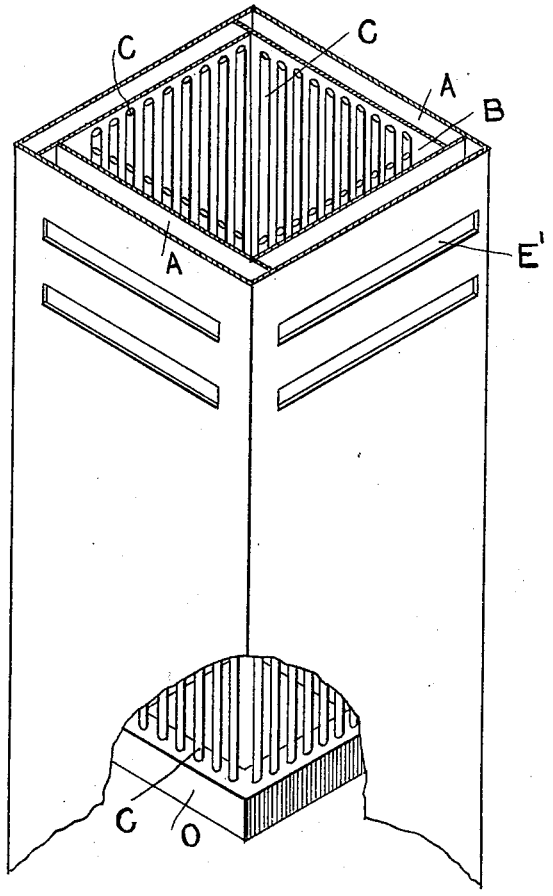

FIG. 4.

Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES MALLINSON, OF LIVERPOOL, ENGLAND.

CONDITIONING OR DRYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 676,681, dated June 18, 1901.

Application filed September 25, 1900. Serial No. 31,093. (No model.)

To all whom it may concern:

Be it known that I, CHARLES MALLINSON, a subject of the Queen of Great Britain, residing at Liverpool, in the county of Lancaster, England, (whose post-office address is 69 Great Mersey street, Liverpool, aforesaid,) have invented certain new and useful Improvements in Conditioning or Drying Apparatus, of which the following is a specification.

This invention relates to apparatus for conditioning and drying grain, berries, sugar, seeds, tea, coffee, cochineal, crystals, and granular or pulverulent material generally, into which the produce or other material, after being washed, drained, or otherwise treated, is placed and then falls by gravity and is finally delivered in a dried condition. An apparatus having a like object is described in the specification of my Letters Patent No. 645,366, of 1900, which apparatus is designed especially for drying hard grain. My present invention has been especially designed for drying material that does not require the natural hardness to be reduced, but does require the native or acquired moisture-extracting, while at the same time improving the color of the product under treatment without the necessity of employing any bleaching material. To this end I arrange the apparatus in a straight line with vertical casings or trunks arranged, preferably, in a square around a central hot-air chamber, down which trunks the material to be desiccated flows in thin streams or layers.

The invention will be understood from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional elevation of the apparatus; Fig. 2, a sectional plan; Fig. 3, an enlarged section of a portion of Fig. 1; Fig. 4, a perspective view showing the vertical casings or trunks arranged in a square around the central hot-air chamber.

A represents vertical casings or trunks arranged upright in a straight line and preferably in a square around the central hot-air chamber B, though of course they can be arranged in a triangle or a hexagon or other suitable shape. Down these trunks the material to be desiccated flows in thin streams or layers. Inside the hot-air chamber B, external to the trunks, are rows of steam or hot-water pipes C, placed in proximity to the sides of the trunks, and around the outside of the trunks are vapor or exhaust shafts D, connected with suitable exhaust-fans at E. Consequently as the material never comes into contact with the pipes the pipes can be placed nearer together than if they were located in the trunk. Openings or perforations E′ are provided in the trunk A, leading to the hot-air chamber B and to the exhaust-shaft D, adapted to admit hot air to the trunks A and to draw off the moisture therefrom into the exhaust-shafts D. In order to distribute the hot air among the grain, I provide deflectors F at intervals. These deflecting-plates are inclined downward for a short distance from the walls on the inside of the trunks A, the effect of these plates being to protect the openings or perforations E′ and keep them clear and at the same time slightly turn over the produce as it descends. They are located at intervals along the whole length of the trunks. At the bottom of each trunk valves L are provided adapted to deliver the material from the trunks A through spouts M. Hoppers H′ are provided at the tops of the trunks, into which the wheat is fed, so that the vertical trunks are always kept full of produce, the rate of descent being regulated to a nicety by the rate at which the valves L discharge. At top of the hot-air chamber B is arranged a steam-chest N, into which the pipes enter and from which they are fed by means of a steam-pipe *n*. At bottom the steam-pipes drain into a water-tank O, the discharge rising through the water to the top of the tank, from whence it is led away to a steam-trap through pipe O′.

P is a safety-valve from tank O.

The steam-pipes C terminate considerably above the bottom of the grain-trunks A, so as to leave a cold-air space below the hot-air chamber B and separated therefrom by a partition R. This cold-air chamber is provided so that a current of cool air can be passed through the produce before finally leaving the machine. This can be drawn by the fans through the stream of descending produce into D before said produce finally leaves the machine. This arrangement dispenses with

the use of a separate cooler and makes the apparatus self-contained.

S is one of a number of valves for regulating the amount of cold air admitted to pass from the cold-air chamber into the grain-trunks.

T is a slide placed in the grain-trunks at or near the termination of the steam-pipes. In starting the machine these slides are closed, so as to insure all the produce being acted upon by the hot air before being allowed to descend and be subjected to the current of cold air. After that they are left open and the work is continuous. When the machine is in full work, the rate of descent of the grain can be regulated by valve L, so as to keep the produce under treatment for the length of time required before being discharged.

As a larger number of pipes C can be used, owing to their being placed external to the trunks, the steam-chest referred to in my prior patent can be dispensed with, and an operator can obtain access to the inside of the hot-air chamber by removing the partition R, thus facilitating repairs. The partition R is furnished with valves Q, which admit air into the hot-air chamber by suction of the fans. By turning the valves the amount of air admitted can be regulated.

If now the exhaust-fans E be put into operation, a stream of air is drawn from the hot-air chamber B into the trunk A through the perforations or openings E′, said air passing on its way between the rows of steam or hot-water pipes C, thus heating the air before it enters the trunks. This air therefore, passing, as it does, between the pipes before it enters the trunks, is thoroughly heated and extracts the moisture from the produce, and so passes through the produce and through the perforations on the other side into the exhaust-shaft D. The deflecting-plates F are adapted to check the wheat in its fall and to turn it over at intervals while breaking up the stream of material as it descends, so that the air-currents may act upon it with the greatest possible effect. They also deflect the produce from the hot side to the exhaust side alternately all the way down. The air-current, moreover, being upward and in an opposite direction to the stream of downward material acts to keep the material under treatment in a light buoyant state, thus allowing the hot air to get free access to every particle of the material and have the moisture extracted to any degree required. By adjusting the valve L, so as to regulate the rate of discharge to a nicety, the rate of discharge is regulated and the vertical trunks are thereby always kept charged full of wheat, besides keeping the produce under treatment for any length of time required. As the hot air is exhausted through the wheat at intervals of every few inches, every grain of wheat is continuously subjected to the currents of hot air, while before finally leaving the machine this downward current of wheat is exposed to a current of cool air which is passed through it from the cold-air chamber by the suction of the exhaust-fans.

I arrange a pair of doors or gates I, hinged at opposite sides of the hopper, so as to converge together at their adjacent edges, and kept closed by being counterweighted, preferably by a cord or wire J, passing over pulleys *j* and coupled to counterweighted levers K, which are geared to the valve L, that controls the delivery-spout end of the apparatus. The arrangement is such that when the feeding gates or shutters I are closed the delivery-valve L is also closed, so that the apparatus will always be kept full of grain and will not empty. The feeding gates or shutters I aforesaid incline downward at an angle of about forty-five degrees. When, therefore, there is not sufficient grain being fed into the hopper to overcome the counterweighted lever K, the gates will close automatically by the counterweight, the delivery-valve also closing automatically at the same time; but when pressure is applied by feeding grain or other material into the hopper the doors I will automatically open and admit grain into the open space below, filling it to such an extent as will prevent the fan drawing grain through the exhaust. The opening of the gates or shutters I automatically opens the valve L in the delivery-spout M and so puts the apparatus into work.

U is a hood located immediately above the converging edges of the doors I, which is adapted to relieve the excessive weight of the grain at that particular point. By this arrangement the grain or other product is delivered exactly into the center of the hopper H′, and when sufficient has accumulated the shutters or gates I open equally and the grain or produce falls from the center to both sides of the hopper beneath, and thus fills the hopper equally and maintains the grain or other produce to such a height or thickness in the hopper that the fan cannot get a suction through it such as will carry grain through the exhaust.

I declare that what I claim is—

1. In an apparatus for drying grain and like granular or pulverulent materials, the combination of straight upright trunks, having inlet and outlet ventilating-apertures at opposite sides of said trunks; a deflecting-plate over each of such inlet and outlet apertures; a central hot-air chamber surrounded by said upright trunks; rows of vertical heating-pipes within said chamber in close proximity to the walls of said trunks; exhaust-shafts surrounding said trunks; and means for drawing hot air through said hot-air chamber, trunks, and exhaust-shafts, substantially as described.

2. In an apparatus for drying grain and other granular or pulverulent material, the combination of straight upright trunks; a hopper mounted at the top of each trunk; valve-doors hinged within said hoppers and adapted to open downward to allow material

to pass through into said trunks; a hood adapted to deflect the material away from the center of said valve-doors; a valve at the discharge end of said trunks; and a weighted lever adapted to operate simultaneously the closing of said valve-doors and discharge-valve, substantially as described.

3. In an apparatus for drying grain and other granular or pulverulent material, the combination of upright trunks; a central hot-air chamber surrounded by said trunks; a series of heating-pipes within said chamber in close proximity to said trunks, and terminating at their lower ends considerably above the bottom of said trunks; a cold-air chamber beneath said heating-pipes and hot-air chamber; and ventilating-apertures adapted to admit air into said trunks from both hot and cold air chambers, substantially as described.

4. In an apparatus for drying grain and other granular or pulverulent material, the combination of upright trunks; a central hot-air chamber surrounded by said trunks; a series of heating-pipes within said chamber in close proximity to said trunks, and terminating at their lower ends considerably above the bottom of said trunks; a cold-air chamber beneath said heating-pipes; means for conveying hot and cold air respectively from said hot and cold air chambers through the trunks; and valves in said trunks adapted to separate the part thereof communicating with said hot-air chamber from the part communicating with said cold-air chamber, substantially as and for the purpose set forth.

5. In an apparatus for drying grain and other granular or pulverulent material, the combination of upright trunks; a central hot-air chamber surrounded by said trunks; a series of heating-pipes within said chamber in close proximity to said trunks, and terminating at their lower ends considerably above the bottom of said trunks; a cold-air chamber beneath said heating-pipes; a removable partition between said hot and cold air chambers; and means for drawing air from said hot and cold air chambers through said trunks, substantially as described.

6. In an apparatus for drying grain and other produce, the combination of upright trunks; central hot and cold air chambers surrounded by said trunks; heating-pipes within said hot-air chamber in close proximity to the walls of said trunks; and valves S adapted to regulate the amount of air passing through said cold-air chamber and trunks, substantially as described.

In witness whereof I have hereunto signed my name, this 7th day of September, 1900, in the presence of two subscribing witnesses.

CHARLES MALLINSON.

Witnesses:
G. C. DYMOND,
J. MCLACHLAN.