Sept. 13, 1932. F. H. DOUTHITT 1,877,648

APPARATUS FOR THE DESICCATION OF SUBSTANCES

Original Filed June 27, 1927 2 Sheets-Sheet 1

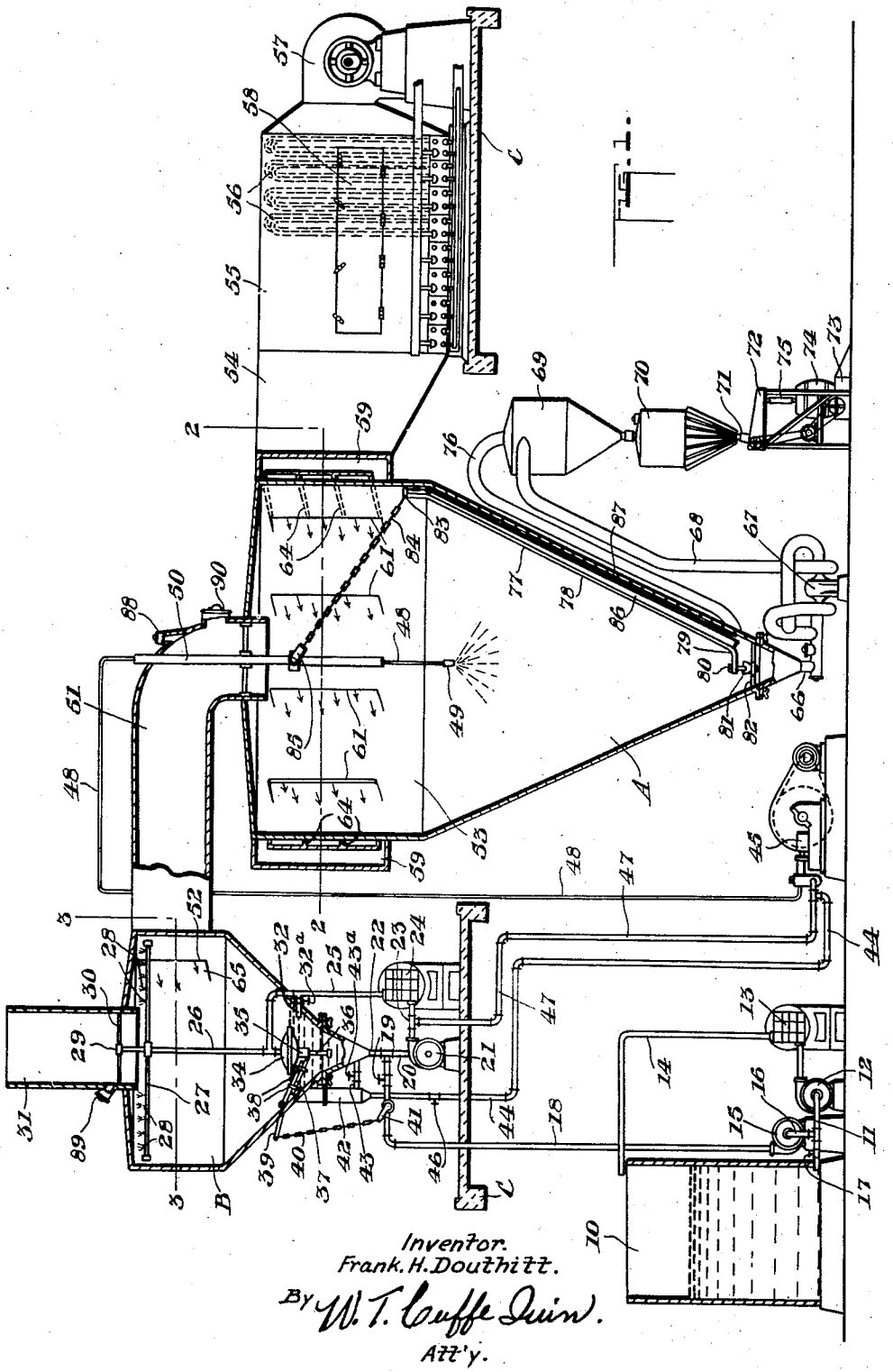

Fig. 1.

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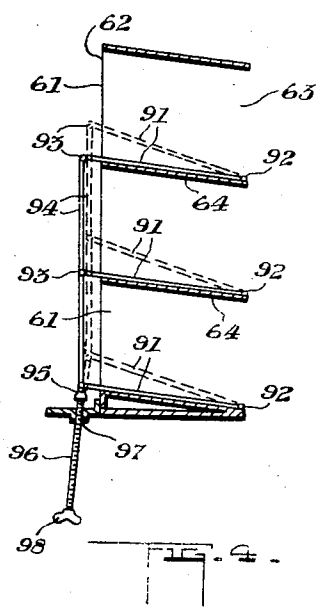

Fig. 4.

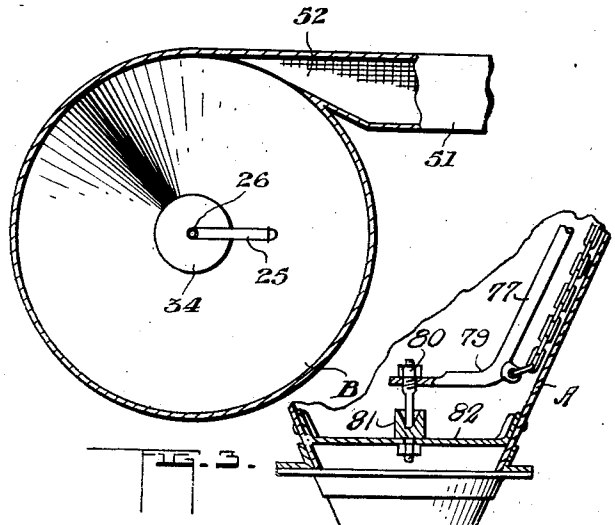

Fig. 3.

Fig. 5.

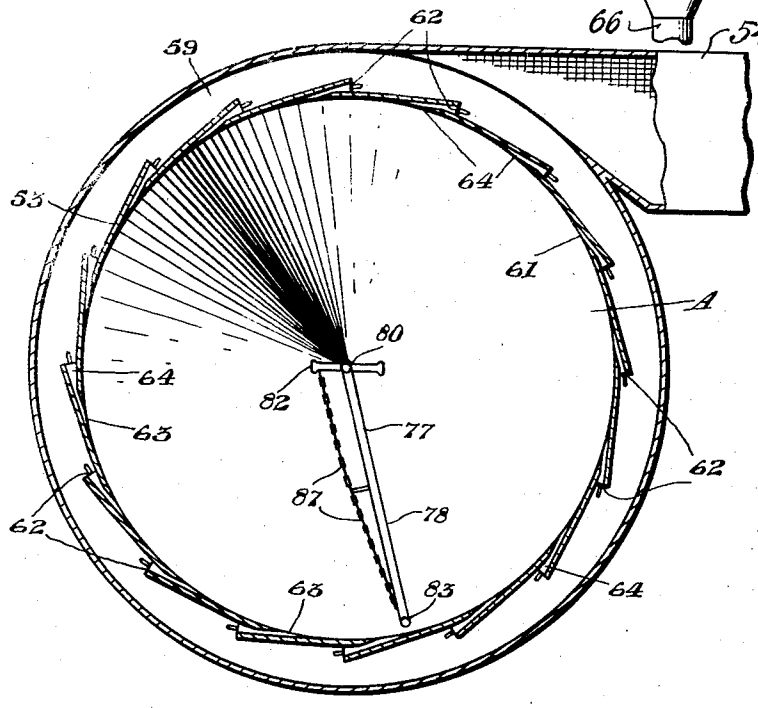

Fig. 2.

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UNITED STATES PATENT OFFICE

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APPARATUS FOR THE DESICCATION OF SUBSTANCES

Original application filed June 27, 1927, Serial No. 201,847. Divided and this application filed April 27, 1929. Serial No. 358,581.

The invention relates to apparatus for desiccating substances and is a division of application #201,847 filed June 27th, 1927, since matured into U. S. Patent No. 1,797,055 which in turn is an improvement in or development of the method and apparatus for desiccating substances described in U. S. patent specifications #1,078,948—#1,107,794 and U. S. application #78,313 filed December 30th, 1925.

The efficiency of the apparatus is increased by the provision of improved means for keeping the walls of the drying chamber clear to prevent deposit thereon, particularly in the case of sticky solids or solids which tend to become sticky at the temperature at which the apparatus is usually operated.

With such objects in view, the main features of novelty of the present invention consist in:—

A device for scraping the interior of the drying chamber, comprising a support carrying the scraping means proper and provided with a universal joint or its equivalent at the lower end and suspension means such as a chain at the upper end.

Referring now to the drawings in which like characters of reference indicate corresponding parts in each figure.

Figure 1 is a general view of the aparatus as a whole, principally in sectional elevation.

Figure 2 is a section on the line 2—2 of Figure 1.

Figure 3 is a section on the line 3—3 of Figure 1.

Figure 4 is a sectional detail showing the means for adjusting the openings from the wind box into the drying chamber while finally,

Figure 5 is an enlarged detail of the universal joint.

In the example of my improved apparatus shown in the drawings, A designates the drying chamber and B the collector. The liquid to be treated is first introduced into a supply tank 10 of any suitable form and here shown as a wood vat suitably lined to preserve the contents. Leading from this tank is a delivery pipe 11 connected to a centrifugal pump 12 which delivers into a heating device 13, the character of which more or less depends on the liquid or substance being treated. When, as in the present instance, milk is being treated the device 13 may be a heater and a pasteurizer. It may on the other hand, be in the form of a cooler or may under certain conditions be dispensed with altogether.

From the heater 13, a pipe 14 leads back into the supply tank 10 whereby in operation a continuous circulation is provided. Connecting the delivery pipe 11 with a centrifugal pump 15 is a branch pipe 16 while a control valve 17 is provided in the pipe 11. The centrifugal pump 15 is connected to a pipe 18 provided with a manually operable valve 19 near its upper end leading to a pipe 20 communicating with the centrifugal pump 21, the pipe 20 communicating at its other end, as at 22, with a discharge in the bottom of the collector B and the centrifugal pump 21 connecting through a pipe 23 with a heater 24 which is in turn connected through a pipe 25 to a vertical pipe 26 within the collector. On the pipe 26 and near the top thereof is rotatably mounted, a horizontal pipe 27 provided with a plurality of nozzles 28 from which the liquid under treatment issues in jets. The end of the vertical pipe 26 is supported as at 29 on a cross bar 30 in the exhaust conduit 31 of the collector B. A branch pipe 32 leads from the pipe 25 into the collector and is provided with a valve 32^a whereby the proportion of liquid which will flow up the pipe 26 is regulated and whereby the exhaust moisture-laden air from the drying chamber is washed before being discharged through the collector conduit 31 and whereby any dried particles escaping from the drying chamber A are entrapped and moistened to be brought down into the liquid in the collector and reheated on the way to the drying chamber thus ensuring that nothing in the way of solids can possibly escape and that the moistened air exhausted from the collector B contains nothing but moisture. A circulation system and return is thus automatically provided for the liquid or substance being dried.

For automatically regulating the supply of liquid to the collector B I provide an improved form of control comprising a float 34 mounted on a sleeve 35 vertically slidable on the lower end of the pipe 36 which forms a guideway for the float. The sleeve 35 is, in lieu of the bell crank lever system described in my previous application # 78,313, provided with an arm 37 hingedly connected thereto and having fixed thereto spaced loops or eyes 38 slidably adapted to engage with an arm or rod 39 pivoted on a wall of the collector B and having connected to its outer end a chain 40 in turn connected to a valve 41 in the pipe 18.

Communicating with and attached to the collector B is a settling device or container 42 of any suitable size and shape, into which the liquid from the collector may pass and settle after reaching a certain level. The container communicates with the lower end of the collector by means of the pipe 43 which is provided with a regulating valve. The pipe line 44 connecting the base of the container 42 and the high pressure pump 45 is provided with a shut-off valve 46 by which means the settling device may be shut off at will and dispensed with.

From the foregoing it will be seen that the liquid in the supply tank 10 is first heated and pasteurized by means of the supply pipe 11, centrifugal pump 12, heater 13 and return pipe 14. It is then pumped by the centrifugal pump 15 through pipe 18 and pipe 20 to pump 21 whence it is pumped through the heater 24 and through the branch pipe 32 into the collector and also into the pipe 26 and nozzle-carrying pipe 28 therein. On a predetermined level being reached by the liquid in the centrifugal the float automatically operates the valve 41 to shut off the supply and the liquid already supplied either passes to the settling device 42 and then through the pipe 44 to the high pressure pump 45 or by way of the pipe 20 and centrifugal pump 21 to the pipe 23 and into the pipe 47 communicating with the pump 45.

The function of the pump 45 is to force the heated liquid coming through the pipe 47 from the collector B or from the collector B through the settling device 42 through a pipe 48 to the spray nozzle 49 located centrally within the drying chamber A. The pipe 48 in the example shown enters the drying chamber through a sleeve 50 which extends through a portion of the centrally arranged exhaust conduit 51 of the drying chamber which communicates tangentially as at 52 (see Figure 3) with the collector B. Thus the liquid, in this case milk, is supplied to the atomizer nozzle 49 through the pipe 48 communicating with the high pressure pump 45 driven from any suitable source of power and adapted to maintain a high and uniform pressure.

As more particularly illustrated in Figure 2, the cylindrical portion 53 of the drying chamber is provided with an air duct 59 peripherally spaced from the cylindrical portion and communicating with the casing whereby in combination with the blower 57 and the heating coils 56 hot air under pressure is supplied to the duct 59.

The substance to be treated, for example milk, is discharged centrally through the nozzle 49 into the falling cyclonic current of heated air established in the chamber by being introduced thereinto through the tangential slots 61 forming nozzle-shaped members tapering inwardly and slanting downwardly in the air duct wall.

The atomized particles will, through the action of centrifugal force, be caused to travel outwardly to be finally arrested by the confining walls of the chamber, down which they fall to the discharge 66 in the bottom or lower end of the drying chamber A.

The powder from the drying chamber A is discharged through the opening 66 in the lower end, which communicates with a power-driven disintegrator consisting of spirally arranged pipes and a blower 67, so that the heavier of the atomized particles will by centrifugal action be thrown to the outer wall of the spiral and there be broken up and the moisture liberated, while the lighter particles will be drawn from the inner portions of the spirals and directly up through the delivery duct 68. This duct or conduit 68 leads to traps 69 and 70 provided with suitable delivery spout. The upper trap 69 has a pipe 76 leading back to the lower end of the driving chamber A for the purpose of returning thereto any solid particles that fail to descend from the traps 69 and 70 at the same time providing an outlet for the air currents.

Co-ordinating with the foregoing which automatically hardens and dries the particles and thus prevents their sticking to the walls of the drying chamber mechanical means are provided in the form of a sweep 77 comprising a rod 78 curved at its lower end at substantially right angles, as at 79 and pivotally mounted at 80 on a universal joint member 81 arranged in a bearing in a cross bar 82. The rod 78 extends slantwise parallel with and spaced from the converging wall of the drying chamber and is straightened at its upper end as at 83 and there suspended by a chain 84 connected to a collar 85 mounted on a suitable bearing on the sleeve 50. A tapering vane 86 is secured longitudinally on this rod, projecting outwardly and adapted to be engaged by the whirling vortex of air whereby the sweep as a whole is continuously kept in motion around the wall of the drying chamber.

As particularly illustrated in Figure 2, lengths of chains 87 are connected to the vane

more effectively to sweep the wall and remove any particles which have adhered thereto.

This improved construction, comprising the universal jointed support on which the sweep is pivotally mounted and the suspension means for the sweeper rod, ensures a more rapid and uniform sweeping movement of this member when the apparatus is in operation, whereby cleaning and sterilizing of the drying chamber is facilitated, as from its mounting it may be swung and bent in any direction; whereas, in the construction heretofore known in the art it was generally necessary to remove the sweeper before the drying chamber could be conveniently and thoroughly cleaned out and sterilized.

The whirling air causes the sweeper to revolve dragging the chains along the sides of the converging walls to remove any deposits thereon and allow them to drop into the discharge in the bottom of the chamber.

Modifications may be made in the apparatus above described within the scope of the claims without departing from the spirit or scope thereof.

What I claim for my invention is:

1. Apparatus of the character described for desiccating substances in which the material is sprayed into whirling currents of moisture absorbing air in a conical drying chamber, a sweep member automatically operable by the said air currents and mounted at its lower end to swivel in all directions, a ring member adapted to rotate around the central axis of the drying chamber, and flexible suspension means connecting the upper end of the sweep with said ring, and trailer chains for the sweep adapted to bear against the walls of the drying chamber.

2. In an apparatus of the character described, the combination with a drying chamber, and means for creating a whirling zone of moisture absorbing air in said chamber, and means for introducing material in atomized form into said whirling zone, of means for automatically sweeping the walls of the drying chamber comprising a universal joint supported adjacent to and accessible from the bottom of the drying chamber, a rod bent at its lower end to engage with the universal joint and intermediately adapted to lie parallel with the walls of the drying chamber, a vane integral with said rod for engagement by the whirling air, a ring member at the central axis of the drying chamber, and a chain connecting the ring with the upper end of the rod whereby the whirling air automatically causes the sweeping means to travel continuously around the walls of the drying chamber, and trailer scraping means associated with the vane carrying-rod for continuous contact with said walls.

3. Arrangement for drying and pulverizing damp or liquid raw material, in which the raw material is treated in a cone-shaped drying chamber by means of whirling streams of air and the streams of air move one or more rubbing blades along the wall of the drying chamber, thereby characterized, that every blade is attached at the lower end by a universal joint and at the upper end is hung by means of a chain attached in a known manner to a ring that can revolve around the mid-axis of the drying chamber.

4. Arrangement according to claim 3, with drag chains attached to the rubbing blades and fitting close against the inner wall of the drying chamber, thereby characterized, that to each rubbing blade only one drag chain stretching over the entire length of the blade is fastened with both ends.

In witness whereof I have hereunto set my hand.

FRANK HOWARD DOUTHITT.