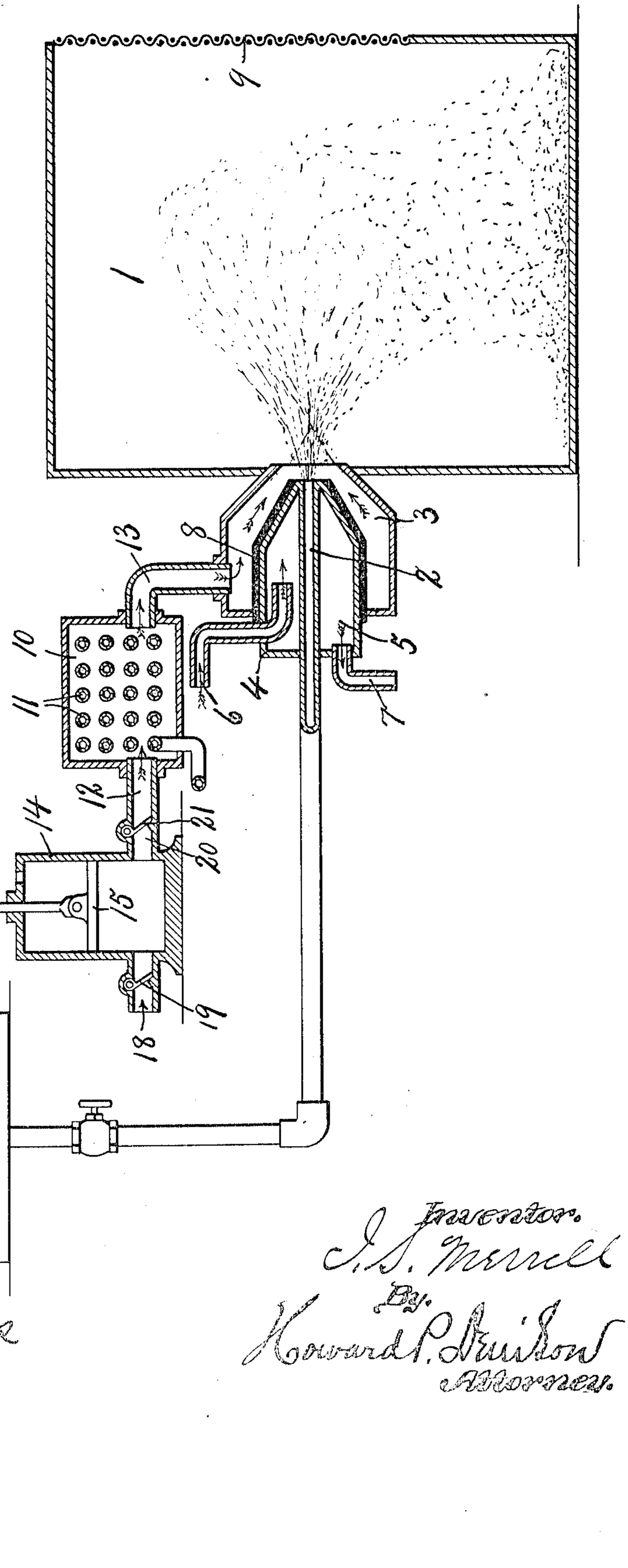
I. S. MERRELL.

DESICCATING APPARATUS.

APPLICATION FILED JULY 29, 1907.

954,451. Patented Apr. 12, 1910.



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DESICCATING APPARATUS.

954,451. Specification of Letters Patent. **Patented Apr. 12, 1910.**

Application filed July 29, 1907. Serial No. 386,026.

To all whom it may concern:

Be it known that I, IRVING S. MERRELL, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Desiccating Apparatus, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to certain improvements in apparatus for desiccating the constituent solids of liquids, such as milk and other liquids containing a large amount of moisture. In this class of apparatus the liquid is introduced in a finely divided state or spray, together with the moisture-absorbing gas, as air, into a suitable desiccating chamber where the moisture of the finely divided particles is rapidly taken up and carried off by the absorbent gas or air, leaving the solids in the form of a dry powder containing the same properties and characteristics as existed in the original liquid and adapted to be collected separately from the moisture-laden air or gas. This system of desiccation requires the use of some form of atomizer or spraying device in which the liquid passage is necessarily small and, therefore, easily congested or clogged by the constituent solids of the liquids, when heated moisture-absorbent is used unless some provision is made for keeping the temperature of the liquid normal, or below that of the heated moisture-absorbent while in transit through the atomizer or spraying device to the desiccating chamber.

In my present apparatus which is employed in carrying out the process described in my pending application Serial No. 386,025, filed July 29, 1907 I preferably employ heated air as the moisture-absorbent, which is introduced under pressure through the atomizer and into the desiccating chamber simultaneously with the introduction of the liquid.

My object, therefore, is to insulate the liquid passage of the atomizer against the heat of the moisture-absorbing air passing therethrough so as to prevent the concentration or thickening of the liquid in the liquid passage, and thereby prevent congestion or stoppage of such passage and injury to the solids of the material. In other words, I have sought to maintain an open liquid passage through the atomizer by either insulating such passage from the heated moisture-absorbent, or by cooling said passage by means of a circulating cooling agent surrounding same, or by both of these means, if necessary.

Other objects and uses relating to the specific construction of the atomizer and relative arrangement of the various parts of the apparatus will be brought out in the following description.

In the drawings—I have shown a sectional view, partly in elevation, of an apparatus for carrying out the objects hereinbefore stated, and comprising essentially a desiccating chamber —1—; a liquid supply conduit —2— and an air conduit —3— surrounding the liquid conduit —2—, and together with said liquid conduit constitutes an atomizer discharging into the desiccating chamber —1—.

The discharge end of the conduit —2— of the atomizer is surrounded by a tubular cap or shell —4— of greater cross sectional area than that of the liquid conduit —2— forming an intervening cooling chamber —5— which is closed at its inner end adjacent to the desiccating chamber —1— and is provided with an inlet conduit —6— and an outlet conduit —7— for the circulation of a cooling agent, as water, which is allowed to circulate freely around the portion of the conduit —2— which is inclosed by the shell —4— so as to keep the temperature of the liquid passing through the conduit —2— normal, or sufficiently below that of the inflowing heated air through the conduit —3— to prevent concentration or thickening of the liquid while in transit through the atomizer to the desiccating chamber.

The conduit —3— for the introduction of heated air into the desiccating chamber is of somewhat greater diameter than the portion of the shell —4— which it incloses, and in order that the liquid passing through the conduit —2— may be further protected from the heat of the moisture-absorbing air passing through the atomizer, a jacket —8— of heat-insulating material, such as asbestos or its equivalent, is interposed between the shells —4— and conduit —3— and is preferably fitted closely upon the outer surface of the portion of the shell —4— surrounded by the air conduit —3— in such manner as to effectively prevent the liquid from absorbing the heat from the air until after the liq-

uid and air are commingled in the desiccating chamber, whereupon the air absorbs and carries off the moisture of the finely divided particles through a screen —9— in one side of the desiccating chamber, leaving the constituent solids in the form of a dry powder which is collected within the desiccating chamber whence it may be removed at will.

Any means may be employed for heating the air in the conduit —3—, and for this purpose I have shown a heating chamber —10— inclosing a system of pipes or conduits —11—, through which the circulating agent, as steam or hot water, may be introduced to heat the air in the chamber —10— which is provided with a supply pipe —12— and outlet pipe —13—, the latter discharging into the conduit —3— of the atomizer. In this class of apparatus it is desirable to introduce the heated air into the desiccating chamber under pressure so as to split up or spray the liquid into the desiccating chamber, where desiccation takes place, as previously stated.

Any suitable device may be employed for forcing the air through the chamber —10— and thence, through the conduit —3— into the desiccating chamber, and for this purpose I have shown an ordinary air pump consisting of a cylinder —14— and piston —15—, the latter being actuated by any suitable mechanism, as a revolving crank-arm —16— and connecting link —17— attached to the piston rod, said pump being provided with an inlet —18— having a check-valve —19—, and is also provided with an outlet —20— and a check-valve —21—, the check-valve —19— opening to admit air on the out-stroke of the piston and closing to prevent reflux on the down-stroke of said piston while the other valve opens on the down-stroke to admit air to the heating chamber —10— and closes on the up-stroke of the piston to prevent reflux of the air from the heating chamber to the pump.

The liquid may be forced through the conduit —2— by any suitable means, preferably by gravity, and for this purpose I have shown a supply tank —22—, as connected to the pipe —2— in a plane some distance above the outlet into the desiccating chamber.

It now appears that the heated air and liquid are introduced simultaneously at substantially the same point into the desiccating chamber, whereby the liquid is split up into a finely divided state, and the particles enveloped by the heated air which rapidly absorbs and carries off the moisture through the screen —9— allowing the dry powdered solids to remain within the desiccating chamber. During this feeding of the liquid and air into the desiccating chamber, the conduit —2— which is surrounded by the heated air conduit —3—, is kept cool by the circulation of a cooling agent through the chamber —5— and around the mouth of the conduit —2—, while at the same time the heat insulation —8— further protects the liquid passing through the conduit —2— of the atomizer against absorbing any of the heat of the heated air in the conduit —3— until after the air and liquid have been liberated in the desiccating chamber.

What I claim is:

1. In combination with a desiccating chamber, a liquid supply conduit discharging into the desiccating chamber, a cooling chamber surrounding the discharge end of the liquid supply conduit, a jacket of heat insulating material surrounding the cooling chamber, and an air conduit surrounding the jacket and also discharging into the desiccating chamber.

2. In a desiccating apparatus, a desiccating chamber, a liquid supply conduit discharging into the desiccating chamber, a cooling chamber surrounding the discharge end of the liquid supply conduit and closed at its inner end nearest the desiccating chamber, a jacket of heat insulating material surrounding the cooling chamber, and an air supply conduit surrounding said jacket and discharging into the desiccating chamber.

3. In a desiccating apparatus, a desiccating chamber, a liquid supply conduit, a cooling chamber surrounding the discharge end of said conduit and closed at its inner end near the desiccating chamber, said cooling chamber being provided with an inlet and an outlet for permitting the circulation of the cooling agent therethrough, a jacket of heat insulating material surrounding the cooling chamber, and an air conduit surrounding the jacket and having a tapering inner end discharging into the desiccating chamber.

4. In a desiccating apparatus of the class described, a desiccating chamber, an air conduit discharging into the desiccating chamber, means for heating the air in transit thereto, a liquid conduit coterminating with the air conduit and discharging into the desiccating chamber, a cooling chamber between the discharge end of the liquid conduit and the discharge end of the air conduit, and a jacket for heat insulation between the cooling chamber and the air conduit.

5. In a desiccating apparatus of the class described, a desiccating chamber, an atomizer discharging into the desiccating chamber and comprising a liquid conduit and an air conduit, means for heating the air passing through the air conduit, and means including a jacket of heat insulating material between the liquid conduit and air conduit for preventing transmission of the heat from the air chamber to the liquid conduit at the point of discharge into the desiccating chamber.

6. In a desiccating apparatus of the class described, a desiccating chamber, an atomizer comprising a liquid conduit and an air conduit discharging at substantially the same point into the desiccating chamber, the air conduit having a tapering inner end whereby the liquid is split up into finely divided particles, means for heating the air in transit to the desiccating chamber, and means including a cooling chamber and a jacket of heat insulating material, both located between the liquid conduit and air conduit for keeping the temperature of the liquid below that of the heated air while in transit to the desiccating chamber.

In witness whereof I have hereunto set my hand this 27th day of July 1907.

IRVING S. MERRELL.

Witnesses:
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