R. W. G. STUTZKE.

PROCESS AND APPARATUS FOR DESICCATING FLUID SUBSTANCES.

APPLICATION FILED DEC. 28, 1915.

1,215,889. Patented Feb. 13, 1917.

Fig. 1.

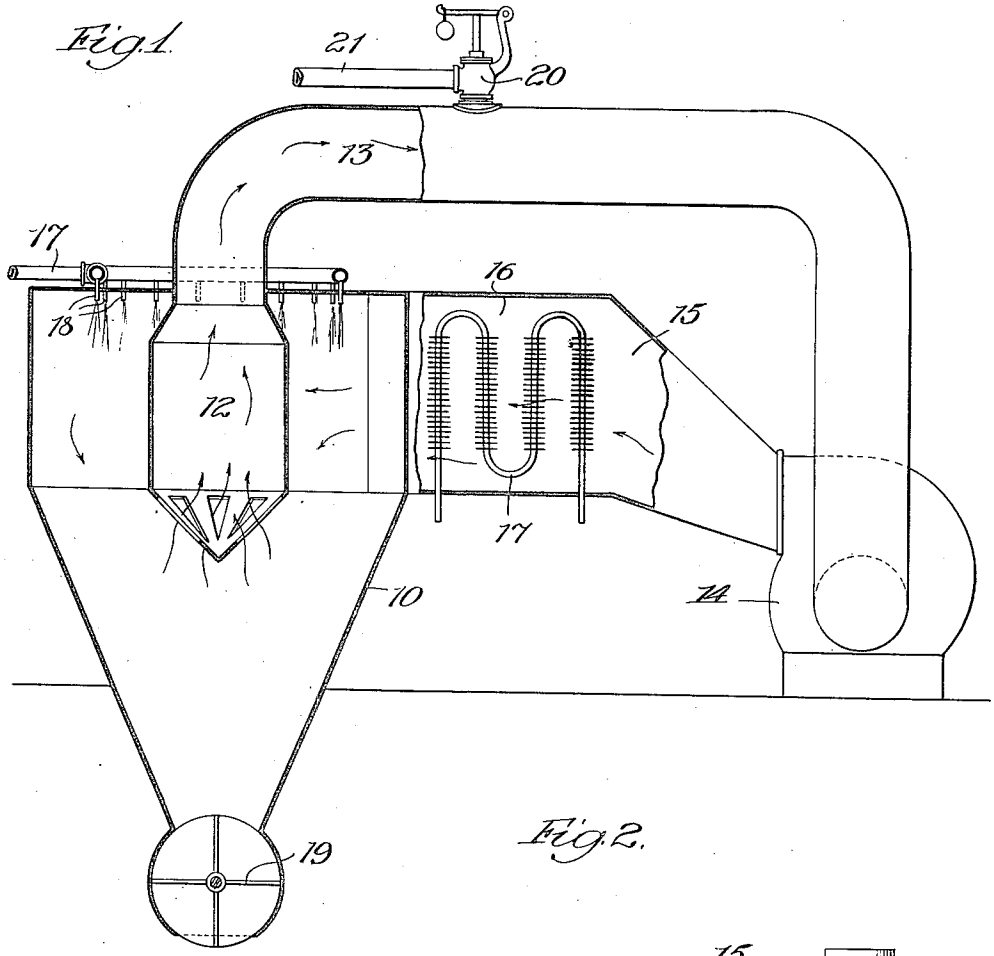
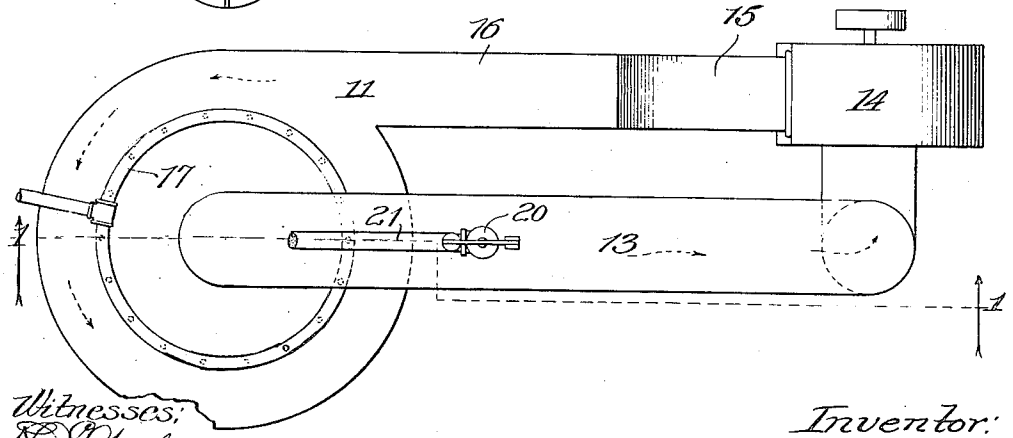


Fig. 2.



Witnesses:

Inventor:

Richard W. G. Stutzke

By Dyrenforth, Lee, Chritton & Wiles

Attys.

UNITED STATES PATENT OFFICE.

RICHARD W. G. STUTZKE, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO G. ARTHUR BUHL, OF CHICAGO, ILLINOIS.

PROCESS AND APPARATUS FOR DESICCATING FLUID SUBSTANCES.

1,215,889. Specification of Letters Patent. Patented Feb. 13, 1917.

Application filed December 28, 1915. Serial No. 69,075.

To all whom it may concern:

Be it known that I, RICHARD W. G. STUTZKE, a subject of the Emperor of Germany, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Processes and Apparatus for Desiccating Fluid Substances, of which the following is a specification.

My invention relates to the art of desiccating fluid substances carrying solid matters in solution or in suspension therein. The object of the invention is to provide an improved process for accomplishing such desiccation and an improved form of apparatus for carrying out the process.

The invention will be more fully understood from the following detailed specification which is descriptive thereof and from the drawings accompanying and forming a part of the same.

In this drawing, Figure 1 is a diagrammatic vertical sectional view, partly in elevation, of a simple form of desiccating apparatus constructed in accordance with my invention, and Fig. 2 is a top plan view of the same.

It may be said by way of introduction that my process of desiccation involves the continuous use of the same desiccating medium, this medium being circulated and recirculated through a practically-closed system of conduits, nothing entering the system save the solution which is to be desiccated, and nothing leaving it save the desiccated product and the moisture removed therefrom. The only energy used in the process (aside from radiation and leakage losses) therefore is that relatively small amount required to continuously circulate the medium, together with those heat units actually required to evaporate the moisture from the product to be desiccated at the working pressure.

The desiccating chamber of my apparatus is in the form of a cyclone dust collector, designated by the numeral 10 in the drawings and having the usual tangential inlet 11 at its upper cylindrical portion and a depending outlet pipe 12 having openings in its lower end and arranged axially within the desiccation chamber. The outlet 12 communicates with a conduit 13 leading to the inlet side of a circulating pump which, as shown in the drawings, is of the conventional centrifugal type and designated by 14. From the tangential outlet of this centrifugal circulating pump an outlet conduit 15 leads to a heating chamber 16 which may be heated as by means of the pipe coil 17. The heating chamber 16 opens directly into the cyclone inlet 11. The lower end of the cyclone collector has the ordinary conical formation and is provided at the bottom with a four-armed dumping gate 19. A loaded outlet valve 20 which may be set at any desired pressure is located in a convenient position along the length of the outlet conduit 13, and may discharge into a pipe 21 which may vent directly to the atmosphere or to another collector as will later appear.

The operation of the apparatus above described is as follows:

The escape valve 20 will be set for a certain predetermined pressure, for instance, one fourth of an atmosphere, a suitable heating fluid will be admitted to the coil 17, and the circulating pump 14 will be driven to cause the air within the apparatus to circulate therethrough in the direction shown by the arrow in the drawing. When sufficient time has been given for the entire apparatus, including the air therewithin, to reach a drying temperature of say, 250° F. or thereabout, the fluid substance to be desiccated is admitted through the pipe 17 and sprayed out of the nozzles 18 into the annular chamber of the cyclone collector. As the fluid is sprayed into the desiccation chamber 10 the moisture is evaporated therefrom and the resultant solid particles are, by the action of the cyclone collector, thrown to the bottom of the chamber while the moisture laden air passes outwardly through the central outlet 12 and by means of the conduit 13 is conducted to the circulating fan thence over the heating coil 17 to be again heated, and from the latter into contact with the issuing jets of fluid again. The continuous evaporation of moisture completely saturates the air within the circulating system in a very short time and due to the heating effect of the coil 17 the moisture continues to be evaporated, causing a rise in pressure within the apparatus. When the pressure has reached the predetermined level the valve 20 opens, and in the normal operation of the apparatus will remain open, adjusting its opening to the rate

of supply of moisture and heat within the circuit. The air which originally occupied the closed system is very soon entirely displaced by evaporated moisture or steam, and in the normal operation of the system after that time is reached, the desiccating medium is steam which has been superheated by the coils 17. Each cubic foot of this superheated steam as it enters the desiccating chamber 10 is capable of absorbing a fixed quantity of moisture with the resultant tendency to rise in pressure, which tendency is offset by the opening of the valve 20. The cyclone collector will be effective to separate practically all of the dried products from the outgoing current of saturated steam. If it is found that any appreciable quantity of the dried powder is escaping through the valve 20 and outlet conduit 21, the latter may be vented into any desired form of collecting chamber for the deposit of this powder.

The higher the pressure maintained within the closed system, the smaller the circulating pump 14 may be. Such higher pressures, of course, inevitably entail a higher temperature for superheating the steam within the system, and for this reason as well as because of the difficulty in constructing a large apparatus capable of withstanding high internal pressures, and of packing the joints and glands of such apparatus, such high pressures will not ordinarily be resorted to, except where compactness is greatly to be desired.

When using my apparatus for desiccating milk, eggs, sugar solutions, and the like, I prefer to operate under pressures only slightly in excess of atmospheric, it being in fact a great convenience to so regulate the internal pressures that at the bottom of the cyclone collector 10, the pressure may be so little above or below atmospheric that the dumping gate 19 may be dispensed with and an ordinary aperture made use of.

While I have shown and described in considerable detail one specific embodiment of my invention, and the exact manner in which the process is carried out in such embodiment, it is to be understood that this showing and description is illustrative only and for the purpose of making my invention more clear, and that I do not regard the invention as limited to these details, nor to any of them, except in so far as I have included the same within the terms of the following claims, in which it is my intention to claim all novelty inherent in my invention as broadly as is possible in view of the prior art.

What I claim as new and desire to secure by Letters Patent is:

1. The process of evaporating liquids which consists in spraying the liquid into an atmosphere of its own vapor, circulating the said atmosphere and superheating it during its circulation, and venting the evaporated moisture from the circulating system.

2. The process of evaporating liquids which consists in spraying the liquid into an atmosphere of its own vapor under pressure, circulating the said atmosphere and superheating it during its circulation, and venting the evaporated moisture from the circulating system.

3. The process of desiccating liquids carrying solid substances therein, which consists in spraying the said liquids into a closed chamber, maintaining a circulation from and back to the said chamber, continuously supplying heat to the circulating fluid, venting the evaporated liquids from the circulating system, and collecting the desiccated solids.

4. The process of desiccating liquids carrying solid substances therein, which consists in spraying the said liquids into a collecting chamber, setting up a circulation from and back to the said chamber, continuously supplying heat to the circulating fluid, venting the evaporated liquids from the circulating system at a point removed from the said collecting chamber, and collecting the desiccated solids within the said chamber.

5. The process of desiccating liquids carrying solid substances therein which consists in spraying the said solids into the tangential inflow portion of a cyclone collector, setting up a circulation from the outlet of the said collector back to the said tangential inlet, continuously supplying heat to the circulating fluid, venting the evaporated liquids from the circulating system, and collecting the desiccated solids within the said cyclone collector.

6. A desiccation apparatus comprising a circulating system, means for setting up a circulation of gases within the said system, means for supplying heat to the circulating medium, means for spraying a liquid to be desiccated into the said circulating medium, and means for venting the said circulating system to limit the pressure therein.

7. A desiccation apparatus comprising, in combination, a collecting chamber, a circulating system for conveying fluid from the said chamber and back to the same again, means for setting up a circulation through the said system, means for supplying heat to the said circulating medium, means for spraying a liquid to be desiccated into the said collecting chamber, and means removed from the said collecting chamber for venting the said circulating system to limit rise of pressure therein.

8. A desiccation apparatus comprising, in combination, a cyclone collector, means for spraying a liquid to be desiccated into the

tangential inlet portion of the said collector, a circulating system leading from the outlet of the said collector back to the said tangential inlet, means for setting up a circulation through the said system, and means for venting the said system to limit rise of pressure therein.

9. A desiccation apparatus comprising, in combination, a cyclone collector, liquid spray nozzles discharging into the tangential inlet portion of the said collector, an outlet pipe extending from the central outlet of the said collector, a pressure relief valve in the same, a circulating pump in the said outlet pipe, an inlet pipe on the discharge side of the said circulating pump, said inlet pipe leading to the said tangential inlet, and a heater interposed in the length of the said inlet pipe.

RICHARD W. G. STUTZKE.

In presence of—
A. C. FISCHER,
O. C. AVISUS.