

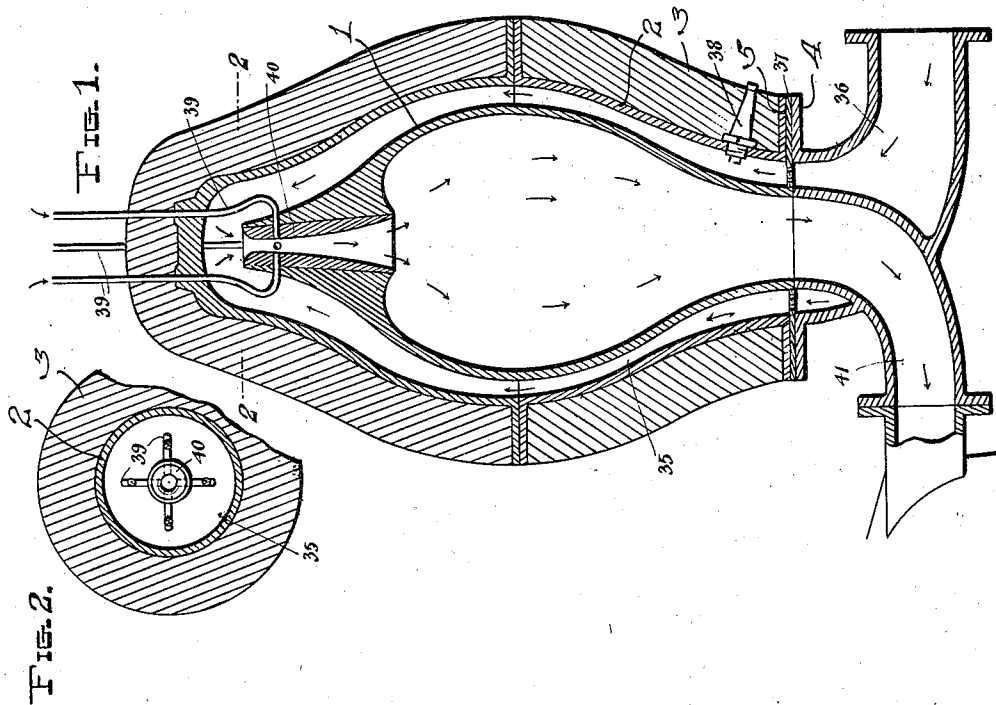
July 23, 1929.

W. S. BOWEN

1,722,175

PROCESS OF AND MEANS FOR DRYING LIQUIDS CONTAINING SOLID CONSTITUENTS

Filed Dec. 28, 1923



Inventor

William Spencer Bowen,

Paul L. Norris

Attorney

UNITED STATES PATENT OFFICE.

WILLIAM SPENCER BOWEN, OF NEW YORK, N. Y.

PROCESS OF AND MEANS FOR DRYING LIQUIDS CONTAINING SOLID CONSTITUENTS.

Application filed December 28, 1923. Serial No. 683,235.

This invention relates to a process of and means for drying liquids having solid constituents. According to the invention a liquid of this character is introduced, in spray form into a chamber into which a heated and burning combustible mixture of gases is simultaneously introduced to evaporate the liquid, leaving the solid constituents in more concentrated condition or the solid constituents in powdered form, as desired.

Means are provided for heating the walls of the vacuum chamber to the end of promoting the greatest evaporative efficiency, provision being made for immediately cooling the dried solid constituents within said chamber to prevent deterioration of their organic principles.

For the attainment of these ends and for the accomplishment of other new and useful objects, as will appear, the invention consists in the features of novelty in the construction, combination and arrangement of the several parts generally shown in the accompanying drawing, described in the specification and particularly pointed out in the appended claims.

The evaporator herein disclosed is of the type wherein a combustible mixture of gases is burned within the apparatus and wherein the liquid containing solid constituents to be dried is sprayed into the hot products of combustion and burning gases, the resultant suspension of solids in the gas being immediately reduced in temperature by the expansion of said gas.

Figure 1 is a vertical section through one form of such an evaporator.

Figure 2 is a section taken along the line 2-2 of Figure 1.

The numeral 1 designates a receptacle forming a spray chamber which is contracted toward its lower end where it terminates in an angularly disposed discharge conduit 41. A jacket 2 surrounds and is spaced from the receptacle 1, thus forming a surrounding jacket space 35 around the receptacle 1 to the lower end of which space a conduit 36 is connected for the admission of a combustible mixture to said jacket space. The jacket 2 is preferably covered with a layer of insulating material 3. Preferably the receptacle 1 is formed integrally with the discharge conduit 41 and combustible mixture inlet conduit 36; and, for convenience in assembling the receptacle 1 and jacket 2, said jacket is

horizontally divided approximately midway between its upper and lower ends. An outwardly turned flange 4 surrounds the inlet 36 and a perforated burner plate or ring 37, which surrounds the lower contracted portion of the receptacle 1, is clamped between said flange and a similar outturned flange 5 formed on the lower end of the jacket 2. A spark plug 38 for igniting the combustible mixture in the jacket space 35 is mounted in an opening in the wall of the jacket 2. A Venturi tube 40 extends into the enlarged upper end of the receptacle 1 and one or more inlet pipes 39 for the liquid to be treated extend through the upper portion of the jacket 2 into said Venturi tube, preferably at right angles to the axis of the latter.

The combustible mixture enters the jacket space 35 which surrounds the spray chamber, by way of the conduit 36, the latter constituting a mixing chamber. After having passed through the perforate burner plate 37 the combustible mixture is ignited by the spark plug 38 and the products of combustion pass upwardly and into contact with the milk supply pipes 39, pre-heating the liquid contained in them. Although the invention may be carried out with merely one liquid supply pipe, I have here shown four symmetrically arranged and communicating with the throat of a venturi 40 through which the products of combustion travel at great velocity. The action of said products of combustion is to draw the liquid from the pipes 39 in the form of a fine spray which is immediately dried by contact with the heated gases. The venturi is preferably formed with a rather elongated lower portion forming an expansion chamber within which the heated combustion gases expand, the temperature of the products of evaporation being thereby reduced to a point sufficiently low to conserve the organic principles of the dried solid constituents and to avoid destruction of the vitamins. Vacuum in the spray chamber is maintained by any suitable vacuum producing apparatus, not shown, with which the discharge conduit 41 of said spray chamber communicates.

It is obvious that the illustrated form of the invention while theoretically operative, may not represent the ultimate structural embodiment that may finally be evolved by the usage of practice, wherefore I do not wish to limit my invention to any particular form or

arrangement of parts but only by those limitations in the claims which are imposed by the state of the art.

Having described my invention what I claim as new and desire to secure by Letters Patent, is:—

1. The process of drying the solid constituents of a liquid having solid constituents which may be undesirably altered by overheating, which consists in admitting said liquid in spray form to a body of heated and burning combustible mixture of gases at suitable pressure, immediately causing said gases to expand thereby lowering the temperature to a point at which the solid constituents will not be undesirably changed, and expanding said gases still further, in vacuo.

2. A concentrating evaporator for drying a liquid having solid constituents which may be undesirably altered by overheating, comprising a receptacle forming a spray chamber, a combustion chamber having an inlet for combustible gases, said chamber surrounding the spray chamber, means in said combustion chamber for igniting said gases, a venturi mounted in one end of the spray chamber and forming the communicating medium between the two chambers, and a sup-

ply pipe opening into the upper part of said venturi for admitting said liquid to said venturi to be sprayed into said spray chamber, the larger end of said venturi being open to the spray chamber.

3. The process of drying the solid constituents of a liquid having solid constituents which may be undesirably altered by overheating, which consists in subjecting the liquid to an atomizing and mixing spray of burning combustible gases, and causing said gases to expand after atomization of the liquid to lower the temperature of the gases to a point at which the solid constituents will not be undesirably changed.

4. A concentrating evaporator, including an outer gas burning and heating chamber, a gas outlet and spray chamber enclosed thereby, a venturi mounted at the inlet of the spray chamber with its large end opening into the spray chamber, said venturi forming the means of communication between the two chambers, and a liquid outlet disposed in the venturi in the path of the in-rushing burning gases.

In testimony whereof I have hereunto set my hand.

WILLIAM SPENCER BOWEN.