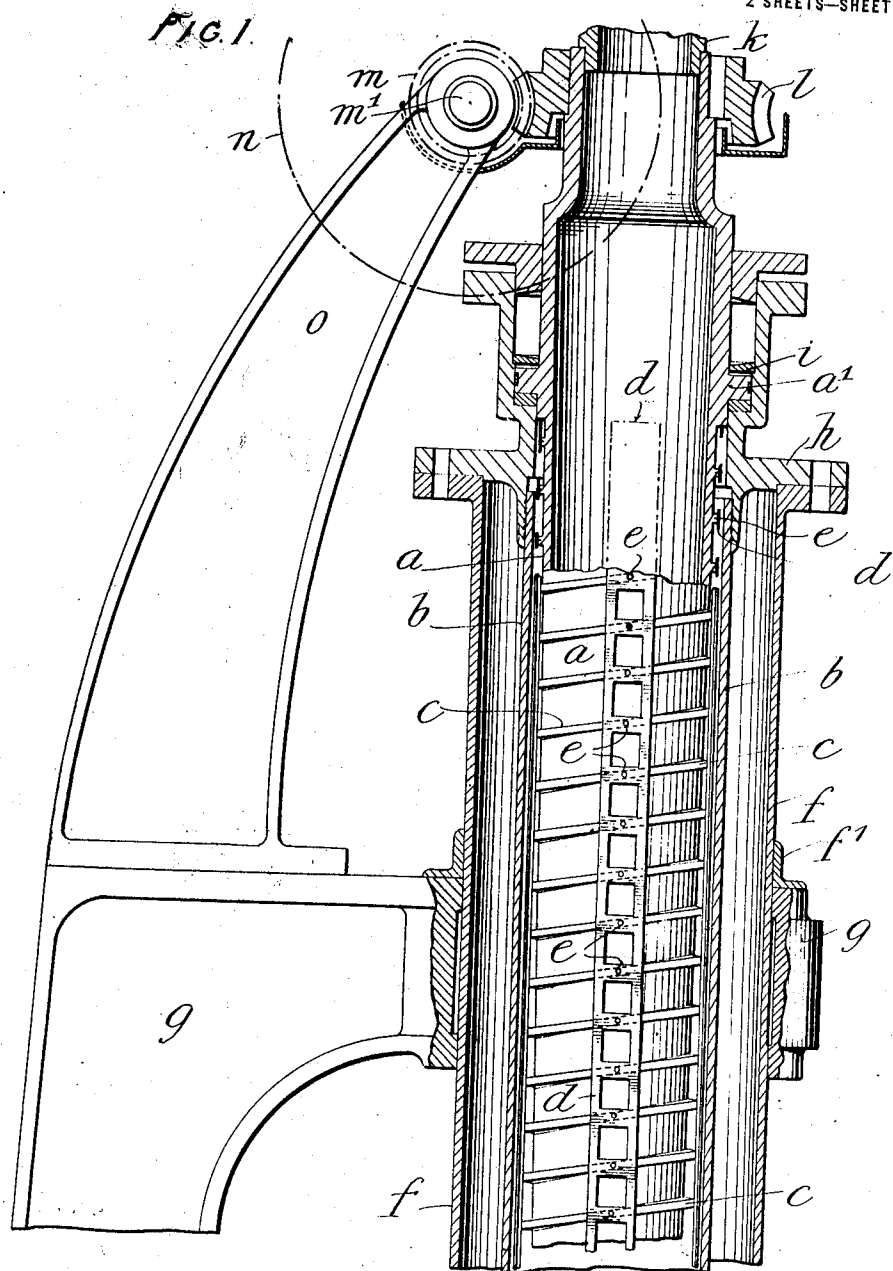


E. SHAW,
 APPARATUS FOR EVAPORATING OR CONCENTRATING LIQUIDS.
 APPLICATION FILED MAY 5, 1919.

1,355,702.

Patented Oct. 12, 1920.
 2 SHEETS—SHEET 1.

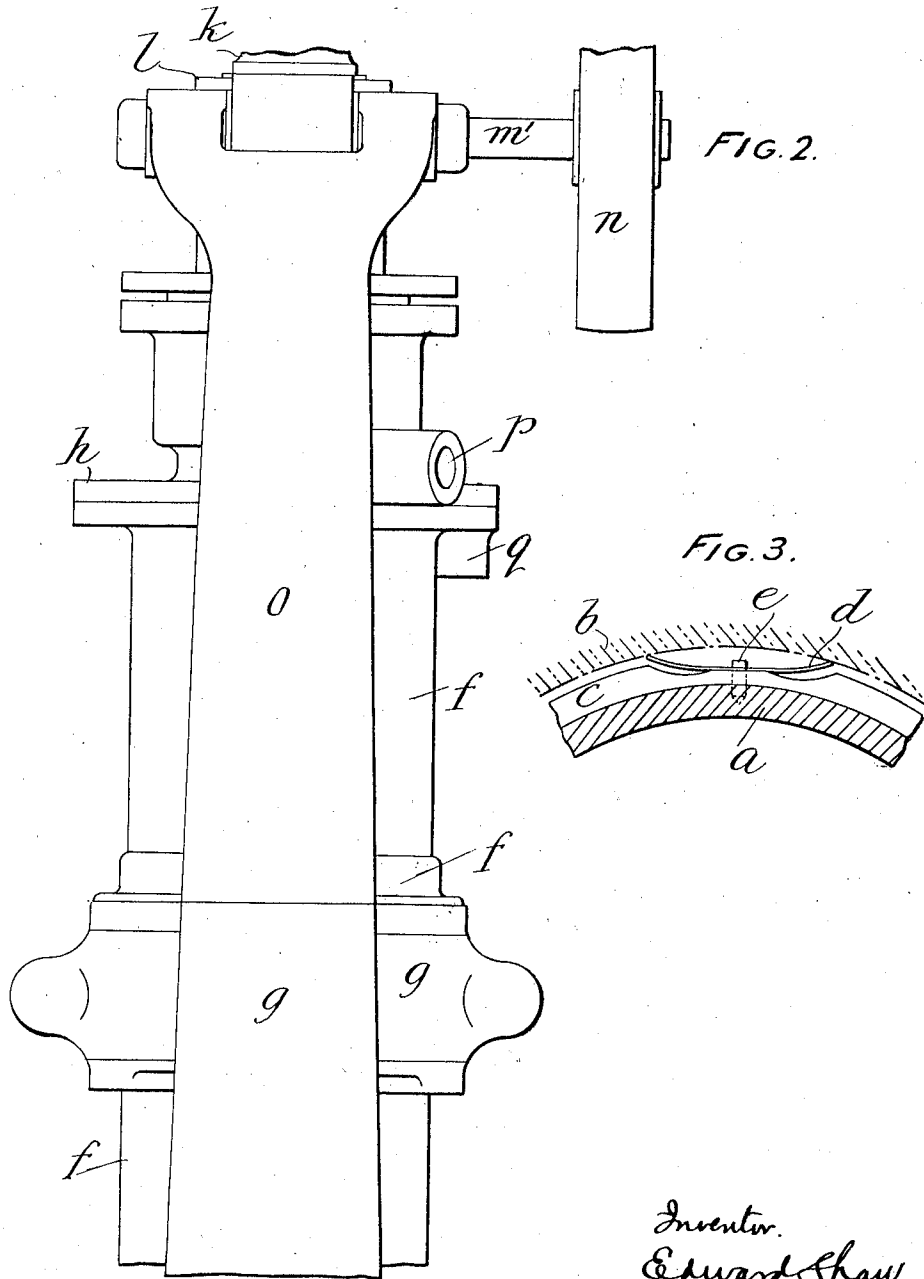


Inventor
 Edward Shaw
 By A. Patterson
 atty

E. SHAW.
 APPARATUS FOR EVAPORATING OR CONCENTRATING LIQUIDS.
 APPLICATION FILED MAY 5, 1919.

1,355,702.

Patented Oct. 12, 1920.
 2 SHEETS—SHEET 2.



Inventor.
 Edward Shaw,
 By A. S. Patterson
 Atty.

UNITED STATES PATENT OFFICE.

EDWARD SHAW, OF LONDON, ENGLAND.

APPARATUS FOR EVAPORATING OR CONCENTRATING LIQUIDS.

1,355,702.

Specification of Letters Patent.

Patented Oct. 12, 1920.

Application filed May 5, 1919. Serial No. 294,989.

To all whom it may concern:

Be it known that I, EDWARD SHAW, a subject of the King of Great Britain and Ireland, residing at the city of London, England, have invented Improvements in Apparatus for Evaporating or Concentrating Liquids, of which the following is a specification.

This invention has reference to improvements in liquid evaporating or concentrating apparatus of the type in which the liquid is forced through a spiral passage surrounded by an outer wall which is heated as by a steam jacket, and more especially to apparatus of this general type in which the spiral passage is of gradually increasing area and is formed by a spiral plate interposed between inner and outer walls and having left between its outer edge and the outer wall a slight space sufficient for the continuous passage of some of the liquid with the object of insuring the complete covering of the heated wall with liquid and the consequent prevention of discoloration of the product due to some portion of it becoming overheated. While apparatus of this kind is highly satisfactory for treating many liquids, it is found that others, for example milk-containing liquids, are apt to form a deposit on the outer heated wall which, becoming overheated results in the color or flavor of the product being impaired.

Now according to this invention means are provided for scraping any deposit from the heated wall of apparatus of the general type referred to during the evaporating or concentrating operation and thus preventing such an accumulation of deposit as would result in the product being impaired.

The scraping means preferably comprise strips of spring steel slightly curved longitudinally and held in any convenient manner so that their two edges bear against the wall, means being provided for imparting movement to the strips such that their edges will sweep the complete surface of the wall and remove any deposit therefrom. The strips may be of skeleton formation so as to obstruct as little as possible the spiral passage.

The accompanying drawings illustrate the invention applied to an evaporating apparatus of the kind described in the specification of my former Letters Patent No.

1,164,413 of 1914, Figure 1 being a sectional elevation, Fig. 2 an elevation at right angles to Fig. 1 and Fig. 3 a detail horizontal section.

In this arrangement the spiral passage is formed between inner and outer tubes *a* and *b* by a spiral web *c* on the exterior of the tube *a*; the scrapers *d*, of which there may be four, are loosely connected to the web *c* by pins *e* projecting from the edge thereof into holes formed along the longitudinal center lines of the scrapers, which are each in the form of a spring strip of curved section (see Fig. 3) and having rectangular apertures formed through it at those parts which come opposite the spiral passage; the strips extend longitudinally from end to end of the spiral passage (or beyond it) and their curved formation results in their bearing along the center on the web *c* and at the edges against the outer tube with a yielding pressure. If desired the web may be slightly recessed on each side of its points of contact with the back of the strip as shown in Fig. 3. The inner tube is capable of being oscillated or rotated about its axis from some suitable moving part, for instance of the liquid pumping mechanism, in any convenient manner and suitable joints are provided between the inner and outer tubes and between the inner tube, which serves as the steam outlet passage, and the steam exhaust pipe.

In the arrangement illustrated, the jacket *f* is supported by a flanged collar *f'* in a bracket *g* and has bolted to its flanged upper end a cover *h* to which the outer tube *b* is attached and which is formed with a stuffing box; the spiral web *c* on the inner tube *a* does not extend around the upper part of the tube *a* which is provided with a collar *a'* that rests in a downward extension of the stuffing box and supports the tube in such wise that it is free to turn and above the collar *a'* is a washer *i* resting on a shoulder in the stuffing box and preventing the collar being gripped when the packing is compressed by the gland. The outer end of the tube, which fits around the end of a fixed exhaust pipe *k*, has keyed to it a worm wheel *l* engaged by a worm *m* spindle *m'* carrying a driving pulley *n* and mounted in bearings in an arm *o* on the bracket *g*. By this arrangement the inner tube *a* carrying the scrapers *d* can be continu-

ously rotated within the outer tube *b* so that the edges of the scrapers remove any deposit from the latter.

p is the inlet for liquid to the spiral passage and *q* is the steam inlet to the jacket which is provided with the usual outlet for water of condensation, it being understood that vapor can escape from the space between the inner and outer tubes *a*, *b* by way of the interior of the inner tube *a* which is open ended at the bottom as in the apparatus of the earlier Letters Patent referred to.

What I claim is:—

1. Apparatus of the kind referred to, comprising an outer tubular member, an inner tubular member, one such member being provided with a spiral web extending to within a short distance of the companion tubular member which has a plain cylindrical surface, means for producing a relative rotary movement between said members, and scraping means mounted upon the web-provided member adapted to react between such web and the cylindrical surface of the companion member in order to prevent accumulation of deposit upon the latter.

2. Apparatus for evaporating or concentrating liquids as claimed in claim 1, wherein the scraping means comprise strips of spring steel slightly curved in cross section and extending longitudinally of the associated tubular member across a number of helices of the spiral web so that two edges of such strips bear against the cylindrical wall of the other member.

3. In apparatus of the kind referred to, a tubular member provided with a spiral web extending around one cylindrical surface, scrapers curved in cross section arranged longitudinally of the tubular member so that two edges project beyond the web aforesaid and pins connecting the

scrapers to the web, substantially as described. 45

4. In apparatus of the kind referred to, a rotatable tubular member provided with a scraper comprising a length of spring metal slightly curved in cross section, provided with a series of apertures through which liquid can pass and with another series of holes intermediate of the apertures aforesaid through the agency of which the scraper can be loosely carried. 50

5. Apparatus of the kind referred to, comprising an outer jacketed tubular member, an inner tubular member provided exteriorly with a spiral web extending to within a short distance of the inner cylindrical wall of the outer member, means for rotating the said inner member and scraping means partially housed in recessed regions in the web so as to extend across a number of helices of the latter, such scraping means bearing continuously against the outer jacketed member. 55

6. Apparatus of the kind referred to, comprising an outer jacketed tubular member, an inner tubular member provided exteriorly with a spiral web extending to within a short distance of the inner cylindrical wall of the outer member, such web having a series of recesses arranged in a line longitudinally of the tubular member, a scraper comprising a length of spring metal slightly curved in cross section, fitting loosely within the said web recesses so that two edges project beyond the web and engage the outer tubular member, pins upon the web passing loosely through holes in the scraper and means for rotating the inner tubular member. 60 65 70 75 80

Signed at the city of Toronto in the Province of Ontario, Dominion of Canada, this thirtieth day of April, 1919. 85

EDWARD SHAW.