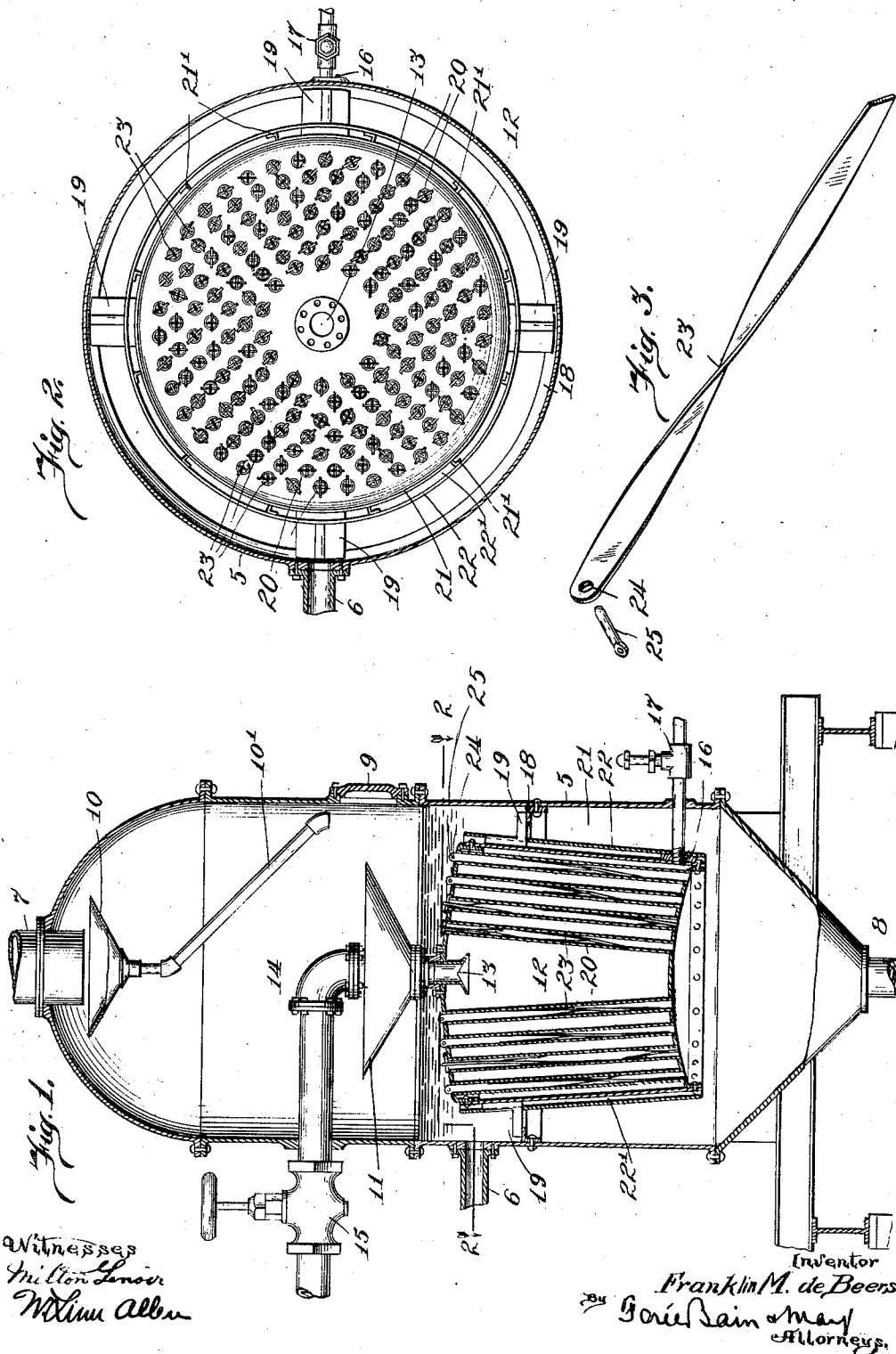


F. M. DE BEERS.
EVAPORATOR.
APPLICATION FILED FEB. 27, 1911.

1,006,363.

Patented Oct. 17, 1911.



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UNITED STATES PATENT OFFICE.

FRANKLIN M. DE BEERS, OF CHICAGO, ILLINOIS.

EVAPORATOR.

1,006,363.

Specification of Letters Patent.

Patented Oct. 17, 1911.

Application filed February 27, 1911. Serial No. 611,080.

To all whom it may concern:

Be it known that I, FRANKLIN M. DE BEERS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Evaporators, of which the following is a specification.

My invention relates to improvements in evaporators and more particularly to devices for treating impregnated liquors by the application of steam heat, to concentrate the solution.

One of the salient objects of my invention is to provide an improved steam chest located in a liquor-receiving receptacle so that an effective circulation of the liquor may be insured, and to this end my invention contemplates the provision of a jacket surrounding the steam chest for the prevention of countercurrents in the liquor.

Another object of my invention is to provide a novel heating tube structure in the steam chest whereby the liquor in its heat-impelled ascent through the tubes may be brought into more intimate contact with the heated tube surfaces, and its circulation correspondingly stimulated. To attain this object, my invention contemplates the provision in each tube of a deflecting member so that the liquor in its passage through the tube may be caused to ascend in a spiral path.

Another object of the invention is to provide a simple and advantageous construction of deflecting member in each tube, so that the same may be readily inserted into the tube without disturbing the steam chest, and may be removed from the tube to clear the same of any matter lodging in the liquor path, the insert being of such form that, in its removal, it may scrape the sides of the tube and carry out with it the accumulated matter.

Other objects of my invention will become apparent from a consideration of the following description of an embodiment thereof, taken in conjunction with the accompanying drawings, wherein—

Figure 1 is a central vertical section through an evaporator structure to which my invention has been applied; Fig. 2 is a cross section on line 2—2 thereof; and Fig. 3 is an enlarged detail, showing the pipe insert.

In the drawing, 5 indicates generally a liquor receptacle of ordinary construction,

providing a liquor inlet 6, a vapor outlet 7 at its top, and a sediment outlet 8 at its bottom for drawing off the concentrated material. For convenience in arranging the parts in the liquor receptacle, and for ready cleaning of the liquor tubes through the steam chest to be described, I preferably provide in the liquor receptacle a man-hole and closure 9. Under the vapor outlet 7, I preferably provide a drip pan 10, of funnel shape, provided with return pipe 10', and I also preferably provide a liquor deflector 11 of usual flaring shape arranged above the steam chest and mounted on the steam supply pipe 15 to be described. All of the structure thus far described is of advantageous construction, well understood in the art.

In the lower half of the liquor receptacle, I arrange my improved steam chest, generally indicated at 12, having an inlet opening 13 at its top, to receive its steam supply through piping 14 and valve 15, from any suitable source of supply, and having an outlet 16 near its bottom, piped past the usual safety pop valve 17 to any delivery point. The steam chest may be supported in the liquor receptacle in any suitable manner, as by the ordinary provision of an inwardly extending ring 18, secured to the inner wall of the liquor receptacle, upon which rest a suitable number of radially projecting castings 19—19, attached to the chest. The steam chest 12 provides the usual tubes 20—20, extending from bottom to top thereof, in parallelism with the circumferential wall, which in the particular construction herein shown is slightly flared outwardly toward its top. Obviously, the liquor will circulate, in general, upwardly through the tubes and downwardly around the exterior of the steam chest.

As a feature of my invention, I provide means for stimulating liquor circulation and preventing a countercurrent in the down-flow space around the steam chest due to the heating effect of the outer surface of the chest, under the influence of which a portion of the liquor immediately adjacent to the chest would tend to travel upwardly against the downwardly trending general flow of the liquor not in contact with the chest. To these ends, I provide a jacket 22 surrounding the steam chest 12, and on all sides spaced from the wall thereof by the interposition of angle iron spacers 21', there-

by providing between such jacket 22 and wall 21 of the steam chest a clearance space 22' in which the liquor heated by contact with the steam-chest wall 21 may move upwardly, so to a great extent carrying off the heat continuously radiated by said wall 21, and leaving the outer wall 22 relatively cool, and so reducing to a minimum the tendency of the downwardly traveling liquor between the wall 22 and the wall of the receptacle 5 to form a countercurrent, deterrent to the desired circulation.

To increase the heating action of each tube 20, I provide therein an insert 23, which shall direct the traveling liquor in a spiral path, so throwing the liquor into more effective contact with the heated peripheral surface of the pipe. An advantageous construction of such insert I have shown in detail in Fig. 3, comprising a metal strip or band of width substantially equal to the internal diameter of a pipe, such band being twisted to any desired extent, preferably at least through one complete turn, and having at its upper end a perforation 24. It will be apparent that such inserts 23 may be placed in the tubes 20, and held in position therein by friction, or by the passage of a wire or pin 25 through each perforation 24. Thus, there will be formed in each pipe a spiral path which will cause the liquor in its ascent to rotate about the central axis of the tube, insuring effective heating of the entire liquor body in flow through the tube, and so stimulating circulation. Further, it will be apparent that in the event of clogging of any tube or tubes by matter accumulating therein, it is only necessary to gain access to the steam chest 12 through the man hole 9 and by working the insert 23 up and down in its tube, all the accumulated material is loosened and may then be drawn out of the tube clinging in the convolutions of the insert, to be readily removed therefrom.

In the operation of my device, the impregnated liquor is run into the liquor receptacle 5 through the inlet 6 to a height somewhat above the steam chest 12. The valve 15 may then be turned to admit steam to the steam chest 12, so heating the surfaces thereof and impelling a circulation of the liquor upwardly through the spiral paths provided in the tubes 20 by the inserts 23 and through the space between the heated wall 21 of the steam chest 12 and the relatively cooler jacket 22 and the wall of the re-

ceptacle 5, so bringing all of the liquor in said receptacle into intimate contact with the steam chest. Thus it will be seen that the body of liquor traveling upward between the steam chest wall and the jacket acts as an insulator to prevent such heating of the down-flowing liquor as would retard the violent circulation necessary to efficient working of an evaporator of this type.

While I have described in detail the application of my invention in one particular style of evaporator, it will be understood that many structural changes may be made without departure from the spirit of my invention.

What I claim is:

1. In an evaporator, the combination with a liquor receptacle, a steam chest associated therewith to provide a downflow space past the steam chest, and tubes through the chest, of a jacket spaced apart from the wall of said chest toward the downflow space to provide a path between the chest and jacket for upward movement of liquor, to prevent countercurrents in the downflow space.

2. In an evaporator, the combination with a liquor receptacle, a steam chest associated therewith to provide a downflow space and provided with heating tubes, of a jacket concentric with said steam chest, and longitudinal spacers spacing said jacket from the side wall of said steam chest toward the downflow space to provide therebetween a pathway for the upwardly traveling liquor heated by contact with said side wall of the steam chest, thereby to prevent countercurrents in the downflow space.

3. In an evaporator, a liquor receptacle, a steam chest therein having sides flaring outwardly from bottom to top, heating tubes in said steam chest inclined outwardly in substantial parallelism to said sides to direct liquor from the tubes toward the side of said liquor receptacle, a tapering deflector above the level of the liquor in said receptacle directing steam of evaporation from the surface thereof toward the side of said liquor receptacle, and a jacket surrounding and slightly spaced apart from the wall of the steam chest.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

FRANKLIN M. DE BEERS.

In the presence of—

MARZ F. ALLEN,
W. LINN ALLEN.