Aug. 29, 1933. A. E. FLOWERS 1,924,919

METHOD OF DISTILLING

Filed Feb. 5, 1932

FIG. 1.

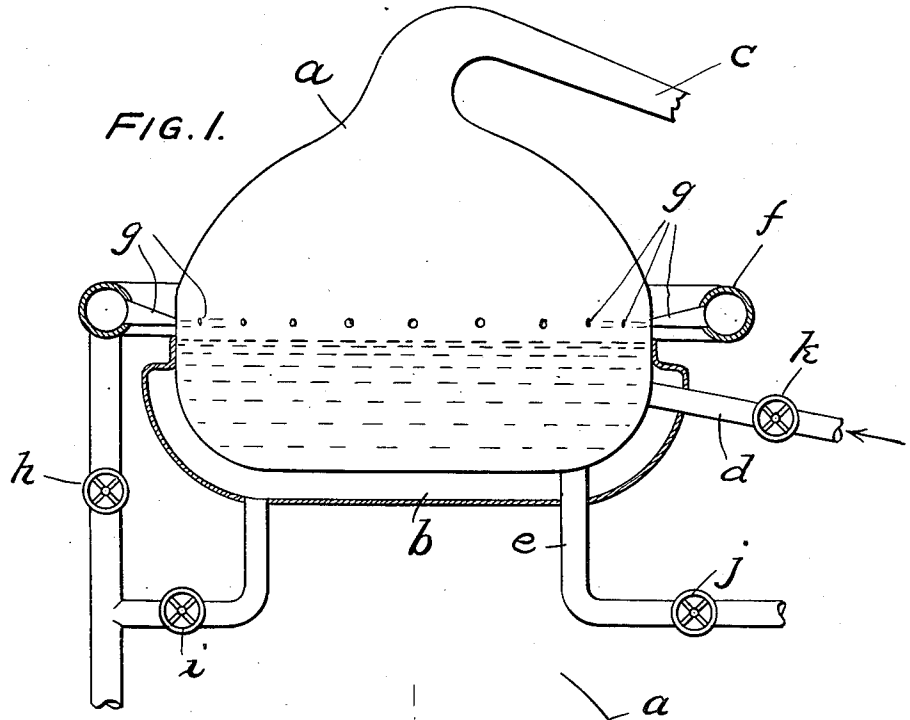
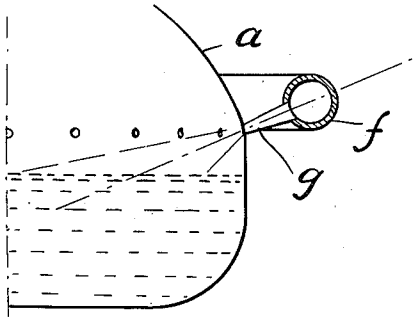


FIG. 3.



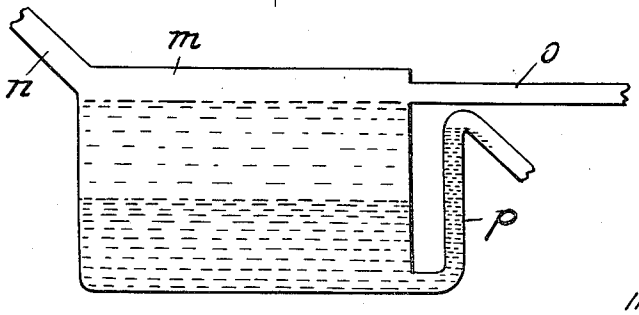


FIG. 2.

INVENTOR

Alan E. Flowers

BY

Bussen and Harding

ATTORNEYS.

WITNESS:

Robt. R. Kitchel.

Patented Aug. 29, 1933 1,924,919

UNITED STATES PATENT OFFICE

1,924,919

METHOD OF DISTILLING

Alan E. Flowers, Poughkeepsie, N. Y., assignor to The De Laval Separator Company, New York, N. Y., a corporation of New Jersey

Application February 5, 1932. Serial No. 591,055

1 Claim. (Cl. 202—63)

This application is a continuation in part of my prior application, Serial No. 406,156, filed November 9, 1929.

My invention relates to the distillation of compounds or mixtures that have a tendency to froth to an objectionable degree.

The object of the invention is to effect the distillation of such liquids with avoidance of objectionable frothing.

Many liquids, during distillation, have a tendency to froth; as, for example, caustic sludge removed from dry cleaners' solvent by the "Glover" treating system. When such sludge, which is given merely as an example, is distilled by methods heretofore known, as, for example, by the application of heat by a jacket, or by coils in the liquid, or by steam jets into the body of the liquid, or by combinations of the above, there is such severe frothing that unvaporized liquid is carried over into the condenser, resulting in serious contamination of the distillate; and if the intended residual liquid is a valuable constituent, its partial loss is of consequence.

In the "Glover" treating system, well known among dry cleaners, a dirty solvent is brought into contact with a solution of caustic soda or other alkali. The caustic saponifies a large part of the animal and vegetable fats in the solvent to such an extent that they are insoluble in the dry cleaners' solvent, but not to the extent to make them soluble in water. The caustic solution is in the bottom of a tank, the solvent bubbles up through it, and the soaps form a layer between the caustic solution and the solvent. The soap layer constitutes the sludge and consists of a mixture of soap, dirt, coloring matter, some water, and usually from 30% upward of solvent.

I have discovered that if, during distillation, high velocity jets of steam or other hot gas from nozzles near the surface of the liquid are directed across approximately parallel to the surface or are directed downward toward the surface at any angle from horizontal to approximately 60° below horizontal, so that the gas shoots into the froth and either directly or by the spreading of the jet impinges on the surface of the liquid, the liquid can be distilled at commercially practicable rates without objectionable frothing. If desired, some additional heat may be introduced into the liquid from a heated jacket, a submerged coil or by small jets below the surface of the liquid, but the amount that can be added in this way is limited if the full advantage of my invention is to be gained. I am not certain how these jets act to keep froth down but believe it to be a mechanical action which may be combined with the evaporative effect of the heat, thereby thinning, breaking, or evaporating the film of the froth bubble.

Means whereby my improved process may be carried out are shown in the accompanying drawing, in which Fig. 1 is a diagrammatic vertical cross-section of a still comprising such means; Fig. 2 is a diagrammatic vertical cross-section of a device for gravitationally continuously separating two liquids of different specific gravities (in the illustrative case, water and dry cleaners' solvent); and Fig. 3 is a diagrammatic, vertical, cross-sectional, partial view of a modification.

Referring to Fig. 1: *a* is a still body having a steam jacket *b* around its lower portion, an outlet *c* from the top leading to a condenser, not shown, and an inlet *d* preferably below the normal level of the liquid. A drain *e* from the bottom affords means to draw off unvaporable residues.

f is a pipe surrounding the still and *g*—*g* indicates a plurality of nozzles for admitting steam or other gas adjacent to but above the surface of the liquid, the jets being directed in parallelism with, or at a very small angle downward to, the surface of the liquid. *h*, *i*, *j* and *k* are valves in their respective pipes.

Referring to Fig. 2: *m* is a reservoir provided at one end with an inlet *n* and at the other end with two outlets, one *o* from near the top and the other *p* from near the bottom leading upward to a level somewhat below *n* and then downward.

In operation, the sludge is forced into the still and steam or other heating medium admitted through the valve *i* to the jacket. When the liquid begins to boil a froth is formed. Valve *h* is then opened admitting steam or other gas to the pipe *f* and thence to the jets *g* which break up the froth.

The vapors and steam which, due to the absence of frothing, are free from unvaporized liquid, pass out through the pipe *c* to a condenser, not shown from which the liquids flow to a separator which may operate by centrifugal force or gravity. In the gravity separator shown in Fig 2, the mixed liquids enter through *n* to the reservoir *m* where the water settles to the bottom and the solvent floats on top of it. As the reservoir fills up, water will rise in outlet *p* and eventually will float over the high point and escape. Solvent floating on top of the water will finally rise to the outlet *o* and escape.

In addition to the jacket *b*, if a jacket be used,

the still may be additionally heated by the introduction of steam or other hot gas into the body of the liquid beneath its surface, but such additional heating must be limited as indicated. Further, if desired, the liquid in the still may be preheated prior to vaporization by any suitable means, as by a jacket, introduction of steam, etc.

In Fig. 3 the steam or gas jets are shown as directed downward toward the surface at a pronounced angle thereto, the spreading jets, however, covering substantially the entire surface of the liquid undergoing distillation.

While in the claim I have specified steam jets it will be understood that other gases, preferably hot, are to be considered as equivalents of steam.

It will be understood that my invention is generally adapatable to the distillation of substances, as liquids, mixtures, compounds, etc., having a tendency to froth and that I do not intend to limit my invention by the description herein of its practical adaptation, which is given merely for purpose of illustration.

What I claim and desire to protect by Letters Patent is:

The method of minimizing frothing during the distillation of liquids having a tendency to froth which includes introducing into a still containing the body of liquid undergoing distillation, from points above the surface of the body of liquid, steam in spreading jets directed at such angle between 0° and 60° to the horizontal and so positioned as to impinge upon substantially the whole surface of said body of liquid, whereby incipient froth is broken up and the vapors and steam escaping from the liquid body are substantially free of unvaporized liquid.

ALAN E. FLOWERS.