(No Model.) 3 Sheets—Sheet 1.

J. VAN RUYMBEKE.

PLANT FOR TREATING SOAP MAKERS' WASTE TO OBTAIN GLYCERINE.

No. 458,648. Patented Sept. 1, 1891.

Fig. 1a.

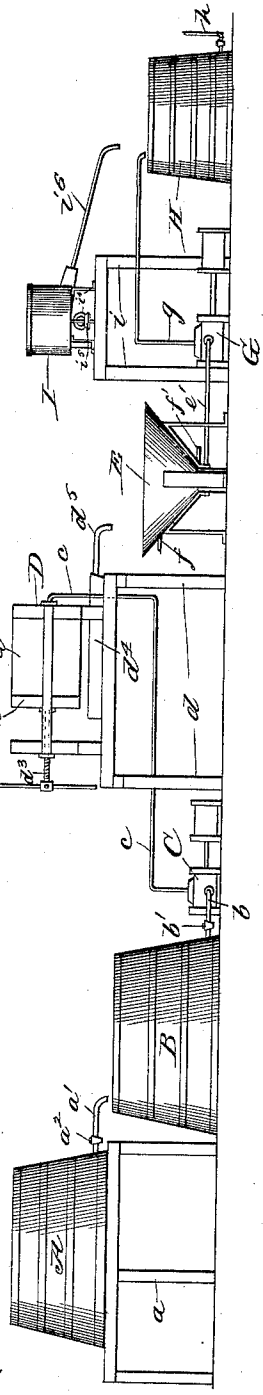
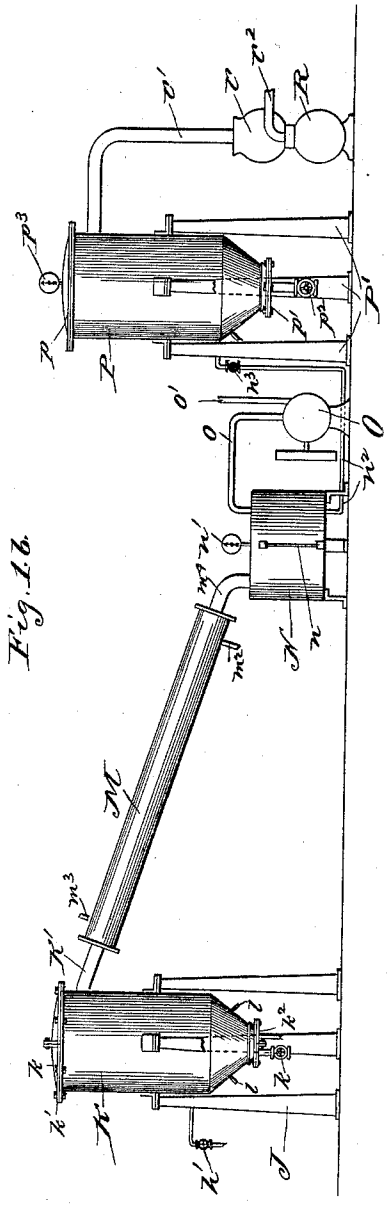


Fig. 1b.



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(No Model.) 3 Sheets—Sheet 2.

J. VAN RUYMBEKE.

PLANT FOR TREATING SOAP MAKERS' WASTE TO OBTAIN GLYCERINE.

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Fig. 3.

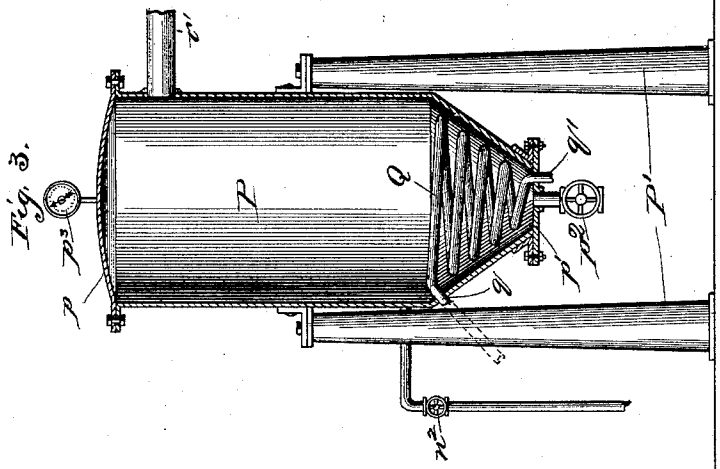


Fig. 2.

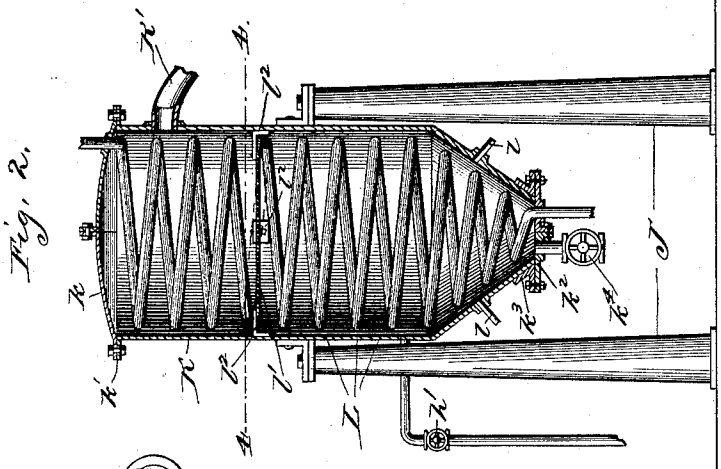


Fig. 4.

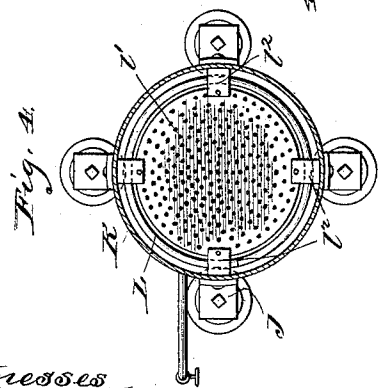
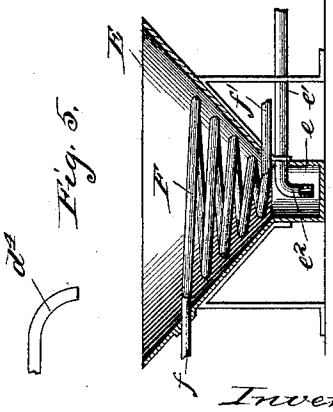


Fig. 5.



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(No Model.) 3 Sheets—Sheet 3.

J. VAN RUYMBEKE.

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Fig. 7.

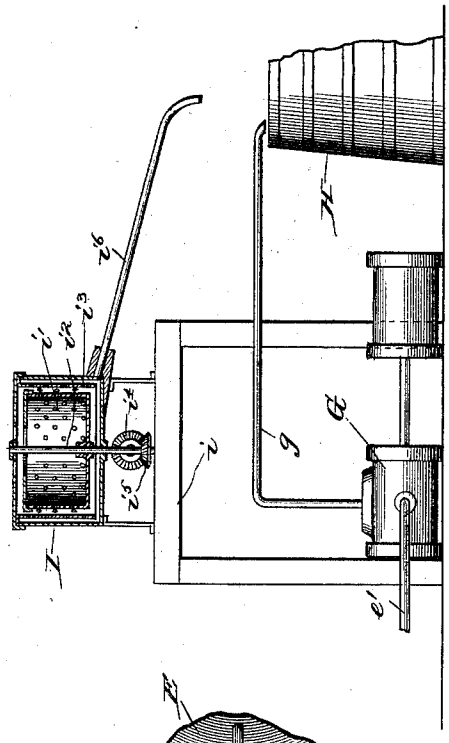


Fig. 6.

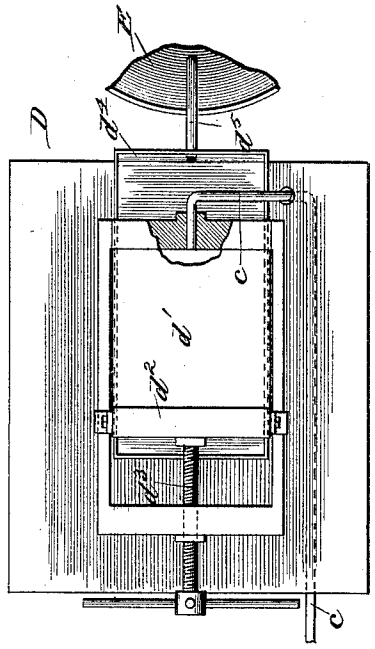
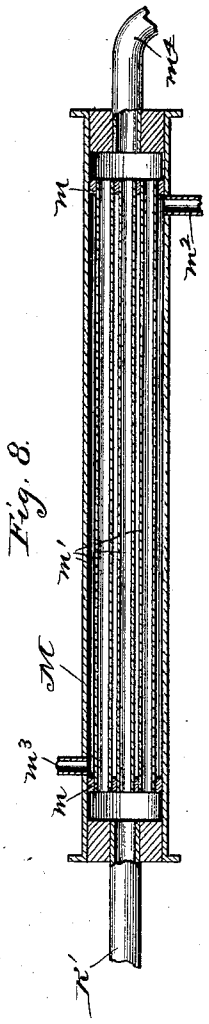


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOSEPH VAN RUYMBEKE, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO WILLIAM F. JOBBINS, OF SAME PLACE.

PLANT FOR TREATING SOAP-MAKERS' WASTE TO OBTAIN GLYCERINE.

SPECIFICATION forming part of Letters Patent No. 458,648, dated September 1, 1891.

Application filed May 15, 1891. Serial No. 392,855. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH VAN RUYMBEKE, a subject of the King of Belgium, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Treating Soap-Makers' Waste to Obtain Glycerine, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figures 1ª and 1ᵇ together represent a side elevation of the entire assembled apparatus embodying my improvements; Fig. 2, a vertical section of the still detached; Fig. 3, a similar section of the vacuum-pan detached; Fig. 4, a plan section of the still, taken on the line 4 4 of Fig. 2; Fig. 5, a vertical section of the evaporating-pan detached; Fig. 6, a plan view of the filter-press detached; Fig. 7, a side elevation of pump and centrifugal filter, the latter in section; and Fig. 8, a longitudinal vertical section of the cooler leading from the still. Figs. 1ª and 1ᵇ are upon the same scale. All the remaining figures are upon the same scale, but enlarged from that of the former.

My invention relates to an apparatus adapted to the production of glycerine from soap-makers' waste. The apparatus is especially adapted for use in connection with the process described in my prior application, Serial No. 375,288, though not necessarily restricted solely to the practice of this process, especially in some of its parts.

I will proceed to describe in detail the construction and operation of the entire apparatus herein shown, except as to such parts as are already well known, and will then point out more definitely in claims the particular improvements which I believe to be new and wish to secure by Letters Patent.

In the drawings it will be understood that Figs. 1ª and 1ᵇ are intended to represent the entire apparatus, the latter, however, being joined onto the right of the former as the apparatus is set up for actual use.

In the drawings, A represents an open tank of any suitable size and shape for receiving the spent soap-lye, and B represents a similar tank of about the same dimensions. The second tank is arranged near the first, so that the lye may be transferred from A to B, and to provide for this being doing conveniently the tank A is mounted upon an elevated platform or frame *a*, and is provided with a draw-off pipe *a'*, having a suitable cock a^2. The tank B is connected with a pump C by means of a pipe *b*, which is provided with a suitable shut-off valve *b'*. This pump is of any ordinary construction and requires no special description here. The pipe *b* constitutes an inlet to the pump, and it is connected by an outlet-pipe *c* with a filter-press D. For convience in carrying forward the process, this press is elevated by mounting it upon a suitable raised platform or support *d*. The press itself may be of any ordinary construction. It is a piece of mechanism well known, and therefore does not require any detailed description here. The main parts may be briefly designated as follows:

d' represents the filter-box, into which the pipe *c* from the pump opens, as seen in Fig. 6.

d^2 is the follower, to which pressure is applied by means of the screw d^3.

On the platform immediately below the filter-box is an open pan d^4, which is provided with an outlet-pipe d^5. Immediately below this outlet or discharge pipe is an open evaporating-pan E. As shown in the drawings, this pan is funnel-shaped, with its lower closed end forming a short cylindrical section *e*, from which a pipe *e'* leads outward, the end of which passes into the pan and is bent down toward the bottom thereof by a short curve e^2, as seen in Fig. 5. The pan is provided with an ordinary steam-coil F for heating purposes, the inlet *f* being near the upper portion of the pan, while the outlet *f'* is at the lower portion of the funnel-shaped part. This steam-coil is made of such size and set within the pan in such manner, however, that it is held away from the interior surface of the pan, so as to leave quite a space entirely free between the coil and the pan, the former not touching the latter at any point. The pipe *e'* is the discharge-pipe for this evaporating-pan and connects it directly with the cylinder of a pump G. The pump G may be of any well-known construction and requires no further description here. It may be the same as the pump C. Its cylinder is provided with an outlet-pipe *g*, leading to a

tank H, into which it discharges, and the pump may be of any construction suitable for transferring the contents of the evaporating-pan E into the tank H. If the evaporating-pan is arranged higher than the tank H, this pump may be dispensed with, the liquid in the pan being drawn off directly into the tank.

A centrifugal machine I is located near the tank H. For convenience it is mounted in an elevated position on a supporting-frame *i*, and a desirable location for this support in carrying out my process is between the evaporating-pan and the tank. This machine is of any ordinary construction. The hollow perforated cylinder *i'* is fixed on a shaft i^2 within the case or inclosing cylinder i^3. The shaft is provided with a bevel-gear i^4, with which a similar gear i^5 engages, the latter being mounted on a driving-shaft to which power is communicated in any suitable manner. The inclosing-cylinder is provided with an outlet-pipe i^6, which is arranged to discharge directly into the open tank H. The tank H is connected by a pipe *h* directly with a vacuum-still K, the pipe being provided with a suitable shut-off valve *h'*, and entering toward the bottom of the still, as seen in Fig. 2 of the drawings. This still is mounted on supporting posts or columns J, as seen in Fig. 2 of the drawings, and Fig. 1^b, where these posts are indicated as four in number, though the number is immaterial. The still is of peculiar construction, which will now be explained. Its main body is cylindrical, set upright within the posts; but at its lower end it is contracted in conical form, so that the opening at this end is much smaller than at the upper end. The upper end of the still is provided with a cover *k*, which is secured by bolts to a horizontal flange *k'*, projecting out at the top of the cylinder, as seen in Fig. 2. The cover is thus made detachable at will. At the lower end there is a bottom k^2, which is fastened to a flanged plate or collar k^3 by bolts, so that it may also be removed whenever desired. The head or cover *k* is made in two parts or halves, which are fastened together by means of vertical flanges along their straight edges, through which bolts are passed, as seen in Fig. 2. The bottom is also made in two parts or halves, which are secured together by similar flanges and bolts, as seen in the same Fig. 2. With this construction it will be seen that one half of the head or one half of the bottom may be detached without removing the other corresponding half. It will be understood, of course, that the joints at the top and bottom of the still must be all suitably packed. In one section of the bottom is set a gate-valve k^4, by means of which sediment collecting at the bottom of the still may be discharged. Within this still is arranged an ordinary steam-heating coil L, entering through one section of the head and passing out through the section of the bottom in which the gate-valve is not placed. In the conical lower end of the still and near the bottom are inserted pipes *l*, which are suitably connected with a steam-generator for the purpose of injecting steam into the still. There is also provided a screen or diaphragm *l'*, arranged across the still at some point below the outlet. This diaphragm may be a perforated plate or wire-gauze or any other suitable material and is fastened in place within the still by any suitable means. In the drawings it is shown secured to the interior of the still by means of small brackets l^2. The outlet-pipe K' is of course near the top of the still and is much larger than the inlet. It leads to a cooler or condenser M. This condenser may be of any construction suitable for the purpose of cooling and condensing the vapors coming from the still. In the drawings it is shown as consisting of a long cylinder, within which are fitted two heads *m*, near the opposite ends thereof. These heads are perforated, and within them are secured the respective ends of a series of small tubes *m'*, making a construction somewhat similar to the flues of a boiler, but leaving a space at each end of the cylinder between this tubular construction and the proper heads of the cylinder. As shown in the drawings, this condenser is mounted in an inclined position leading slightly downward from the still. Near its lower end it is provided with an inlet-pipe m^2, opening into the tubular section of the cylinder just within the perforated head, and near the upper end of the condenser is a similar outlet-pipe m^3, which opens out from this same section of the condenser just within the upper perforated head, as seen in Fig. 8. These pipes are to provide for the circulation of cold water through the condenser and around the tubes by any suitable mechanism. At the lower end of the condenser is a discharge-pipe m^4, which leads to a closed tank or receiver N. This receiver is provided with a water column *n* and a vacuum-gage *n'*, so that the quantity of liquid therein may be properly indicated and also the degree of vacuum. An ordinary dry vacuum-pump O is connected by means of a pipe *o* with the receiving-tank N, and therefore through the latter and the condenser M maintains the required vacuum in the still K, which in the practice of the process referred to should be at about twenty-nine inches for the best results. The pipe *o'* is the exhaust-pipe of this pump. The receiver N is connected with an ordinary vacuum-pan P by means of a pipe n^2, which is also provided with a suitable shut-off valve n^3. The pan P is such as is ordinarily used for concentrating liquids; as shown in the drawings, it is substantially of the same shape as the still K; but the top *p* and the bottom *p'* are made entire, instead of in two parts, and are secured in place the same as already described for the still K. This pan is also supported upon and secured to columns P' by means of supporting-lugs, as already described for the still K. A gate-

valve p^2 is set in the bottom of this pan for drawing off its contents, and a vacuum-gage p^3 is set in the top or head. An ordinary steam-coil Q is set in the lower part of this pan, the inlet being at q, while the outlet is at q' at the bottom of the pan. A wet vacuum-pump R is provided with a condensing-chamber r, through which it is connected with the pan P by means of a suction-pipe r', which connects with the pan near its upper end. The pump is also provided with an exhaust-pipe r^2, as usual.

In carrying out my process hereinbefore referred to for recovering glycerine from soap-makers' waste with the apparatus described above the operation is as follows: The tank A is filled or partially filled with the spent soap-lye and the quantity contained in the tank determined in any convenient way. Three-fourths of the liquid in the tank A is then drawn off into the tank B, and to this liquid in tank B there is added a sufficient quantity of muriatic acid to exactly neutralize it. The remaining fourth of the liquid is then let down from the tank A into the tank B and mixed with the neutralized lye in the latter. This operation affords a convenient way of effecting an exact three-fourths neutralization of the entire quantity of lye. It may be done in some other way; but this mode is very convenient and at the same time certain. To this liquid in tank B, three-fourths neutralized, there is then added a quantity of persulphate of iron, equivalent to one-third of the acid used, and well mixed therewith, whereby a complete neutralization of the free alkali is obtained and a double decomposition of the soapy matter. The liquid is now in proper condition without any further treatment for separation in the filter-press D, to which it is transferred by the pump C. By the operation of the filter-press the clear liquid is received in the pan d^4, and thence delivered directly into the evaporating-pan E, while the precipitate is left in the press in the form of a cake. The liquid received in the evaporating-pan from the filter-press is crude glycerine, salt, and water, which is then evaporated in the usual way by means of the steam-coil in the said pan. During this process of evaporating the salt crystallizes out and drops to the bottom of the tank, which effect is greatly facilitated by the arrangement of the coil away from the sides of the tank, for the settling of the salt crystals is not impaired under this arrangement, as would be the case if the coil rested against the inner surface of the pan, in which latter case the salt would gradually incrust the steam-pipes and so impair their action. The narrowing of the tank at the bottom also facilitates the separation of the salt crystals from the glycerine as the salt drops into the contracted bottom of the pan, leaving above an almost pure solution of glycerine and some salt, the evaporating process being continued until the water is mostly boiled off and the most of the salt crystallized out. The liquid is drawn off from the evaporating-pan and delivered into the tank H by the pump G, in which it is allowed to stand and cool, thus crystallizing out some more salt and also sulphate of soda, which settles at the bottom of the tank. These salts settling at the bottom of the evaporating-pan and the tank H are removed to the centrifugal machine I, by the operation of which the crude glycerine solution remaining therein is separated from solids and runs off through the pipe i^6 into the tank H. The salts left by this separation are suitable for reuse in the manufacture of soap, and thus a saving is effected. The clear solution of salt in glycerine standing in the tank H is now drawn into the still K by the operation of the vacuum-pump, which still is especially adapted to the distillation of the solution in question, and also of all kinds of greasy and fatty solutions, oils, &c. In this still the glycerine is distilled off and passes into the condenser. As already stated, I prefer to obtain the heat necessary for distillation by means of a steam-coil, for then there is no danger of unduly heating the sides of the still, which would lead to burning or incrustation of some material upon the inner surface. At the same time I secure a regular and equable degree of heat throughout the entire body of liquid. At the same time steam is injected directly into the liquid through the pipes l, whereby the liquid is agitated and still further heated. When steam is thus injected, especially if superheated, I have found that small crystals of salt are carried along with the vapors of distillation, which of course injure the distillate, which will be a clear glycerine, but a little salty. The diaphragm l' obstructs the upward movement of these particles of salt, thereby preventing them from passing over with the vapors of distillation. The vapors are drawn from the still into the condenser M, where, as they pass through the flues, they are condensed by the action of the constant current of cold water flowing up through the cylinder around the tubes and collect in liquid form at the lower end of the condenser, and this liquid is discharged into the receiver N as a clear aqueous solution of glycerine. In this part of the operation I have found that it is desirable to have a vacuum of about twenty-nine inches, under which the glycerine readily distills by the application of saturated steam at about sixty pounds pressure in the steam-coil of the still, at which low heat it is obvious that it is impossible to burn the material. By the operation of the vacuum-pump R the glycerine solution is transferred from the receiver N to the vacuum-pan P, where it is concentrated in the ordinary way to any required density and the concentrated glycerine drawn off therefrom through the gate-valve at the bottom. The result is a clear pure glycerine.

The particular construction of the still af-

fords some advantages. Whenever there is occasion to reach the interior of the still, it may be accomplished by removing only one-half of the top or head, and the same is true of the bottom, so that the still may be readily entered from the top or bottom for purposes of repair or removal of the salt or any other sediment remaining at the bottom of the still, and this can be accomplished without in any way disturbing the steam-coil in the interior of the still. The perforated diaphragm in this still is a feature of special importance in the distillation of a salty solution of glycerine.

With this entire apparatus I am enabled to carry out conveniently and expeditiously my aforesaid process for the treatment of soap-makers' waste to obtain glycerine and substantially as a continuous process.

There may be changes in some details of construction and there may be modifications in the particular arrangement of some of the parts of the entire apparatus without materially changing the nature thereof.

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

A plant for obtaining glycerine from soap-makers' waste, consisting of a mixing and neutralizing tank, a filter-press, a pump for transferring the neutralized lye to said filter-press, an evaporating-pan arranged to receive the liquid from the press, a cooling and settling tank, a pump for transferring the liquid from the evaporating-pan to said tank, a still, a condenser, a closed receiving-tank, a dry vacuum-pump, a vacuum-pan, and a wet vacuum-pump, all arranged and connected to operate together, substantially as described.

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