Feb. 13, 1940. B. CLAYTON 2,190,591

METHOD OF PROCESSING SOAP

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Fig. 1.

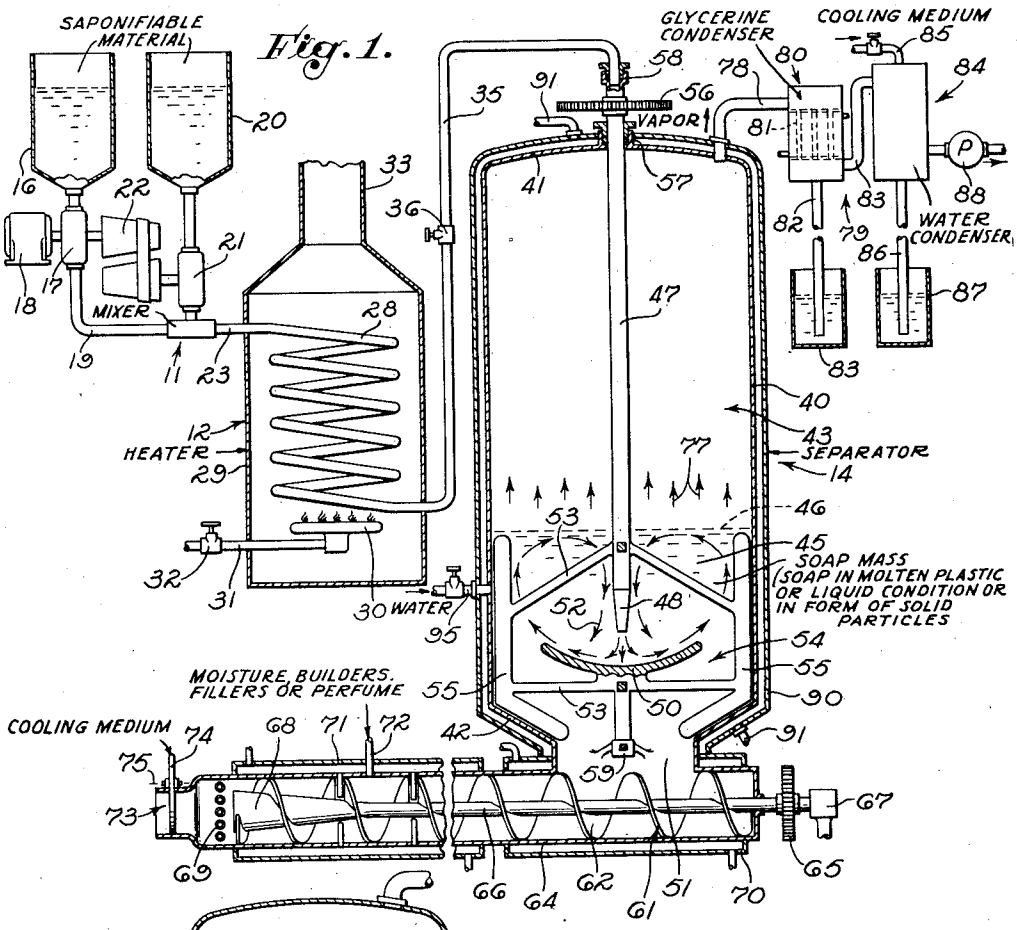
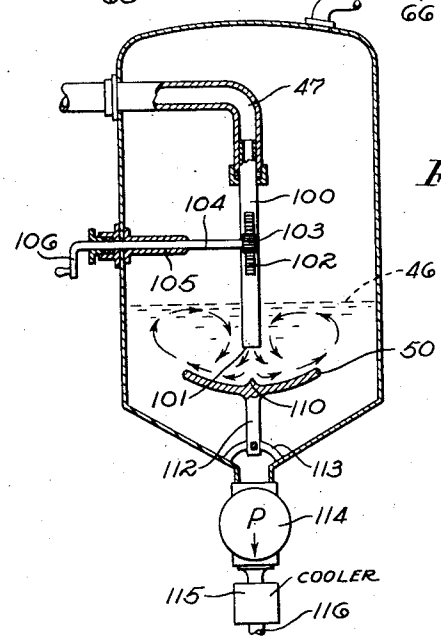


Fig. 2.



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METHOD OF PROCESSING SOAP

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My invention relates to a novel method and apparatus for separating volatile material from non-volatile material and for processing material such as soap and the like. More particularly, it relates to a system for processing a soap stream to produce soap of desired moisture content which can be delivered continuously from the equipment.

It is an object of the present invention to process a stream of material containing a non-volatile substance, such as soap, and in many instances volatile material such as water, glycerine, etc., and to discharge such a stream into a chamber closed from the atmosphere, the point of discharge being beneath the surface of a mass of material comprising or containing the non-volatile material.

While applicable to various materials, the process will be particularly described with reference to the processing of soap. In forming soap, it is customary to apply heat to a mixture of saponifiable and saponifying materials. Within the meaning of the present application, the saponifiable material may be any of the fats, oils, greases and fatty acids which are commonly used in soap manufacture, including tallow and other animal fat, cotton seed oil, various other vegetable fats and oils, fish oils, fatty acids from various sources, materials containing saponifiable acids (e. g., rosin or other resinous substances). The term "saponifying material" is here used to include any of those substances which are adapted to produce saponification of such materials, such, for instance, as various hydroxides or materials acting to saponify the saponifiable material, this saponifying material being usually, though not invariably, in aqueous solution.

One mehod of effecting such a saponifying reaction is to introduce properly proportioned quantities of saponifying and saponifiable materials into a reaction zone, conditions of heat and pressure therein being such as to complete the saponifying reaction. If a stream of the resulting reaction products is introduced into the upper end of a relatively large separating or expansion chamber to separate vapors from the soap, the soap will settle to the bottom of the chamber and the vapors can be withdrawn from the upper end thereof. The present invention can be used in conjunction with a soap stream produced by various processes, this soap stream containing soap and sometimes other materials, such as water, glycerine, etc., and the term is herein used with reference to a stream of soap whether or not it includes such other materials.

It is an object of the present invention to maintain a soap mass in a chamber from which air is preferably excluded and to introduce a soap stream continuously into this soap mass at a position beneath its surface. Such an expedient can be used to advantage in controlling the liberation of vapors from the soap mass whether these vapors are due to volatile material in the soap stream or the soap mass, or both. It can also be used to control the moisture content of the soap to be discharged from the system. Within the meaning of the term "soap mass" as herein used, this mass may contain soap which is fluid due to the presence of a solvent such as water, or soap which is substantially anhydrous yet fluid due to the presence of heat (e. g., molten or plastic soap), or soap which is in the form of solid particles (e. g., powder, granules, etc.), whether or not they are anhydrous.

Another object of the invention is to release a soap stream into a soap mass to control the expansion thereof. If vapors are present in the soap stream, it is thus possible to retard the expansion thereof.

A further object of the invention is to circulate or agitate the soap mass to facilitate the separation of vapors therefrom or to facilitate uniform incorporation of soap from the soap stream into the soap mass.

Another object of the invention is to maintain a vapor atmosphere above such a soap mass, usually to the exclusion of air when the soap is at such elevated temperature as to be deleteriously affected by contact with air or other oxidizing agent.

Another object of the invention is to remove soap from the soap mass in such manner as to permit maintenance of desired conditions in the chamber. For example, the soap can be withdrawn at such rate as to maintain the surface of the soap mass above the point of discharge of the soap stream. So, also, if vacuum conditions are maintained in this chamber, the soap can be withdrawn in such manner as not to materially impair the vacuum.

Usually, it is desirable to control the liberation of vapors from the soap mass by controlling the temperature and pressure conditions in the chamber. It is an object of the invention to control either or both of these factors. Temperature may be controlled by the heat of the soap stream and the application of heat to the chamber, if desired. The desired pressure conditions in the chamber can be maintained by the retention or

rate of withdrawal of vapors from the upper end thereof.

Another object of the invention includes the provision of a system for separating soap from vapor which requires much less space than certain previous systems.

Further objects and advantages of the invention will be made evident to those skilled in the art from the following description of one embodiment of the invention described with reference to the making and processing of soap though applicable to various other materials.

Referring to the drawing:

Fig. 1 diagrammatically indicates one form of soap making system of the invention including the novel separating system.

Fig. 2 is an alternative form of separating means, illustrated in section.

In general, the system disclosed in Figure 1 diagrammatically illustrates a proportioning means which supplies properly proportioned quantities of soap-forming materials to a mixer 11 in which a preliminary mixture forms, the saponifying material being dispersed in the saponifiable material. This preliminary mixture is then subjected to heat and pressure in a heater 12, the resulting product being moved to a separator 14 wherein the vapors and soap are separated.

More specifically, the proportioning means may include a tank 16, heated if desired, from which the saponifiable material may be withdrawn by a suitable pump 17 driven by a motor 18 or other variable-speed drive means. A pipe 19 communicates with the discharge of the pump 17 and delivers the saponifiable material to the mixer 11. Similarly, a tank 20, heated if desired, may retain the saponifying material, e. g., an aqueous alkaline solution, this saponifying material being withdrawn by a pump 21 driven at a speed proportional to the speed of the pump 17. A variable-speed transmission 22 may be used to operatively connect the pumps 17 and 21, such a means being diagrammatically indicated as of the cone-pulley type. The pumps 17 and 21 function to deliver properly proportioned streams of the saponifying and saponifiable materials to the mixer 11 at sufficient pressure to force these materials through the system and into the separator 14.

The mixer 11 may be of any one of a number of types. Mechanical mixers including moving agitator means may be utilized, though I generally find it sufficient to merely bring the flowing streams of saponifiable and saponifying materials into contact with each other to form the preliminary mixture. This can be accomplished by bringing the streams together in a chamber of the mixer 11, the resulting preliminary mixture being discharged through a pipe 23 to the heater 12. Means for indicating the pressure and temperature in the pipe 23 may be provided.

While various types of heaters may be utilized, I find it convenient to utilize a heater including a pipe coil 28 enclosed by a shell 29, this coil being externally heated by any suitable heating medium. A burner 30 is shown in this capacity, being supplied with combustible material through a pipe 31 controlled by a valve 32. The products of combustion rise around the coil 28 in heating relationship therewith and are discharged through a stack 33. The coil 28 forms a reaction zone of elongated character through which the products move with mild turbulent flow, the intake of the coil 28 being connected to the pipe 23 and the discharge of this coil being connected to a pipe 35. Suitable automatic control for the burner 30 may be utilized to maintain the material going through the pipe 35 of a constant nature. If desired, a control valve 36 may be associated with the pipe 35 acting as a throttle or pressure-reducing means. Further, the pipe 35 may be provided with suitable temperature and pressure indicating means, preferably positioned ahead of the valve 36.

The apparatus thus far described in detail forms one means of producing a soap stream which is to be processed. However, continuous saponification is not essential to the utility of the subsequent steps for the soap stream can be formed in various other ways. Regardless of the way in which the soap is formed, the soap stream preferably discharges continuously into the separator 14 in heated condition. If the soap is formed in ways other than that shown and if the temperature is not at the desired value, stream heating by flow through an elongated passage, such as is provided by the coil 28, will be found desirable.

The separator 14 includes a container 40 providing an upper head 41 and a sloping lower head 42 between which is defined a chamber 43. A soap mass is maintained in the lower end of this chamber, being indicated by the numeral 45, the upper surface of this soap mass being indicated by the numeral 46 and lying intermediate the upper and lower ends of the chamber 43. The soap stream from the pipe 35 moves into the chamber 43 through a pipe 47 which extends downward and terminates at a position below the upper surface 46 of the soap mass so that the soap stream is discharged directly into the soap mass rather than being discharged into the upper end of the chamber 43. While an open-ended pipe 47 can be used with success, I find it desirable, in some instances, to utilize a nozzle 48 at the lower end of the pipe 47 to build up a back pressure on the system. A pressure differential thus exists on opposite ends of the nozzle 48, causing expansion and forming the final reaction products which are discharged into the soap mass.

Though not invariably necessary, I sometimes find it preferable to utilize a baffle or deflector 50 disposed to extend across the flow from the nozzle 48 and positioned below the upper surface 46 of the soap mass. Such a deflector serves several functions. Thus, it prevents uninterrupted movement of the soap stream downward in the soap mass 45 to a soap draw-off passage 51 communicating with the extreme lower end of the chamber 43. In effect, it forms two zones in the soap mass, one being above and one below the deflector. Most of the vaporization takes place in the upper zone and the soap is desirably withdrawn from the lower zone. Also, it deflects the flow of the soap stream in such manner as to cause turbulence in the soap mass 45, and to circulate the soap stream through the soap mass 45 in a predetermined path, thus facilitating separation of vapor therefrom. At the same time, it confines this agitation and circulation to the upper zone and permits the soap in the lower zone of the mass to be relatively quiescent. To control the circulation, it is sometimes preferable to utilize a deflector 50 of dish-shape. This causes the downward-moving soap stream to be deflected outward from the axis of the stream and flow along the upwardly-concaved surface of the deflector 50, thereafter flowing upwardly and inwardly through the soap mass to be drawn

downward immediately around the nozzle 48. A closed circulation is thus induced, as indicated by the arrows 52, and the material is moved through a closed path, a portion of which may be adjacent the upper surface 46. This continuously renews the upper surface of the soap mass with hot soap to facilitate vapor separation therefrom and gives additional time for the vapors to separate.

Various means may be utilized to support the deflector 50 in such way as not to interfere with the withdrawal of the soap through the passage 51. In the embodiment disclosed, this is accomplished by supporting the deflector from the pipe 47 by arms 53. If the soap mass is not of a character to readily flow into the passage 51, or if it is desired to agitate the soap mass other than by injection of the soap stream, a scraper or agitator 54 may be positioned to move with blades 55 adjacent or in contact with the inner walls of the chamber 43. Such an agitator or scraper may be driven by various means but, in the system shown, the pipe 47 is made rotatable and is driven through a gear 56 so that the blades 55 can be secured to the arms 53 and effect rotation of the pipe 47, deflector 50 and blades 55 as a unit. Stuffing boxes 57 and 58 respectively seal the pipe 47 relative to the head 41 and the pipe 35. The blades 55 can journal the lower end of the rotatable unit or an arm-supported bearing 59 may be provided.

It is usually desirable to withdraw the soap forcibly from the soap mass 45 either intermittently or continuously to maintain the surface 46 above the point of discharge of the soap stream and to prevent the soap from staying in the chamber 43 for such time as might cause deleterious reactions due to heat, for example, discoloration, etc., if the soap mass is at high temperature. Continuous withdrawal is preferable for the soap can then be withdrawn at such rate that the upper surface 46 of the soap mass remains substantially constant in position. A withdrawal means is shown in this capacity and may be of any suitable type designed to withdraw the particular character of soap comprising the soap mass 45. A screw conveyor 61 can be used to withdraw this soap, regardless of condition and even if a high vacuum is maintained in the chamber 43. As shown, such a screw conveyor includes a screw 62 rotating in a housing 64 with only a small clearance therebetween. A gear 65 may be the driving source and the screw conveyor may push or move the soap leftward through an annular passage between a shaft 66 of the screw and the housing 64, this screw being journalled by the housing and a thrust bearing 67. This annular passage may provide a tapered portion formed by a head 68 wherein the soap is compressed into a mass which forms an effective seal for the chamber 43 if a vacuum is maintained therein. The screw conveyor may be of any desired length, or may comprise a plurality of intersecting units through which the soap is moved in succession to be discharged ultimately through a cooling grid 69 formed of a plurality of interconnected pipes through which a cooling medium is circulated. Cooling of the soap stream before exposure to the atmosphere is always desirable if the soap mass is maintained at such high temperature that oxidation or other undesirable reactions would result upon exposure to the air. Such cooling may be effected by means auxiliary or supplementary to the cooling grid 69, for example, jackets 70 and 71 may surround the housing 64 and receive a cooling medium, or the soap may be cooled in various other manners while being transported in the screw conveyor.

If desired, moisture or builders, filters, perfumes, etc. may be added to the soap during this transportation, as through a pipe 72. Such materials will become intimately mixed with the soap during movement through the screw conveyor and will thus appear in the soap discharged therefrom or extruded through a valve 73 which may be of the swing gate type providing a handle 74 and pivoted on an axis 75 to present an aperture of variable size to the advancing soap.

The soap stream introduced into the chamber 43 is usually at a temperature which is above the boiling point of water at the pressure existing in this chamber. Correspondingly, vapors separate from the soap mass and, if the soap stream comprises reaction products from the saponification of a glyceride type of oil or fat, these vapors may be a mixture of glycerine and water vapors. Temperatures of the incoming soap stream may be quite high, often several hundred degrees F. Temperatures from 450–600° F. are commonly used, though higher or lower temperatures are desirable in some instances depending on the saponifiable material and upon the desired character of the soap mass. The heat units available for vaporization in the chamber 43 can be derived from the soap stream exclusively or additional heat may be added in this chamber.

Pressure conditions in the chamber 43 may be controlled by the existence or rate of withdrawal of these vapors. These move from the soap mass as indicated by the arrows 77 to fill the upper end of the separating chamber 43, thus maintaining the upper surface 46 of the soap mass in contact with these vapors to the exclusion of air. These vapors are, in general, water vapors or glycerine vapors or both, though in some instances there will be present other vapors or even gases formed by the saponifying reaction. The term "vapors" is herein used to cover any or all of these, or various combinations thereof.

Such vapors are withdrawn from the upper end of the chamber 43 by a pipe 78. If it is desired to condense portions or all of these vapors, the pipe 78 may communicate with a condenser means 79. In the embodiment illustrated, I have shown a glycerine condenser 80 in which the vapors move through tubes 81 surrounded by a suitably circulated cooling medium, the condensate moving through a pipe 82 and being discharged into a tank 83 below the surface of the body of condensate therein. The pipe 82 is made sufficiently long to compensate for any reduced pressure utilized in the separating chamber 43.

Any uncondensed vapors, such as water, etc., move through a pipe 83 to a condenser 84, shown as being of the jet type, the cooling medium being introduced through a valved pipe 85, this cooling medium and condensate being discharged through a pipe 86 to accumulate in a tank 87. The pipe 86 is of sufficient length to compensate for any reduced pressure in the chamber 43.

To control the pressure in the chamber 43 and to withdraw from the condenser 84 any uncondensed products, I provide a pump 88 of the vacuum type. If no condenser means is utilized, the pump 88 may intake directly from the pipe 78 or this pump may be dispensed with in some instances to permit maintenance of atmospheric

or superatmospheric pressures in the chamber 43. However, in the double-condenser system shown, the pump 88 intakes from the condenser 84. Suitable means may be utilized for controlling the degree of vacuum produced by this pump, such means being will known in the art. The absolute pressure in the chamber 43 will be dependent in large measure upon the product to be formed and the way in which the system is operated.

The mode of operation will be described first with reference to a process in which molten or plastic soap forms the soap mass. This is particularly desirable if glycerine or other high boiling point volatiles are to be removed. The soap stream in this instance can be formed by saponifying a glyceride oil or fat and an aqueous saponifying material. It is not necessary to utilize any large excess of the aqueous saponifying material, for example, caustic soda, though a small excess may be used, if desired, to insure complete saponification.

If continuous saponification is effected, the proportioning pumps 17 and 21 will be set to deliver these materials to the mixer 11 in proper proportion. The preliminary mixture is formed in the mixer 11 and saponification begins to take place. With progressive flow through the coil 28, the products will be increased in temperature to complete the saponifying reaction and form the soap stream. The pressures in the reaction zone may be relatively high, several hundred pounds per square inch if desired, though lower pressures can be utilized with success. If glycerine is to be recovered and if the soap is to be collected in the chamber 43 in molten form, it is usually desirable to supply sufficient heat so that the water in the soap stream will be completely vaporized when discharged from the reaction zone, a portion or all of the glycerine formed by the reaction being also in vapor form at this time. The continuous saponifying system illustrated is only one of a number of ways of forming the soap stream and it is clear that other means may be used in this connection. If other saponifying systems are used, it may still be desirable to heat the product, preferably while flowing as a stream. In the present example, a heater of the type indicated by the numeral 12 may well be used and the soap stream issuing therefrom will desirably have all of the water and a part of the glycerine in vapor state.

This soap stream is preferably released into the chamber 43 while a high vacuum is present therein. In this example, it is desirable to use as high a vacuum as is commercially practical and it is possible to collect and maintain in the chamber 43 a fluid soap mass formed of substantially anhydrous soap, the fluidity being imparted by the presence of heat and the soap mass being in molten or plastic condition. With such a mode of operation, practically all of the glycerine can be removed from the soap and, if desired, condensed fractionally into relatively pure glycerine. Or the glycerine and the water vapors may be condensed together and subsequently separated.

If such a soap stream were released into the upper end of the chamber 43, sudden expansion of the existing vapors would take place and the glycerine would separate in a zone above the soap mass. If introduced beneath the surface 46 of the soap mass, this sudden expansion is retarded and the soap in the soap stream becomes associated directly with the soap mass. The water and glycerine vapors separate from the mass as distinct from being separated before the soap in the soap stream becomes associated with the soap mass and this is an important feature facilitating vapor separation. The retarded expansion effected by the submerged discharge of the soap stream is effective not only in insuring separation of substantially all of the glycerine but also in preventing soap particles being removed from the chamber 43 along with the vapors. In addition, the entire space above the soap mass is filled with these vapors to the exclusion of air and the soap can be maintained in molten or plastic condition until the vapors separate without deleterious reactions. Further, the whole mass of separated vapor moves upward uniformly in the chamber 43 as distinct from being violently agitated if the soap stream is released into the upper end of this chamber to discharge at a point above the surface 46 of the soap mass.

The condition of the soap mass 45 will depend largely upon its temperature. If the temperature of the incoming soap stream is sufficiently high, the soap mass will be molten and quite fluid, even though some cooling may take place in the chamber 43. Once soap has become molten, it can be cooled many degrees below the temperature necessary to place it in molten condition without destroying its fluidity. If desired, such cooling may be counteracted or heat may be supplied to this chamber by the provision of a jacket 90 through which a heating medium may be circulated through connections 91. Alternatively, the chamber 43 can be heated by other means such as by injection of superheated steam into the vapor space or into the soap mass at a position beneath the surface 46. With somewhat lower temperatures of the soap stream or with more cooling in the chamber 43, the soap mass 45 may be in a more or less plastic condition which is still very satisfactory from the standpoint of glycerine separation.

In this example, the soap will remain in molten or plastic condition until it enters the withdrawal means. It can there be cooled in various ways as by circulating a cooling medium through jackets 70 and 71 and the grid 69. In some instances, circulation of a heating medium through the jacket 70 is desirable to maintain the soap in molten or plastic condition in the first portion of the conveyor. Various materials such as moisture, builder, fillers, perfumes, etc. can be introduced into the soap in the screw conveyor in any suitable manner, as through the pipe 72. The conveyor may be of any suitable length or may comprise several intersecting units through which the soap is moved in succession. The soap may well be cooled in this conveyor to such an extent that no deleterious reactions will result upon discharge into the atmosphere. At the same time, the soap will be compressed in the conveyor housing, particularly adjacent the tapered head 68. This compression, assisted by cooling of the soap, will form an effective vacuum seal for the chamber 43 so that the soap can be continuously removed without impairing the vacuum therein.

The invention can also be used to advantage if the soap mass 45 is in the form of solid particles, such as powder or granules. Production of this type of soap is possible if the temperature of the soap stream is lower than that required to collect the soap in molten or plastic condition or if higher absolute pressures are maintained in the chamber 43. Discharge of the

soap stream beneath the surface 46 of such a soap mass retards expansion of the incoming stream and agitates the soap mass to give a better separation of vapors. In addition, such submerged discharge tends to prevent the rising vapors from carrying fine soap particles upward to the condenser system.

In this example, the soap can be collected and withdrawn from the chamber 43 in anhydrous condition and some of the glycerine can also be removed. Glycerine removal is bettered by application of heat to the chamber 43 as by circulating a heating medium through the jacket 90 and by agitation of the soap particles forming the soap mass 45. Glycerine separates more slowly from such a powdered mass but, by retaining the soap in the chamber 43 for a time and applying heat to the jacket 90 while agitating the soap, it is possible to remove a substantial portion of the glycerine. On the other hand, the system can also be used to produce substantially anhydrous soap from which practically none of the glycerine has been removed.

Even a portion of the water present in the soap stream can be retained in the soap by suitable control of the temperature of this incoming stream, the temperature in the chamber 43, the absolute pressure and the depth of submergence of the nozzle 48. If this incoming soap stream contains water and is at a temperature which is above the boiling point of water at the pressure existing in the chamber 43, steam will be liberated when the stream is discharged in submerged position and will move upward through the soap mass. If this mass is at such temperature that some of the steam will condense, it is possible to hydrate the soap to a desired extent.

If powdered or granular soap is to be collected and removed from the chamber 43, the pressure therein need not be below atmospheric. So, also, if no glycerine is to be recovered, the condenser 80 can be dispensed with. Even the condenser 84 and the vacuum pump 88 can be eliminated if the resulting water vapor is not to be condensed. In this instance, discharge of vapors through the pipe 78 will prevent the entrance of air into the chamber 43. On the other hand, if all of the glycerine is to be retained in the soap, it is possible to use an open chamber 43 from which some or all of the water may continuously discharge to produce a soap of desired moisture content.

The screw conveyor shown is well adapted to continuously withdraw the sub-divided soap from the chamber 43 in powdered or granular form. Cooling thereof can be effected in the conveyor before discharge into the atmosphere and moisture or various materials can be added to the soap in the conveyor. The soap will be compressed into a compacted mass as it is moved forward, thus forming an effective seal for the chamber 43.

The third way of utilizing the invention is to maintain the soap mass 45 in fluid condition due to the presence of water, the soap stream being discharged thereinto. In this connection, it is desirable that vaporization of water take place in the chamber 43, the vapor separating from the soap mass 45. Such vaporization requires heat and the incoming soap stream can well supply this, with the result of cooling the soap and at the same time hydrating it in the chamber 43. The latent heat of vaporization required to vaporize a unit of water in this chamber is large and a very considerable cooling is thus possible. Further cooling can be effected in the chamber 43 by circulation of a cooling medium through the jacket 90, if this is desired.

In some instances, it is desirable to intermittently or continuously introduce water into the chamber 43. This can be accomplished by any suitable means, such as a pipe 95. If this expedient is used, the total amount of water entering the chamber will be represented by the sum of the water entering through this pipe and the moisture present in the incoming soap stream. This total amount of water is withdrawn from the chamber 43 either in the form of vapor removed from the upper end thereof or in the form of moisture associated with the soap removed by the conveyor. Thus, by properly controlling the incoming moisture with respect to the vaporization which takes place in the chamber 43, the soap can be hydrated to the desired extent. On the other hand, assuming sufficient cooling and/or sufficient pressure in the chamber 43, no vapors need be withdrawn and the continuously withdrawn soap can have a moisture content as determined by the moisture in the incoming soap stream. This in turn can be controlled by the strength of the aqueous saponifying solution or by otherwise controlling the amount of water in the soap stream. However, in most instances, it is desirable to remove a controlled amount of vapor from the chamber 43 continuously, as well as to withdraw the soap continuously.

In this example, also, it will be clear that the amount of vaporization in the chamber 43 will depend upon conditions of temperature and pressure therein. Temperature conditions will in turn depend upon the temperature of the incoming soap stream and can also be varied by circulation of a heating or cooling medium through the jacket 90 and by proper control of the temperature of the water entering through the pipe 95. Pressure conditions in the chamber can be controlled by the rate of removal of vapors and soap therefrom. If the vapors are removed or withdrawn only slowly, as by throttling the discharge of vapors from the chamber, superatmospheric pressures can be developed and correspondingly less water will vaporize from the soap mass. Faster withdrawal of the vapors will permit maintenance of lower pressures with increased vaporization. By proper control of these factors, it is possible to cool and hydrate the soap to a desired extent in the chamber 43. Even if the soap is hydrated in the chamber 43, the conveyor may well be used to control its withdrawal, though the cooling function of the conveyor becomes less important in this example.

In all instances, the depth of submergence of the nozzle 48 below the upper surface 46 should be sufficient to insure that the soap stream will be discharged into the soap mass rather than permitting the stream to form a depression in the upper surface 46. It is desirable to maintain this submergence and this can well be done by controlling the rate of withdrawal of the soap.

However, in Figure 2, there is shown another system for maintaining the relative positions of the nozzle and the upper surface 46. Here the pipe 47 is of a telescopic character to provide a vertically-movable pipe 100 terminating in an open lower end 101. A rack 102 may be secured thereto and meshed with a pinion 103 carried by a rotatable shaft 104 which is journalled in a

sleeve 105. A crank 106 or other means may be used for turning the shaft to change the vertical position of the pipe 100 and thus regulate the relative positions of the end 101 and the upper surface 46 of the soap mass.

Also, in Figure 2, the deflector 50 is shown as providing a central tapered point 110 which helps to spread the soap stream to set up the circulation path shown. This deflector is shown as being supported by a rod 112 secured to a spider 113. A pump 114 serves to withdraw the soap intermittently or continuously, though the withdrawal means 60 of Figure 1 can well be used in this connection. It is possible to use a suitable pump in withdrawing the soap if this soap is in pumpable condition. If desired, the soap may be cooled by a cooler 115 which receives the soap from the pump 114. The soap may then be extruded through an extrusion orifice 116.

In general, it will be clear that the soap stream need not necessarily contain glycerine. For example, if the soap stream results from the saponification of fatty acids derived from various sources, no glycerine need be present therein. Further, the soap stream need not contain water, for example, it may be a stream of substantially pure soap, molten or plastic if desired, and advantageous results accrue from the discharge of such a stream into a soap mass, particularly if this mass contains water. Hydration of the soap to the desired degree is readily accomplished by this expedient.

Nor is the invention limited to processing a soap stream. It is well adapted to the separation of volatiles from non-volatiles by introducing a heated stream containing these into the chamber 43 and discharging such a stream beneath the surface of a mass of the non-volatiles maintained in the stream. This mass may contain non-volatiles exclusively or may contain some volatile matter. Control of vaporization from the mass can be effected by controlling the variables previously mentioned. Material can be continuously removed from the mass to control the position of the surface thereof. Likewise, the rate of removal of vapors can be varied to control the pressure and the amount of vaporization taking place from the mass.

Various changes and modifications can be made without departing from the spirit of the invention as defined in the appended claims.

I claim as my invention:

1. A method of processing soap, which method includes the steps of: maintaining a mass of soap in a chamber; continuously moving a soap stream into said chamber and discharging same into said mass of soap at a position beneath the surface thereof while the temperature of said soap stream is sufficient to liberate vapors at the pressure existing in said chamber whereby the soap in said stream becomes associated with said mass of soap and vapors are continuously liberated from the soap mass; continuously withdrawing vapors from that portion of said chamber above the surface of said soap mass; and continuously withdrawing soap from said soap mass at such rate as to maintain the surface of said mass of soap at a position above the point of discharge of the soap stream.

2. A method of processing soap, which method includes the steps of: maintaining a soap mass in a chamber with an atmosphere of vapor thereabove; continuously moving a soap stream into said chamber and discharging same into said mass of soap at a position beneath the surface thereof whereby the soap in said stream becomes associated with said mass of soap; maintaining the temperature in said chamber sufficiently high to separate water in vapor form from said soap mass to maintain the vapor atmosphere above said mass of soap; and withdrawing soap from said soap mass.

3. A method of processing soap, which method includes the steps of: maintaining a mass of soap in a chamber; continuously moving a soap stream into said chamber and discharging same into said mass of soap at a position beneath the surface thereof while circulating the material of said soap mass to facilitate liberation of vapor therefrom; continuously removing vapor from the upper end of said chamber; and maintaining the surface of said soap mass above the point of discharge of soad soap stream.

4. A method of processing soap, which method includes the steps of: maintaining a mass of soap in a chamber; continuously moving a soap stream into said chamber and discharging same into said mass of soap at a position beneath the surface thereof whereby the soap in said soap stream becomes associated with said soap mass; circulating that portion of said soap mass in an upper zone of this mass to facilitate separation of vapors therefrom while preventing substantial circulation in a lower zone of said mass; continuously removing vapor from the upper end of said chamber; and removing material from the lower zone of said soap mass in such manner as to maintain the surface of said soap mass above the point of discharge of said soap stream.

5. A method as defined in claim 3 including the step of withdrawing soap from said chamber at such rate as to maintain the surface of said soap mass above the point of discharge of said soap stream, and cooling the soap thus withdrawn.

6. A method of processing soap, which method includes the steps of: maintaining in a chamber from which air is excluded a mass of soap which is substantially anhydrous yet fluid due to the presence of heat; continuously moving a soap stream containing glycerine into said chamber and discharging same into said mass of fluid soap at a position beneath the upper surface thereof whereby the soap in said stream becomes associated with said soap mass and glycerine vapors separate from the soap mass; circulating the material in the soap mass in a manner to continuously renew the upper surface of this mass to facilitate liberation of vapors therefrom; maintaining a high vacuum in said chamber; and continuously withdrawing vapor from the upper end of said chamber while maintaining the surface of said soap mass above the point of discharge of said soap stream.

7. A method as defined in claim 6 including the step of cooling the soap after withdrawal from said chamber and before exposure to the atmosphere.

8. A method of processing soap, which method includes the steps of: forming a heated soap stream containing soap and vaporizable material by applying heat during stream flow through an elongated passage; maintaining a soap mass in a chamber; continuously discharging said soap stream into said soap mass at a position beneath the upper surface thereof whereby the soap in said stream becomes associated with said soap mass and vapor separates from this mass; and continuously withdrawing vapor from the upper end of said chamber while maintaining the sur-

face of said soap mass above the point of discharge of said soap stream.

9. A method of processing soap, which method includes the steps of: forming a heated soap stream containing soap and vaporizable material by applying heat during stream flow through an elongated passage; maintaining a soap mass in a chamber; continuously discharging said soap stream into said soap mass at a position beneath the upper surface thereof whereby the soap in said stream becomes associated with said soap mass and vapor separates from this mass; continuously withdrawing vapor from the upper end of said chamber at such rate as to maintain a vacuum in said chamber; and withdrawing soap from said soap mass without impairing said vacuum and at such rate as to maintain the surface of said soap mass above the point of discharge of said soap stream.

10. A method of producing a soap of desired moisture content, which method includes the steps of: maintaining in a chamber a mass of soap containing water while the temperature in said chamber is such that water will vaporize at the pressure existing therein; continuously discharging a soap stream into said soap mass at a position beneath the surface thereof whereby the soap in said stream becomes associated with said soap mass and vapors are liberated from the soap mass; continuously removing vapor from said chamber; and withdrawing soap from said chamber.

11. A method of producing a soap of desired moisture content, which method includes the steps of: maintaining in a chamber a mass of soap; delivering to said chamber an amount of moisture in excess of that desired in the finished soap; continuously introducing a soap stream into said mass of soap at a position beneath the upper surface of this mass whereby the soap in said stream becomes associated with said mass; supplying sufficient heat to said chamber to vaporize that excess of the moisture delivered thereto over and above the amount desired in the finished soap; continuously removing from the chamber the vapor formed by vaporization of this excess of moisture; and withdrawing soap from said mass at such rate as to maintain the upper surface thereof above the point of introduction of said soap stream.

12. A method of hydrating and cooling a soap stream which is at an elevated temperature, which method includes the steps of: maintaining in a chamber a mass of soap containing water; discharging said soap stream continuously into said mass of soap while at a temperature which is above the boiling point of water at the pressure existing in said chamber whereby the heat units in said soap stream are available for vaporization of part of the water from said soap mass to leave the remaining water in the soap mass for hydration purposes and whereby the soap in the stream is cooled; and continuously withdrawing the vapors thus formed.

13. A method of continuously producing soap from a saponifiable material by reaction therewith of a saponifying material, which method includes the steps of: maintaining in the lower end of a chamber a soap mass having an upper surface between the uppermost and lowermost portions of said chamber; forming reaction products including soap and vaporizable material by heating a mixture of said saponifiable and saponifying materials; introducing said reaction products directly into said soap mass at a position below said upper surface thereof whereby the soap in said reaction products becomes associated with said soap mass and vapor is liberated from said upper surface; removing vapor from the upper end of said chamber; and removing soap from said soap mass from said chamber in such amount as to maintain said upper surface above the point of introduction of said reaction products.

BENJAMIN CLAYTON.

CERTIFICATE OF CORRECTION.

Patent No. 2,190,591. February 13, 1940.

BENJAMIN CLAYTON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 30, after "substances)," insert etc.; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of April, A. D. 1940.

(Seal)

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