

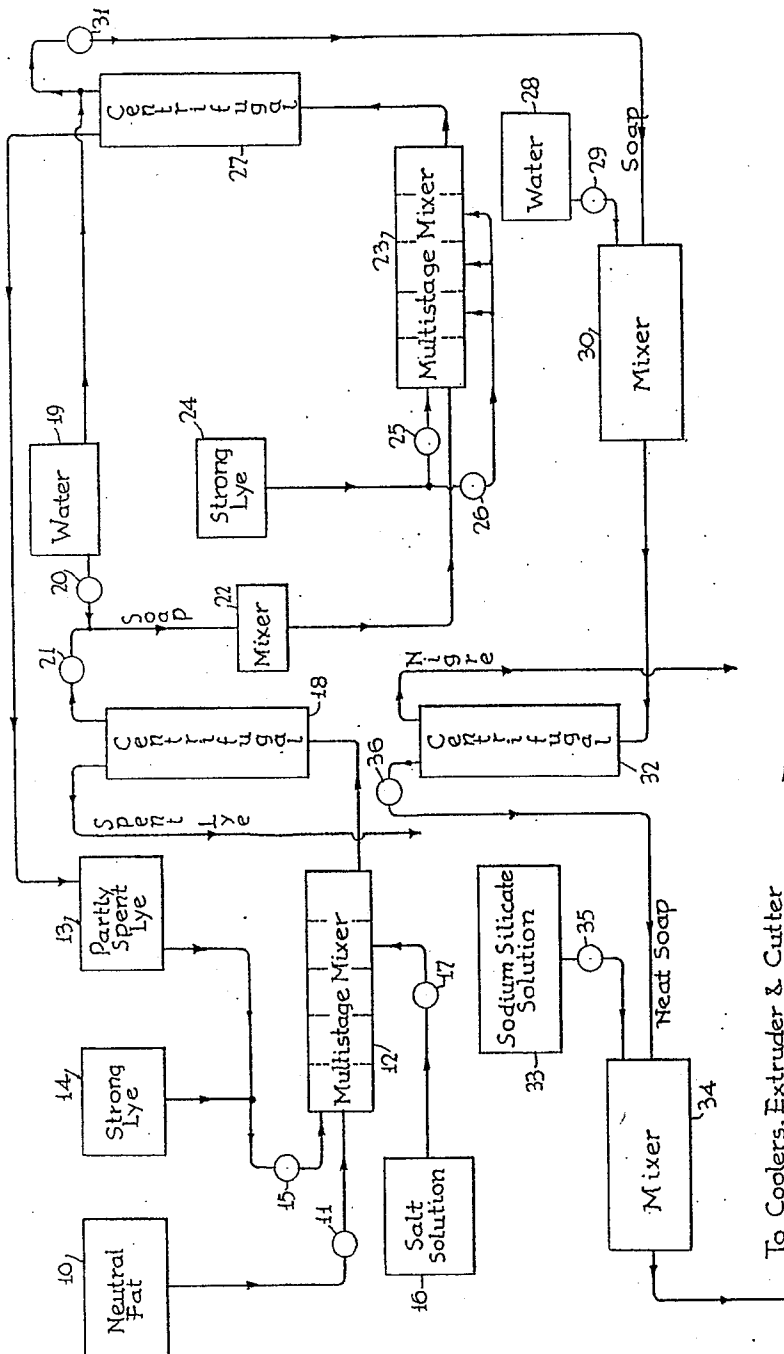
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MANUFACTURE OF SOAP

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MANUFACTURE OF SOAP

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The present invention relates to the art of soap making. An object of the invention has been to reduce the time consumed in the soap making operation, with resulting reduction in processing equipment and amount of material held in process. In accordance with the present invention, the time required for the soap making operation is reduced from a period of several days, to a period of one hour or less, and preferably to a period of approximately 20 minutes.

An important object of the invention has been to reduce the cost of the soap making operation by reducing the heat requirements of that operation. In prior art soap making operations, the materials are mixed together by passing live steam through the fat and lye, to effect mixing thereof and reaction. Much of the heat so applied is lost by reason of the evaporation of the steam. In the practice of the present invention, this waste is avoided by effecting the mixing operations by enclosed mechanical means, instead of using steam to accomplish mixing.

Another disadvantage in the practice of prior art processes of soap making lies in the fact that difficulty is encountered in obtaining a soap of exactly the desired constitution. Since the mixing step is accomplished by passing steam through the fat and lye, a variable amount of steam will condense during the course of the mixing step. The result is that kettles of soap, produced from identical raw materials, will differ materially in the proportion of water, salt, glycerine and caustic soda which they contain. The variations in the proportions of these ingredients cause variations in the texture and other characteristics of the finished soap. An important object of the present invention has been to avoid this difficulty by adopting a uniform procedure in connection with the soap making operation, involving incorporation into the soap of carefully controlled and uniform proportions of various soap constituents.

A further object of the invention has been to avoid the necessity of the so-called "fitting" step heretofore used by soap makers as a finishing step to effect removal of remaining dirt, caustic soda, glycerine and other impurities from the soap material resulting from the "strong change." This "fitting" step involved separation of a phase called "nigre" from the soap-containing mixture resulting from the "strong change." In the practice of the present invention, this "fitting" step is in most cases unnecessary.

Further objects and advantages of the invention, and the manner in which the above, and such further objects, are attained, will be obvious

from a reading of the following description in the light of the attached drawing, in which the single figure is a flow sheet illustrating a preferred embodiment of the practice of the invention.

The invention will first be described with reference to the manufacture of soap from a source of fat consisting of approximately 75% tallow and 25% coconut oil. It is to be understood, of course, that this form of description is adopted solely for the purpose of convenience, and that the invention is not to be limited because of specific description of the specific conditions peculiarly applicable to the manufacture of soap from such a mixture.

The mixture of tallow and coconut oil is heated to a temperature of approximately 185° F. The heated fat is then pumped from container 10 by pump 11 to a mixer 12, which may be of the multi-stage type.

Simultaneously with the passage of fat through the mixer 12, lye, or other saponifying reagent, is passed from container 13 to the mixer 12. The saponifying reagent used in this step is partly spent lye from a preceding soap-making operation, as will be more definitely explained hereinafter. Since the partly spent lye is relatively dilute (for example, between 13 and 15° Bé.), by reason of the fact that it contains a large quantity of water resulting from a prior saponifying step, and that it contains also glycerine and other impurities, it is desirable that this lye be strengthened by incorporation of a certain amount of stronger lye therewith. Thus, fresh lye from container 14 may be mixed with spent lye in container 13, or may be continuously passed in desired proportion into the flowing stream of lye from container 13, as illustrated. The concentration of the mixture of lyes so produced is preferably about 30° Bé. A stream of saponifying reagent from containers 13 and/or 14 is continuously passed by pump 15 into the multi-stage mixer 12.

The pumps 11 and 15 are preferably similar to the metering and pumping units, respectively, of the proportioning equipment illustrated and claimed in the U. S. patent to Jones 2,009,890. By employing this type of proportioning apparatus it is possible to effect adjustment of the ratio of lye to fat by a simple adjustment corresponding to adjustment of the screw 70 or 91 illustrated in Figures 4 and 7, respectively, of the patent drawing of that patent. The quantity of lye introduced into the mixer 12 is preferably just about sufficient, if all of the lye were utilized in

the saponifying reaction, to saponify all of the fat; i. e., it is approximately a stoichiometric equivalent of the fatty acid content of the fat under treatment. The temperature rise after commencement of the reaction between the saponifying reagent and fat, if the initial temperature is approximately 185° F., will ordinarily be of the order of approximately 30° F.

The mixing operation performed in the first stage of the multi-stage mixing operation may be accomplished by any well known type of mixing action, i. e., this mixing operation may be performed by a high speed mechanical agitator, by baffles, by atomization, by turbulent flow, or by orifices.

After a substantial quantity of soap has been formed by reaction of alkali upon the fat in the mixer 12, the reaction mixture will be a viscous, plastic mass, and continued intimate mixing of the ingredients thereafter becomes more difficult. The stages of the mixer 12 subsequent to the first stage therefore employ a compound mixing action, since it is highly desirable that continued thorough mixing be accomplished at this time. Such action involves agitation with a unitary agitating element having at least 2 separate types of motion, such as planetary rotation of the axis of the agitating element during independent rotation of the element about such moving axis. Alternatively, such compound mixing action may involve rotation of two or more agitating elements or arms in opposite directions, to effect general turbulence of the plastic mass.

The fat is first thoroughly mixed with lye in the first three compartments of the mixer 12. Such a mixing operation will ordinarily consume between 5 and 20 minutes, and at the conclusion of this mixing operation, most of the lye has become neutralized by reaction with the fatty acid of the fat. At this stage of the mixing operation, the soap-making mixture is a fairly homogeneous mass. It is necessary to effect "graining" of this mass before separation of the soap from other ingredients of the mixture can be accomplished; i. e., it is necessary that the soap particles be precipitated from aqueous solution and caused to agglomerate to a certain extent in order to produce two separate phases, consisting respectively of a solution of water in soap, and a so-called aqueous spent lye phase containing glycerine and both soluble and insoluble impurities. A salt solution, at approximately the temperature of the mixture, is continuously proportioned from container 16 by a pump 17 into one of the later stages of the mixer 12, the fourth stage as illustrated. A suitable salt solution for use in this connection consists of a 16% solution of sodium chloride. Such solution should be added in sufficient quantity to bring the aqueous phase in the mixer 12 up to a salt concentration of approximately 13 to 15%, since it is found that best graining results are obtained when the aqueous phase reaches a concentration within these limits. In any case, it has been found that the salt content of the aqueous phase resulting from addition of the salt solution from container 16 to the multi-stage mixer 12 should be between 10 and 20%. A compound mixing action is used in the stages of the mixer 12 in which the salt solution is incorporated in the soap mixture, just as in the later stages of the lye mixing operation.

After incorporation of the salt solution, the mixture is aged for a period varying between 1 and 10 minutes. The mixture is agitated quite vigorously during this aging operation, in order

to obtain the desired graining or precipitation of the soap and to insure the uniform distribution of the grained soap of the mixture as it passes to the succeeding step of centrifugation.

The grained soap mixture is passed (preferably continuously) from the multi-stage mixer 12 to a centrifugal separator 18. The centrifugal separator may be of any type designed to effect continuous stratification of the aqueous and soap phases formed in the mixer 12 from each other, and a separate discharge of these stratified constituents from the centrifugal. Thus, a centrifugal operating upon the principle of continuous discharge of the lighter soap phase under liquid balance against the heavier aqueous phase, containing glycerine, dirt, etc., may be employed. In case a centrifugal of this type is employed, hot water is preferably introduced directly into the cover of the centrifugal into which the soap phase is discharged, in order to dilute the soap promptly and assist in its removal.

The centrifugal separator 18 may also include peripheral openings through which separated solid matter may be discharged separately from the soap and aqueous phases during continuous and separate discharge of said soap and aqueous phases, respectively.

The soap phase discharged from this machine is diluted with an aqueous liquid in sufficient quantity to form a water solution of the soap. When brought to this condition, the diluted soap is sufficiently liquid to permit of pumping and intimate incorporation and mixing of further saponifying reagent therewith. The soap stratified in the centrifuge 18 is a grained soap, and the individual grains have relatively hard outer surfaces which resist incorporation of saponifying reagent. It is necessary that this grained soap be intimately mixed with water, in order that these protective surfaces may be broken down so that the subsequently added saponifying reagent may mix with, and saponify, the fat which would otherwise be protected by the hard outer surfaces referred to.

As pointed out above, in case a centrifugal separator operating on the liquid balance principle is used, the water mixed with the soap at this stage may be incorporated by feeding hot water into the centrifugal cover into which the soap is discharged. In any case, it is desirable, for the reasons pointed out above, that water, or a dilute solution of lye, be intimately mixed with the soap phase discharged from the centrifugal 18, and such intimate mixing is preferably accomplished promptly after discharge of this soap from the centrifugal; i. e., within a few minutes after such discharge. Water from container 19 is continuously passed by pump 20 into confluence with soap passing from centrifugal 18, and pumped by pump 21 into the mixer 22. This mixer will, like the later stages of the mixer 12, be of a type having a compound mixing action. The ratio of water to soap is preferably controlled by metering apparatus of the same type described above with respect to pumps 11 and 15, as is the proportioning of all of the various constituents added to the soap-making mixture during the practice of the steps of the process to be described hereinafter.

The soap-containing material discharged from the mixer 22 is passed continuously to a multi-stage mixer 23, where it is mixed with a strong saponifying reagent, such as lye of approximately 30° Bé. concentration from container 24. A quantity of lye from container 24 sufficient to

complete the saponification of the fat content of the soap mixture passed from mixer 22 is added directly to the first stage of the mixer 23 through pump 25. Each of the stages of the mixer 23 preferably employs a compound mixing action such as described above with respect to the later stages of mixer 12. The first operation performed in the mixer 23 is completion of the saponification of the fat passed to this mixer.

After this saponification has been completed, it is necessary that the mixture be again grained in order that efficient washing may be accomplished, and soap separated from saponifying reagent, glycerine, dirt, etc. This graining operation is accomplished by adding further charges of the saponifying reagent (e. g., lye as discussed above) through pump 26 to the advanced stages of the mixer 23. This additional strong lye serves to convert the plastic mass existing in the first stage of the mixer 23 into separate phases, just as does the addition of salt in the advanced stages of mixer 12. Most of the salt and glycerine contained in the soap is dissolved in the aqueous phase, and the addition of a further quantity of strong lye for graining thus has the further advantage of effecting removal of practically all of these residual impurities from the soap. As illustrated in the flow sheet, the additional lye may be added for graining in three separate increments in three successive stages of the mixer 23, and I have found that best results are accomplished by such gradual or incremental addition of the graining solution. Violent mixing is continued in every stage of the mixer 23, in order that a fairly uniform mixture may be delivered to the centrifugal 27. The grained soap-containing mixture discharged from the mixer 23 is next passed to a centrifugal separator 27, which may be a machine of any of the types described above in connection with the centrifugal 18. Partially spent lye, containing some glycerine, salt, etc., is discharged as the heavier phase from the centrifugal 27 and is returned to the container 13 for blending with stronger lye and use in the initial saponifying step in the mixer 12 in the treatment of further fat to be saponified, as described above.

The soap discharged from the centrifugal 27, as the lighter phase, will, in most cases, be at least as good in quality as neat soap produced by prior art processes, even after the performance of the conventional step of "fitting" with water performed in connection with such prior art processes. A subsequent step of "fitting" will therefore be unnecessary in most cases in the practice of the present invention, since the two centrifugal separating steps remove from the soap, constituents which must be removed by the "fitting" step in prior art practice. In cases in which it is desired to produce a soap of unusually high quality in the practice of the present invention, a step of "fitting" will be employed. This may be accomplished by mixing the soap phase separated from the centrifugal separator 27 with water. Sufficient water (e. g., 20-30%, based on the weight of the soap) is added to this soap phase to cause the soap-containing material to undergo a transformation which permits later separation into a nigre phase and a neat soap phase respectively. A part of the water added to effect such transformation may be passed from container 19 into the soap-discharge cover of centrifugal 27 to assist the discharge of the soap phase from this centrifugal. The remainder of the water may be pumped from container 28 by pump 29 into a mixer 30, where it is mixed with the soap

phase passed by pump 31 into the mixer 30. The mixture of neat soap and nigre formed in the mixer 30 is next passed to a centrifugal separator 32, which may be of any of the types described above with respect to centrifugal separators 18 and 27.

The neat soap phase discharged from centrifugal 32 may be continuously diluted with sodium silicate, perfume or other constituents desired in the finished soap. This may be accomplished by passing the substance to be mixed with the neat soap from container 33 into mixer 34 by pump 35. The mixer 34 is preferably a compound mixer, and the neat soap is continuously pumped through this mixer by pump 36. The neat soap mass discharged from the mixer 34 may then be passed through coolers, extruders and cutters, in well known manner.

In the above discussion, I have described specific conditions for the manufacture of soap from a mixture of fats consisting of tallow and coconut oil. I have discussed the treatment of such fats under preferred conditions, but it will be understood that these conditions may vary widely within the spirit of the invention. For example, the temperatures may vary within considerable limits from those discussed above (provided the initial temperature is sufficiently high to cause rapid saponification), as may also concentrations of reagents, time factors, and other conditions.

While the process has been described specifically with reference to the manufacture of a hard soap from tallow and coconut oil, it will be understood that practically any source of fat heretofore used in kettle soap making may be employed. Thus, for example, cotton seed oil, palm kernel, palm, or other oils may be advantageously used. In case it is desired to produce a soft soap by treatment of oils of lower molecular weight, a lower initial temperature than the temperature of 185° F. specified above as preferable for the manufacture of hard soap, is employed. The initial temperature even in the manufacture of soft soaps, however, will ordinarily be in excess of 150° F.

It is possible to employ temperatures which are very materially in excess of the temperatures above indicated as preferable. For example, a reaction temperature which is above the boiling point of the aqueous phase of the soap-forming mixture at atmospheric pressure may be used, since the entire apparatus is under pressure sufficient to maintain the aqueous phase liquid, even at temperatures of 230° F. or above. If the initial temperature of the materials employed in the process is unusually high (e. g., 210° F., or higher), it may be desirable to cool the mixture during the course of the saponifying reaction. This may be accomplished by providing cooling coils in the mixers, and circulating a refrigerant through such coils, or it may be accomplished by using a jacketed mixer, in which the refrigerant circulates through the jacket. As a still further alternative, the mixture may be cooled during the course of the saponifying reaction by permitting a part of the aqueous phase to evaporate, in which case the latent heat of evaporation of the removed portion of the aqueous phase absorbs the heat of reaction, or at least a substantial part of said heat. Alternatively, this may be accomplished by introducing the brine used for graining in the mixer 12, or the lye used for graining in the mixer 23, at a temperature substantially below the temperature of the mixture to which

the graining solution is added. By cooling the mixture in this way, the graining is effected simultaneously with the reduction of the temperature to the best temperature for centrifugation. This feature of cooling the mixture prior to centrifugation is claimed in my co-pending application Serial No. 417,747, filed November 4, 1941.

The centrifugal separators 18, 27 and 32 may be of any type adapted to effect continuous separation of aqueous phase from soap. They may, for example, be liquid balance separators, as discussed above, and they may be provided with peripheral openings adapted to be intermittently opened to effect discharge of subsided solids during continuous discharge of soap and aqueous phase separately. As a further alternative, a centrifugal separator of the type which effects discharge of the lighter soap phase under the influence of its own rotational inertia may be employed. Thus, a centrifuge such as that illustrated in the patent to Jones, 2,089,123, may be employed, the soap phase being continuously discharged from the machine through the skimming nozzle 19 illustrated in that patent. This feature of discharging the soap under its own rotational inertia is claimed in my co-pending application Serial No. 432,375, filed February 26, 1942.

An important feature of the invention consists in the fact that the entire separation of aqueous phase from soap is accomplished in an extremely brief time in the centrifugal separators, with the result that such separation occurs at a temperature which is practically constant. In the manufacture of soap from the tallow and coconut oil mixture referred to above, for example, best results are obtained when centrifugation is accomplished in the centrifuge 18 at a temperature between 205 and 220° F., and the use of a centrifugal separator for effecting prompt separation of aqueous phase from soap enables the temperature to be held at exactly the desired point.

Instead of completing the saponification of the fat by the treatment in the mixer 23, it may in some cases be desirable to introduce an additional treating stage in the process by duplicating the elements 22 to 27 of the flow sheet, and effecting only partial saponification in the mixer 23, while completing the saponification in a subsequent stage of the treating operation, which is identical in general method of operation with the stage represented by the elements 22 to 27 of the flow sheet. If such additional stage is employed, it will preferably be arranged in counter-current relationship with respect to the stage indicated by the numerals 22 to 27; i. e., the partially spent lye from the treating stage which is subsequent to the stage 22—27 will be added to the fat together with the lye from container 24 in the stage of the process preceding the stage in which such lye is formed. It is even possible to divide the treating step designated by the reference numerals 22 to 27 into three or more counter-current treating steps, such as discussed above.

It is likewise possible to omit the steps of the process illustrated by the reference numerals 10 to 18, and effect complete saponification of the fat in a single treating step in which the fat is first saponified with lye, and thereafter grained by the addition of a further quantity of lye. If desired, the soap-containing mixture resulting from such saponification and mixing, followed by centrifugation, may be passed directly to a spray drying apparatus in which it is discharged in dispersed form to effect evaporation of moisture and production of a spray dried soap.

If desired, a suitable proportion of rosin or rosin soap may be added to the soap-forming materials at any suitable stage in the practice of the process. Thus, for example, rosin or rosin soap may be mixed with the neutral fat in the container 10, or it may be separately added to the mixture in the mixer 12, or to the soap-containing mixture discharged from the centrifugal 18. Rosin soap may also be added to the soap material discharged from the centrifugal 27, or rosin soap may be added in the mixer 34.

It is important that particular attention be given to the concentration of lye employed in the saponifying and graining operation performed in mixer 23.

It is desirable that the caustic soda added at this point be in no case higher than 35° Bé. concentration and best results have been obtained in cases in which the lye was between 25 and 35° Bé. In most cases the preferred concentration of lye is just about 30° Bé. In any case, it is desirable that the concentration and quantity of lye added at this point be of such character as to produce, when blended with the aqueous phase present in the soap-containing mixture passed from mixer 22 to mixer 23, a lye having a concentration between 8 and 20° Bé. Ideal results have been obtained in cases in which the total quantity of 30° Bé. lye passed from container 24 to mixer 23 by pumps 25 and 26 was approximately $\frac{1}{3}$ of the total quantity of aqueous phase contained in the soap mixture passed to mixer 23, thereby producing a lye in mixer 23 which was of approximately 12° Bé. concentration.

An important feature of the invention relates to the temperature at which the materials in mixer 23 are maintained. It has been found that, when the mixture is maintained at a temperature below 200° F., and preferably between 150° F. and 200° F., a much more thorough removal of glycerine, lye, dirt, and other undesired constituents occurs in the centrifugal separator 27, than in cases in which higher mixing and separating temperatures are employed. This phenomenon is exactly the opposite of what one might expect, since, as a general rule higher efficiency of separation is obtained at the reduced viscosities obtained by increased temperature. Thus, an important feature of the invention consists in the discovery that, by operating at a temperature substantially below that employed for the "strong change" of conventional kettle soap making, very greatly improved separating results are obtained in the practice of the present invention.

The manner in which the objects of the invention have been attained will now be apparent. It will be evident that the total quantity of equipment required for the processing for manufacture of a given quantity of soap per day will be but a small fraction of the amount of equipment required in the prior art kettle soap-making process. In the practice of the invention, the constituents are passed through the various mixers and to the various centrifuges through closed apparatus under pump pressure, and the mixing operations are accomplished entirely by mechanical means. By reason of the use of closed conduits maintained full of liquid under pump pressure, incorporation of air with the soap passing to the centrifuges is avoided. By reason of the use of mechanical mixers, in place of mixing with live steam, as in the prior art, the variable factor of condensation of steam in the mixture is avoided, waste of heat by loss of steam is avoided,

and soap of exactly the desired predetermined constitution is produced.

The apparatus of the present invention requires very little space, and represents an important economy to the soap-maker in this connection.

Example

Tallow, coconut oil and spent lye are passed through the apparatus illustrated in the flow sheet at such a rate that a mixture of 1500 pounds tallow and 500 pounds of coconut oil are continuously mixed with 1250 pounds of 30° Bé. lye (containing 298 pounds NaOH) in the continuous reactor, during passage of further material, similarly proportioned, through the apparatus. These reagents are charged at a temperature of approximately 185° F. and the heat of reaction raises the reaction mass to 218° F. in the reactor. At a point near the discharge end of the reactor, where saponification is substantially completed, 1440 lbs. of 13.75% brine (containing 198 pounds NaCl) is added. The brine is added at approximately 218° F., and the temperature of the mixture is unchanged. The grained mass is charged to the centrifugal, which discharges as a heavy phase spent lye to the amount of 1770 pounds (containing 221.5 pounds glycerine and 192.5 pounds NaCl). Simultaneously 2920 pounds of partially saponified soap is discharged. This soap is mixed with 317 pounds of water and charged to the second stage reactor, together with 353 pounds of 30° Bé. lye (containing 84 pounds NaOH). Both soap and caustic are charged to the reactor at a temperature of 195° F. and maintained at that temperature in the reactor. The lye is introduced into the reactor at three or more points along the direction of travel through it. The grained mixture from the reactor is charged to the second stage centrifugal from which is discharged as a heavy phase 794 pounds of partly spent lye (containing 70 pounds NaOH). Simultaneously 2796 pounds of saponified and washed soap are discharged from the centrifugal. The analysis of this soap is as follows:

H₂O 25%, NaCl .20%, NaOH .16%, glycerine .40%

Partly spent lye above referred to is fortified with 456 pounds of 50° Bé. lye (containing 228 pounds NaOH), yielding the same quantity of 30° Bé. lye originally charged to the first step and is therefore returned for use at that point. Small quantities of salt with glycerine are also returned with this lye, but for convenience have been ignored in the material balance.

Still further modifications will be obvious to those skilled in the art, and I do not, therefore, wish to be limited except by the scope of the sub-joined claims.

I claim:

1. In the manufacture of soap, a continuous process comprising thoroughly mixing a fat with a saponifying reagent at a saponifying temperature for a brief period of time, adding a graining agent and passing the resulting soap-containing mixture to a centrifugal rotor and there subjecting said mixture to centrifugation to separate aqueous phase resulting from said mixing and graining operations from the soap-containing mass resulting from said operations, and continuously and separately discharging the soap-containing mass and aqueous phase from the zone of centrifugation, the mixture being vigorously agitated after the addition of the graining

agent to effect fine dispersion of the graining agent and maintain the grained soap substantially uniformly distributed in said soap-containing mixture and then promptly passed to said step of centrifugation while said grained soap is still in said condition of substantially uniform distribution.

2. A process as defined in claim 1, in which the soap-containing mass discharged from the zone of centrifugation is mixed with a further quantity of saponifying reagent and thereby subjected to completion of the saponification reaction, and the resulting mixture is grained by addition of a further quantity of saponifying reagent and agitated after completion of this last-mentioned graining operation to maintain the grained soap in a condition of substantially uniform distribution in the soap containing mixture, and passed to a centrifugal rotor to effect an additional step of centrifugation while said grained soap is in said condition of substantially uniform distribution, and continuously discharged from said additional step of centrifugation.

3. In the manufacture of soap, a continuous process comprising thoroughly mixing a fat with a saponifying reagent at a saponifying temperature for a brief period of time, thereafter adding a graining agent and passing the resulting soap-containing mixture to a centrifugal rotor and there subjecting said mixture to centrifugation to separate aqueous phase resulting from said mixing and graining operations from the soap-containing mass resulting from said operations, and continuously and separately discharging the soap-containing mass and aqueous phase from the zone of centrifugation, the mixture being vigorously agitated after the addition of the graining agent to effect fine dispersion of the graining agent and maintain the grained soap substantially uniformly distributed in said soap-containing mixture, and then promptly passed to said step of centrifugation while said grained soap is still in said condition of substantially uniform distribution.

4. A process as defined in claim 1, in which said fat and saponifying reagent are passed under super-atmospheric pressure through a closed continuous mixing apparatus to the zone of centrifugation during the steps of saponification and graining.

5. A process as defined in claim 1, in which the saponification and graining operations are accomplished by subjecting the fat and saponifying reagent to intense mechanical agitation while passing said fat and reagent under super-atmospheric pressure through a closed mixing apparatus to the zone of centrifugation.

6. In the manufacture of soap, a process comprising thoroughly mixing a fat with a saponifying reagent at a saponifying temperature, adding a graining agent and promptly passing the resulting soap-containing mixture to a centrifugal rotor and subjecting said mixture to centrifugation to separate aqueous phase resulting from said mixing and graining operations from the soap-containing mass resulting from said operations, continuously and separately discharging the soap-containing mass and aqueous phase from the zone of centrifugation, and continuously mixing the discharged soap-containing mass with an aqueous liquid by injecting said aqueous liquid into contact with said soap-containing mass as said soap-containing mass is discharged from the influence of centrifugal force,

whereby to mix said aqueous liquid thoroughly with said soap-containing mass, and thereafter passing the mixture resulting from combining said aqueous liquid with said discharged soap away from the zone of centrifugation.

7. In the manufacture of soap, a continuous process comprising thoroughly mixing the fat with a saponifying reagent at a saponifying temperature for a brief period of time, adding a graining agent and vigorously agitating the mixture after such addition to maintain the grained soap substantially uniformly distributed in said mixture, and promptly passing the resulting soap-containing mixture to a centrifugal rotor while said grained soap is still substantially uniformly distributed and subjecting said mixture to centrifugation to separate aqueous phase resulting from said mixing and graining operations from the soap-containing mass resulting from said operations, continuously and separately discharging the soap-containing mass and aqueous phase from the zone of centrifugation, mixing the discharged soap-containing mass with an aqueous liquid and thereby converting said soap-containing mass to a homogeneous condition, thereafter mixing said homogeneous soap-containing mass with a further quantity of saponifying reagent and agitating the resulting mixture to effect further saponification of said mass and graining said mass, and subjecting the mixture resulting from said further saponification and graining to a further step of centrifugation to remove aqueous phase from the soap-containing mass resulting from said further saponification.

8. In the manufacture of soap, a process comprising mixing a fat with a saponifying reagent at a saponifying temperature, separating aqueous phase from the soap-containing mixture so obtained, adding an aqueous liquid to the soap-containing mass from which aqueous phase has been so separated to convert said soap-containing mass to a homogeneous condition, continuously subjecting the resulting homogeneous soap-containing mass to further saponifying reaction to complete the saponification thereof by mixing with said soap-containing mass a saponifying reagent, and graining the saponified mixture by adding further saponifying reagent thereto during its flow to a zone of centrifugation vigorously agitating the mixture after said further addition

to maintain the grained soap substantially uniformly distributed in the resulting mixture, and finally subjecting the saponified and grained mixture to centrifugation by passing said mixture continuously to a rotating centrifugal rotor while said grained soap is substantially uniformly distributed, to effect removal of aqueous phase from soap, and continuously discharging said aqueous phase and soap as separate effluents from the centrifugal rotor.

9. In the manufacture of soap in a process including continuous centrifugation of a mixture containing grained soap and an aqueous phase to separate the aqueous phase from the grained soap and discharge the aqueous phase separately from continuously discharged grained soap, the steps comprising continuously mixing an aqueous liquid with the grained soap as said grained soap is discharged from the zone of centrifugation, and thereafter passing the resulting mixture of soap and aqueous liquid away from said zone of centrifugation.

10. In the manufacture of soap, a continuous process comprising thoroughly mixing a fat with a saponifying reagent at a saponifying temperature for a brief period of time, adding a graining agent and passing the resulting soap-containing mixture to a centrifugal rotor and there subjecting said mixture to centrifugation to separate aqueous phase resulting from said mixing and graining operations from the soap-containing mass resulting from said operations, and continuously and separately discharging the soap-containing mass and aqueous phase from the zone of centrifugation and removing the soap-containing mass so discharged away from the centrifugal by promptly mixing said mass, after discharge from the zone of centrifugation, with an aqueous liquid and passing the resulting mixture of aqueous liquid with the discharged soap-containing mass away from the centrifugal, the mixture being vigorously agitated after the addition of the graining agent to effect fine dispersion of the graining agent and maintain the grained soap substantially uniformly distributed in said soap-containing mixture, and then promptly passed to said step of centrifugation while said grained soap is still in said condition of substantially uniform distribution.

ASHTON T. SCOTT.