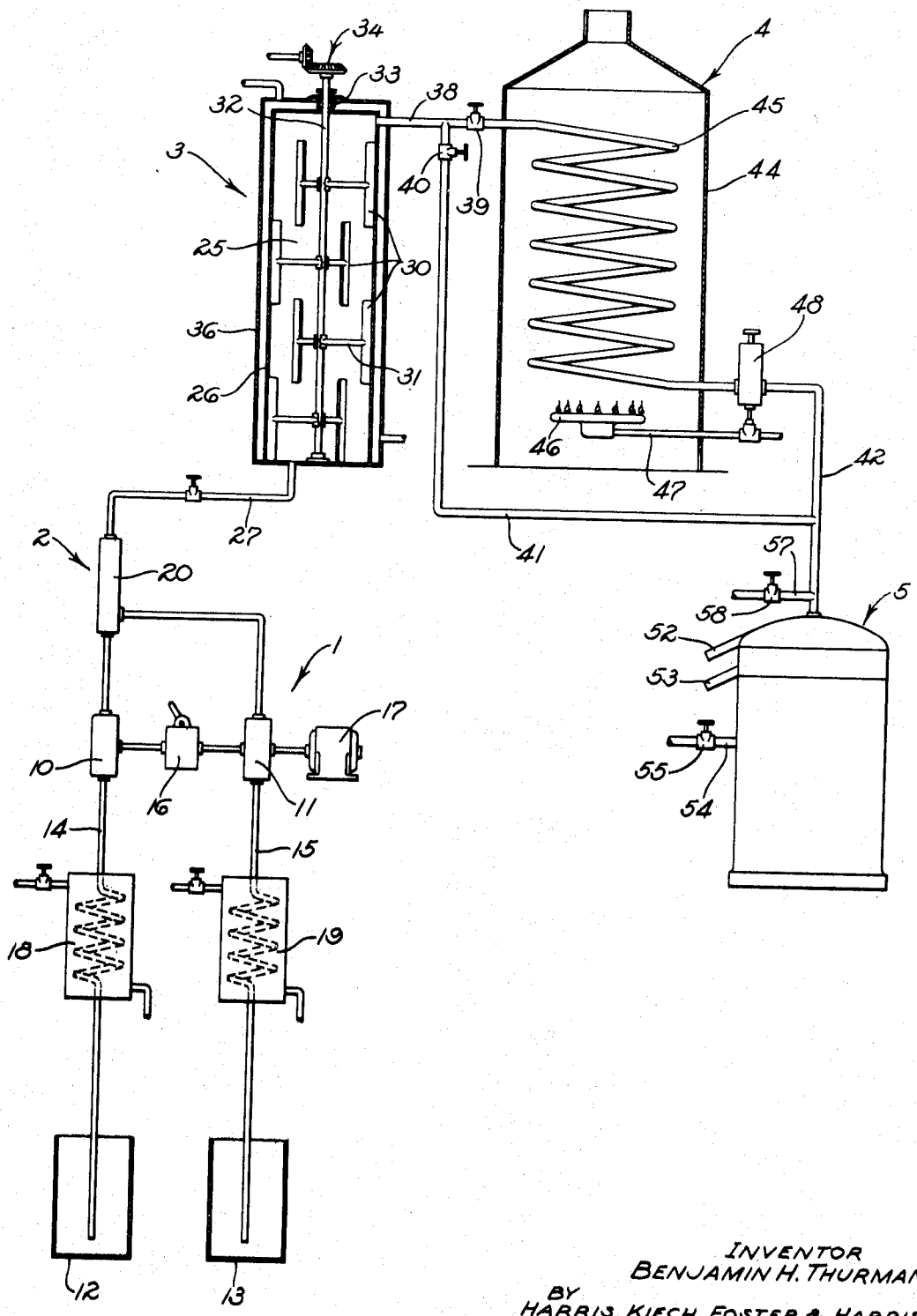
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PROCESS FOR REFINING GLYCERIDE-TYPE OILS

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PROCESS FOR REFINING GLYCERIDE-TYPE OILS

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My invention relates to a novel method for refining glyceride type oils.

Such refining has for its purpose the removal of various impurities from such oils. In general, it has two aspects, seeking in the first place to neutralize and remove free fatty acids with a minimum of saponification of neutral oil and, in the second place, to produce a refined oil of satisfactory color, evident either from the refined oil when first separated or from this oil after subjection to conventional bleaching steps.

It is an object of the present invention to provide a novel method for accomplishing both neutralization and color reduction by use of a refining reagent, for instance caustic soda, caustic potash, usually in aqueous solutions, or other alkaline solutions, used in excess of that amount theoretically required to completely react with the free fatty acids.

Much of the refining of vegetable oils is now being performed by continuous processes. With most glyceride type oils, such continuous processes are entirely satisfactory. I have found, however, that difficulty is sometimes encountered in applying the process to various crudes and still producing refined oils of satisfactory color. For instance, Brazilian or Egyptian cottonseed oil or certain American cold-pressed oils give difficulty in this respect and the present invention has been found very satisfactory in treating such oils. Also, the refining of the so-called "slow-breaking" oils is materially improved by the present invention. All such oils, and others of similar nature, are herein referred to as "difficult oils".

It is an object of the present invention to refine such oils by use of an excess of the refining reagent and to condition the oil by maintaining the excess reagent in contact therewith, after neutralization of the free fatty acids, for an increased time sufficient to produce a desired bleach of the oil.

A further object is to maintain the oil during this additional contacting period under such conditions as to prevent substantial separation of the constituents, particularly to prevent the gravitational separation of all or any substantial part of the soap stock or foots resulting from the reaction between the free fatty acids and the refining agent. The mixture may be maintained under the superatmospheric pressure conditions during this period of additional contacting though this is not always essential.

The invention also finds application to the refining of glyceride type oils of a character which can be refined to produce oils of satisfactory color by the continuous process now known in the art. It is thus not limited in all of its aspects to treatment of a difficult oil. For instance, other novel concepts of the invention reside in applying heat to such portions of a refining system as will facilitate separation of the refined oil and improve the operation of the process generally.

It is another object of the present invention to mix proportioned quantities of a glyceride type oil and a refining reagent and to move the resulting mixture through a conditioning zone or chamber at relatively low velocity preparatory to separation of the refined oil, and preferably to maintain the mixture in this conditioning zone or chamber under such conditions that the foots will not substantially separate therefrom.

Further objects and advantages of the invention will be made evident hereinafter.

While the process and apparatus are applicable to the refining of all glyceride type oils, the following description will have particular reference to the refining of cottonseed oil of the difficult type.

In the drawing, I show diagrammatically a simple form of apparatus by which the process can be carried on.

In the illustrated apparatus, the numeral 1 indicates a proportioning means, 2 a mixing means, 3 a conditioning means, 4 a heating means and 5 a separating means.

The function of the proportioning means 1 is to deliver to the mixer 2 proportioned quantities of the glyceride type oil and the refining reagent. Preliminary tests on the oil being refined will indicate the free fatty acid content and an amount of refining reagent is used to take care of the amount theoretically necessary to completely react with the free fatty acids and leave an excess. This excess will desirably be about the amount used in conventional refining processes.

Any suitable proportioning means can be used in this capacity, the embodiment shown including an oil pump 10 and a reagent pump 11 respectively withdrawing oil and refining reagent from tanks 12 and 13 through pipes 14 and 15 and delivering same to the mixing means 2. Such pumps may be of the piston type and may be interconnected by a variable speed means 16, being driven by a suitable drive means 17 or various other control means can be used to vary the proportions introduced into the mixing zone. If desired, the oil or the reagent, or both, may be

preliminarily heated before being mixed. This may be accomplished by applying heat in the tanks 12 and 13, or by the interposing of heaters 18 and 19 in the pipes 14 and 15. Heaters of the coil type will be found very satisfactory and a heating medium can be circulated through a container surrounding such coils in any well known manner.

If continuous mixing is to be used, the mixing means 2 will give very satisfactory results. The function of the device shown is to mix intimately the proportioned streams of oil and reagent delivered thereto. Various mixers can be used in this regard which rely upon mechanical agitation, turbulence or other mixing actions. I have found it entirely satisfactory to inject one liquid into a flowing stream of the other. For instance, the mixing means 2 may include a shell 20 providing a mixing zone and the reagent can be introduced into a flowing stream of the oil moving in this zone. This injection, together with the turbulence in this mixing zone, is sufficient to quickly form an intimate mixture and disperse the reagent in fine droplets in the oil. No subsequent mixing of a more violent nature is necessary.

The reaction between the reagent and the free fatty acids is very rapid and most of the free fatty acids will be neutralized in the mixing zone or during flow therefrom and prior to reaching the conditioning means 3. However, the color-removing reaction between the color impurities and the excess reagent usually proceeds more slowly. With oil such as Brazilian, Egyptian or American cold-pressed cottonseed crudes, this color-removing reaction is quite slow and with these, as well as with certain slow-breaking oils, it is desirable to prolong the contact time between the excess reagent and the oil.

The function of the conditioning means 3 is to provide a zone in which the mixture will be conditioned, one factor in this conditioning being such prolonging of the aforesaid contact time between the excess reagent and the oil. In refining difficult oils, the mixture may remain therein for several minutes for, with oils such as mentioned above, I have found that satisfactory colors can be obtained by prolonging the time of contact of the excess reagent and the color impurities in the mixture. With the foreign oils mentioned and with American cold-pressed oils and with most slow-breaking oils, I have found it desirable to use a total contacting time, between first mixing and separation, of three minutes or more and often five minutes or more. This time will vary with different oils and invariable ranges cannot be set forth in view of the different characteristics of different oils and the seasonal variations thereon, as well as variations due to different procedures in pressing the seeds to obtain such oils. In general, it can be said that the total time of contact should be sufficient to produce an oil of the desired color.

In the preferred mode of operation, the contacting time in the conditioning means 3 is longer than the mixing period in the mixing means 2. In fact, I prefer to intimtely mix for a very short period of time and remove the mixture from the mixing zone about as soon as neutralization of the free fatty acids is complete. The mixture thus removed from this zone will then include oil, foots, color impurities, and all or a major portion of the excess refining reagent.

I have found that this conditioning of the mixture can best be performed in a conditioning zone or chamber in which the mixture exists under such conditions that the foots are not permitted to gravitationally separate therefrom. It is desirable that the foots be maintained substantially uniformly distributed in the oil during this conditioning period and only such turbulence is desirable as will be sufficient to maintain a proper distribution of the foots and the excess refining reagent in the oil, with a consequent maintenance of the contact between the excess refining reagent and the oil. It is not desirable to agitate the mixture violently during this conditioning period, for such action would tend to break up the foots, thus making the subsequent steps of the process more difficult to perform. Turbulence or agitation in this conditioning zone, however produced, will thus be desirably less than in the mixing zone, for it is neither necessary nor desirable that violent mixing or excessive turbulence should be used during the conditioning. In addition, if the conditioned mixture is later moved as a stream to the separating means 5, it will usually be found desirable to use a conditioning zone which is larger in cross sectional area than the conduit through which the conditioned mixture flows to this separating means. This permits conditioning under decreased velocity if the mixture is continuously delivered to and withdrawn from the conditioning zone.

This conditioning can well be accomplished according to the present invention by use of a vertically-extending chamber or zone 25 formed by a container 26 which is preferably, though not necessarily, confined from the atmosphere so that superatmospheric pressures can be maintained therein sufficient to force the mixture through the subsequent equipment. If open to the atmosphere, gravitational flow can be relied upon to move the conditioned mixture to the separating means. The mixture is delivered from the mixing means 2 through a pipe 27 positioned to introduce the mixture into either the upper or lower portion of the container, the latter being preferred in flowing this mixture upward in this container.

In some instances, the vertical movement of the mixture in the chamber 25 may be sufficient to maintain the foots uniformly distributed. However, I have found that the foots will tend to deposit on the inner walls of this chamber and, for the purpose of removing these deposited foots, I prefer to utilize some means in this chamber moving adjacent such walls. By way of example, a series of superimposed scrapers 30 may be used to rotate adjacent, or in contact with, the inner cylindrical wall of the chamber 25, the various series being so disposed that substantially all portions of this wall are cleaned by movement of the scrapers. Each scraper may be mounted on a relatively small rod 31 and thus attached to a shaft 32 which is suitably journalled and which extends through a stuffing box 33. Gear means 34 may be used to drive these rotatable units but the speed of rotation should be quite slow. A speed of about 75–100 R. P. M. will be found satisfactory. If violent agitation is used during the conditioning step, a tight emulsion will be formed which is not readily susceptible to centrifugal separation. Further, any such violent agitation will tend to break up the particles of foots and defeat any tendency for the foots to begin to agglomerate in this chamber. While one function of this rotatable structure is to remove from the walls and return to the oil foots which may cling thereto, it will also serve

as a turbulence-producing means which establishes such mild turbulence as will maintain the foots uniformly suspended. In general, it can be said, however, that the turbulence in this conditioning chamber should be relatively less than is required in the mixing zone, and the desired turbulence can be induced by flow conditions or by use of a rotating element, or by both.

Such conditions may be simulated or duplicated by continuous flow of the mixture from the mixing zone through a conditioning chamber formed by a pipe or coil suitably designed. Such a pipe or coil will preferably be of smaller cross sectional area than the container 26 and considerably longer. It may be so designed that the incidental turbulence due to stream flow of the mixture therethrough will maintain the foots uniformly distributed and prevent substantial deposition thereof on the walls. For example, a coil having a diameter of about 2½ inches will be found satisfactory if suitable velocity is maintained therein. Coils or pipes of larger or smaller diameter may be used if proper velocity conditions and incidental turbulence are maintained. The length of such an elongated conditioning zone should be such as to give sufficient increase in contact time similar to that obtained by the use of the larger conditioning chamber shown in the drawing.

This conditioning is usually facilitated if the mixture is at somewhat elevated temperature, though heat applied to the conditioning chamber can often be dispensed with, particularly where pre-heating of the oil and reagent, or either, is used. However, the system shown permits heat to be supplied to the container 26, if desired, as by a jacket 36 therearound and through which a suitable heating medium may be circulated.

The conditioned mixture is preferably withdrawn from the opposite end of the chamber 25 from which it is introduced as through a pipe 38 containing a valve 39. By closing the valve 39 and opening a valve 40, this mixture will flow through a pipe 41 to an intake pipe 42 of the separator 5. By closing the valve 40 and opening the valve 39, the conditioned mixture will flow through the heating means 4 and thence to this pipe 42 preparatory to separation. Depending upon how much heat has been added before the conditioned mixture flows through the pipe 38 and upon how much heat is added in the separating means 5, the heating means 4 can be used or dispensed with as the process may dictate.

In the embodiment illustrated, the heating means 4 includes a shell 44 in which is positioned a pipe coil 45 intaking from the pipe 38 and discharging into the pipe 42. A heating medium may be circulated through the shell 44 or a burner 46 may be positioned in the lower end thereof, receiving a fluid fuel through a pipe 47 and discharging products of combustion upward around the coil 45 in heating relationship. A suitable adjustable thermostat 48 may control the supply of fuel to the burner in response to the temperature of the reaction products discharged from the coil 45. Such thermostats are well known and need not be specifically described.

The coil 45 provides an elongated passage of relatively small cross sectional area, while the chamber 25 provides a space of considerably larger cross sectional area. Thus, the velocity of the mixture in the chamber 25 will be relatively low and the velocity through the elongated passage defined by the coil 45 will be relatively higher and the same differential velocity can exist if the conditioning chamber is formed by a coil or pipe though this is not, in all instances, necessary. This increase in velocity is often desirable, particularly if heat is supplied during passage through the coil 45. In addition, such movement through the coil 45 facilitates agglomeration of the foots preparatory to centrifugal separation. With the slow-breaking oils, it is often desirable to operate the system so that the break occurs primarily in the coil 45 or in the pipe 41, as distinct from the conditioning chamber 25, though this is not essential on this or other types of oils, particularly if pre-heating is used.

The function of the separating means 5 is to receive and separate refined oil from the reaction products delivered thereto. The embodiment illustrated shows a single centrifuge in this regard though, usually, the stream is divided between a plurality thereof. Conventional high-speed centrifuges may be used in this capacity, respectively delivering refined oil and foots through spouts 52 and 53. However, use of a centrifuge, such as shown in the co-pending application of Benjamin Clayton, Serial No. 34,258, entitled Process for refining glyceride oil, now Patent No. 2,100,277, granted November 23, 1937, is particularly advantageous in the present process and produces continuous operation over long periods of time, better-colored oils, lower refining losses, etc., and improves the process throughout. Such a centrifuge is of the type in which heat is applied to the zone of centrifugal separation. For example, steam may be introduced into the centrifuge through a pipe 54 as controlled by a valve 55 to surround the rotating bowl thereof. Heat thus applied to the centrifugal zone by conduction through the bowl insures smooth and continuous movement of the soap stock or foots along the outer wall of the bowl and prevents accumulation of deposits on this wall, thus overcoming a source of difficulty in other types of centrifugal equipment which must be shut down every few hours to clean the bowl. It permits discharge of the refined oil and soap stock at differential temperature if desired and can be utilized to overcome the refrigerating effect in the centrifuge.

Another method of applying heat to the zone of centrifugal separation is to introduce a suitable heating medium into the reaction products as they flow into the centrifugal zone, for instance, or hot fluid can be introduced into the pipe 42 immediately ahead of the centrifuge through a pipe 57 including a valve 58. A quick increase in temperature by applying heat to the reaction products before centrifugal separation, or by applying heat to the centrifuge itself, makes possible the use of lower temperatures in the preceding equipment and results in decreased refining losses.

It will be clear, however, that heat may be applied at various points along the system. For instance, the oil, or the oil and the refining reagent, may be pre-heated before being mixed. The mixture may be heated during conditioning by circulating a heating medium through the jacket 36. Heat may also be applied during flow through the heater 44, or it may be applied more directly to the zone of centrifugal separation by heating the bowl of the centrifuge or introducing a heating medium through the pipe 57. It is within the scope of the present invention to apply heat at one or more of these points.

If pre-heating of the oil or refining reagent, or both, is used, the desirable degree thereof will

depend upon the heat subsequently added, the place or places where it is applied and upon the characteristics of the particular oil to be refined. If heat is applied to subsequent portions of the system, it is not essential to pre-heat the oil except as an incidental amount of heat may be beneficial in putting the more viscous oils, such as various fats, into better condition for pumping. Thus, the oil can be introduced into the system at substantially room temperature or somewhat above, if subsequently heated in the conditioning chamber 25, the coil 45 or in or at the centrifuge itself. However, in many instances, unexpected results accrue from using higher pre-heating temperatures and, in this respect, heating of the conditioning zone 25 or the coil 45 may often be dispensed with. Temperatures as high as 160° F. or higher may be applied to the oil before introducing the refining reagent thereinto and, if desired, similar pre-heating temperatures may be applied to the refining reagent itself though, in most instances, it is quite satisfactory to introduce this reagent at a temperature which is lower than that of the oil. If the temperature of the refining reagent is higher than that of the oil, it will serve to additionally heat this oil in the mixer 20. Very satisfactory treatment can be obtained by thus pre-heating the oil or the refining reagent, or both, and moving the mixture through the conditioning zone 25 and thence either directly to a centrifuge through the pipe 41 or through the coil 45. In either instance, the operation is distinctly improved by the use of a centrifuge provided with a heated bowl. Also, in either instance, heat applied to the conditioning zone 25 or the coil 45 may be dispensed with if the pre-heating temperature has been appropriate. In other instances, sufficient heat may be applied to the conditioning zone 25 or to the coil 45, or to both, to maintain the temperature therein substantially the same as in the mixing zone. Somewhat better results will sometimes be obtained by flowing the conditioned mixture through the coil 45 before reaching the centrifuge, rather than by-passing this coil by flow through a shorter path defined by the pipe 41. However, in either instance, flow through this coil or through the pipe 41 may additionally condition the mixture for efficient centrifugal separation of the foots from the oil, for example, by further agglomerating the particles of foots yet maintaining these uniformly dispersed so that the mixture reaching the centrifuge is of a uniform character and actual gravitational separation of the foots is prevented before reaching this centrifuge.

In other instances, pre-heating can be dispensed with and the mixture can be formed at substantially room temperature, or somewhat thereabove. Here again, the use of a centrifuge providing a heated bowl is advantageous, irrespective of whether additional heat is applied in the conditioning zone 25, the coil 45 or adjacent the centrifuge. It will be understood that, in this mode of operation, heat may be applied at one or more of these points and that the coil 45 can be by-passed with success in many instances by proper design of the equipment and by properly-controlled addition of heat. In other instances, the temperature can be maintained relatively low until flow through the coil of the heater, no increase in temperature taking place in the conditioning zone.

By way of illustration, the process has been used to refine deteriorated Brazilian crude cottonseed oil at a rate of 125 pounds per minute to produce a bleachable grade of oil. Mixing was obtained by introducing the refining reagent into a stream of oil moving through the mixing zone and the time of such mixing was very short, being only a few seconds. The container 30 of the conditioning means was eighteen inches in diameter and five feet high and the mixture remained therein about six minutes. No heat was supplied at this point in this test, nor was the oil pre-heated.

The conditioned mixture was heated during flow through a sectional coil formed of one and one-half inch pipe and having a total length of about 550 feet. The resulting reaction products were introduced into the centrifuge at a temperature of about 135–145° F. and steam was used for heating the exterior of the bowl. The temperature of the refined oil discharged from the centrifuge was approximately the same as the entering reaction products and the foots discharged at a temperature approximately 10–20° F. hotter. The system operated continuously and produced a bleachable grade of refined oil. The color of the oil issuing from the spout 52 was 35 yellow, 7 red, and readily bleached to 20 yellow and 2.5 red when a bleaching material was added thereto and subsequently filtered therefrom.

It will be understood that the invention is not limited to continuous introduction and withdrawal from the conditioning chamber 25. In some instances, it is possible to utilize a plurality of such chambers, filling them successively with the mixture and successively withdrawing the conditioned mixture therefrom, this mixture moving either directly to the centrifuge or being first passed through a heating zone, such as is defined by the coil 45. In this manner, any desired contact time can be obtained and, if desired, the chambers may be open to the atmosphere though a closed conditioning chamber is preferred. If such a multi-chamber system is used, it is desirable to maintain such turbulence in the conditioning zone that the foots remain substantially uniformly distributed therein and, if superatmospheric pressure is maintained therein by the proportioning pumps, this pressure can be used to force the conditioned oil through the subsequent equipment. However, substantially atmospheric pressure can be used during the conditioning step and the pressure subsequently raised to force the conditioned mixture therefrom, or gravity-induced flow relied upon to move the conditioned mixture to the centrifuge.

Various changes and modifications can be made in the process and apparatus, as will be apparent to those skilled in the art, without departing from the spirit of this invention as defined in the appended claims.

I claim as my invention:

1. A process for refining glyceride type oils to remove impurities such as free fatty acids and color impurities, which process includes the steps of: forming a mixture of proportioned quantities of said glyceride type oil and an alkaline refining reagent capable of reacting very rapidly with said free fatty acids to form foots and used in excess of that amount theoretically required to complete reaction with the free fatty acids, the excess being available for reaction with said color impurities to produce a mixture containing oil, foots, color impurities and the excess of said refining reagent; introducing said mixture into a relatively wide stirring chamber and therein maintaining a relatively large volume thereof under such conditions of turbulence to maintain the foots uniformly distributed in the oil while avoiding turbulence in

excess thereof and for a sufficient time and at a sufficient temperature to condition the mixture for the act of centrifugal separation and to effect substantial color reduction; flowing a stream of this conditioned mixture into a zone of centrifugal separation; and there separating the foots from the oil while applying heat to the zone of centrifugal separation sufficient to condition the mixture for said centrifugal separation.

2. A process for refining glyceride type oils to remove impurities such as free fatty acids and color impurities, which process includes the steps of: neutralizing said free fatty acids by adding to and mixing with said oil an alkaline refining reagent capable of reacting with said free fatty acids to form foots and used in excess of the amount theoretically required to neutralize said free fatty acids, the excess being available for reaction with said color impurities thus producing a mixture containing oil, foots, color impurities and the excess of said refining reagent; conditioning this mixture for centrifugal separation in a relatively large conditioning zone by applying heat thereto while maintaining therein only such turbulence as will prevent substantial separation of said foots and continuing this conditioning until said color impurities have reacted with said excess of the refining reagent; moving a stream of the conditioned mixture through an elongated passage to a separating zone; applying heat to said mixture during this flow through said elongated passage; and centrifugally separating the foots from the oil in said separating zone by subjection to centrifugal force while the mixture is at a temperature sufficient to facilitate such separation.

3. A process for refining a glyceride type oil to remove impurities such as free fatty acids and color impurities, which process includes the steps of: continuously mixing proportioned streams of said oil and an alkaline refining reagent capable of very rapidly reacting with the free fatty acids in said oil to form foots and used in excess of that amount theoretically required for such reaction with the free fatty acids; alternately discharging the mixture thus formed into a pair of conditioning chambers; and retaining said mixture in said chambers for a sufficient time and under sufficient temperature conditions to insure breaking of the emulsion and to effect substantial color reduction; maintaining conditions in said chambers such that said foots remain suspended in said mixture; alternately withdrawing the mixture from said conditioning chambers to form a continuously moving stream; and subjecting the mixture in said stream to a centrifugal force to continuously separate refined oil therefrom while maintaining an emulsion breaking temperature during such separation.

4. The process of refining animal and vegetable oils containing free fatty acids which comprises mixing an alkaline refining agent with said oil to neutralize the free fatty acids and form a mixture including soap stock, heating a relatively large vessel containing a relatively large body of said mixture, during agitation thereof, to a temperature sufficiently high to break any emulsion which may exist, thereby to condition the mixture for the act of centrifugal separation of the soap stock from the oil, continuing the agitation of such relatively large body of the mixture at a rate sufficient to maintain the mixture substantially uniform and to prevent stratification of said soap stock, but at a rate insufficient to break up the particles of the soap stock, withdrawing a stream of the thus conditioned mixture from said relatively large vessel, while the agitation continues, and delivering the same to a centrifugal separator and continuously centrifugally separating said soap stock from the oil of said stream while the mixture is conditioned for such separation.

5. The herein described process of refining animal and vegetable oils which comprises the steps of mixing the oil with an alkaline reagent at a sufficiently low temperature to permit the formation of an emulsion and the substantially complete neutralization of the free fatty acids with the resultant formation of soap stock, subjecting a relatively large body of said mixture, in a relatively large vessel, to an elevated temperature, sufficiently high to break the said emulsion, thereby to condition the mixture for the act of centrifugal separation of the soap stock therefrom, subjecting the mixture in said vessel to mild mechanical agitation after the application of heat thereto, sufficient to cause such turbulence as will maintain a proper distribution of the foots in said oil, without such violent agitation as would tend to break up the foots in a difficultly separable condition, thereby maintaining the mixture in a separable condition, while continuously withdrawing the same from the vessel and introducing it to a centrifugal separator for the continuous separation of the soap stock therefrom while the mixture is conditioned for such separation.

6. A process for refining animal and vegetable oils which comprises the steps of mixing an alkaline refining reagent with said oils to effect substantially complete neutralization of the free fatty acids contained in the oil and the resultant formation of soap stock, maintaining a relatively large body of the mixture in a relatively large receptacle, subjecting the mixture in said receptacle to a temperature sufficient to break any emulsion which may exist and tend to permit at least some agglomeration of the soap stock particles, subjecting the heated mixture to mild mechanical agitation sufficient only to prevent the same from gravitational settlement, whereby to constantly maintain said body of the mixture in a condition for centrifugal separation, continuously withdrawing through a relatively small conduit a stream of the thus conditioned mixture from the vessel and introducing it to a centrifugal separator, and centrifugally separating the soap stock from the refined oil while at a sufficient temperature to facilitate such centrifugal separation.

7. The process of refining animal and vegetable oils which comprises the steps of introducing an alkaline refining reagent to said oils while subjecting the same to relatively intense agitation and under such low temperature conditions as to favor the formation of an emulsion, whereby to rapidly neutralize the free fatty acids and form soap stock, maintaining a relatively large body of said emulsion in a relatively large stirring vessel, applying heat to said vessel to an extent sufficient to break said emulsion while subjecting the same to stirring action of a relatively less intense character and sufficient only to create a turbulence to maintain the foots uniformly distributed in the oil while avoiding turbulence in excess thereof, thereby to constantly maintain a body of the mixture conditioned for centrifugal separation and for a time sufficient to cause the breaking of the emulsion while continuously discharging a stream of said mixture from the ves-

sel and introducing it to a centrifugal separator for the separation of the soap stock from the refined oil, while maintaining a temperature sufficient to facilitate such separation.

8. The process of refining animal and vegetable oils which comprises the steps of adding an alkaline reagent to the oils to neutralize the free fatty acids and form soap stock, maintaining a relatively large body of the mixture, in a relatively large vessel, at a temperature sufficient to condition the mixture for centrifugal separation, agitating the conditioned mixture at a rate sufficient only to maintain the soap stock particles in an evenly dispersed condition and preventing the gravitational settlement thereof, continuously withdrawing a stream of the mixture, while continuing the said agitation, and introducing the same to a centrifugal separator at a temperature sufficient to facilitate such separation.

9. The process of refining vegetable oils of the cold pressed type which comprises the steps of admixing with such oils an alkaline refining reagent, substantially in excess of the amount theoretically required to neutralize the free fatty acids contained in such oils and to form soap stock, breaking any emulsion which may form during the mixing of the alkaline reagent and the oils, delaying the time of contact of the alkali with said oils by maintaining a relatively large volume of the mixture in a relatively large receptacle for a period of time sufficient to remove the color impurities of said oil, continuously withdrawing from said relatively large receptacle said admixture in the thus treated condition and subjecting the same to centrifugal separation to separate the soap stock and combined color impurities from said oils and employing sufficient temperature at the time of such separation to condition the mixture for separation.

10. A process of refining animal and vegetable oils containing free fatty acids which comprises mixing an alkaline refining reagent, in an amount in excess of that theoretically required to neutralize said free fatty acids, with said oil, and forming an emulsion containing soap stock, continuously introducing into a relatively large chamber a stream containing said emulsion, maintaining said mixture in said chamber for a sufficient time and at sufficient temperature to substantially break said emulsion and substantially reduce the color by reaction between the excess refining reagent and the color impurities, continuously withdrawing a stream of said mixture and introducing the same to a centrifugal separator and effecting separation of the soap stock from the oil while the mixture is at a temperature sufficient to facilitate such separation.

11. A process of refining animal and vegetable oils which comprises the steps of mixing, in stream flow, mechanically metered and properly proportioned streams of oil and a saponifying reagent whereby to effect substantial neutralization of the free fatty acids contained in said oil and the formation of soap stock, subjecting the mixture to a temperature sufficient to facilitate centrifugal separation, accumulating in a relatively large vessel a relatively large volume of said mixture while subjecting the same to such a state of movement as to condition the soap stock for centrifugal separation, continuously withdrawing the mixture of soap stock and oil from the relatively large vessel and introducing the same to a centrifugal separator and there effecting separation of the soap stock while the mixture is at a temperature sufficient to condition the same for such separation.

12. The process of refining animal and vegetable oils which comprises the steps of adding an alkaline reagent to the oils to neutralize the free fatty acids and form soap stock, conditioning the mixture for centrifugal separation with the aid of heat sufficient for that purpose, and thereafter subjecting a relatively large body of the mixture, in a relatively large vessel, to mechanical agitation sufficient to maintain the soap stock in a condition for treatment by the centrifugal separator, continuously withdrawing a stream of said mixture, while continuing said agitation, and introducing the same to a centrifugal separator and there effecting continuous separation of the soap stock from the oil while the mixture is at a temperature sufficient to condition the same for such separation.

13. In the art of removing free fatty acids and coloring material from animal and vegetable oils wherein proportioned streams of oils and an alkaline refining reagent are admixed and subjected to an emulsion breaking temperature, the improvement which comprises delivering a stream of said mixture at said emulsion breaking temperature to a color reduction zone of relatively large capacity whereby the rate of movement of said stream is reduced and the period of contact prolonged in order to render color impurities separable with the soap stock, and centrifugally separating said soap stock along with color impurities from said oil while said mixture is conditioned for said centrifugal separation.

14. The process of refining relatively "slow breaking" oils which comprises the steps of mixing proportioned streams of an alkaline refining reagent and said oils to effect substantial neutralization of the free fatty acids therein contained and to form soap stock, delivering the mixture, at an emulsion breaking temperature, to a conditioning zone of relatively large capacity and prolonging the time of contact between the oil and alkali for a sufficient period of time to insure the breaking of any emulsion which may persist in said admixture whereby to condition the mixture for the act of centrifugal separation and thereafter subjecting the mixture to centrifugal separation while in a condition facilitating such separation.

15. In the art of continuously removing free fatty acids and color impurities from animal and vegetable oils comprising the steps of mixing an alkaline refining reagent with said oils to substantially completely neutralize the free fatty acids contained therein and to form soap stock, conditioning the mixture for the step of centrifugal separation with the aid of heat sufficiently high to break any emulsion which may result from said admixing, advancing the thus broken emulsion of oil and soap stock through a color reduction zone of relatively large capacity whereby to decrease the rate of flow therethrough and there maintaining it for a period sufficiently long to permit color reduction, preventing the continued rise in temperature of the mixture as it passes through said color reduction zone by discontinuing the application of heat thereto whereby to minimize refining losses during the color reduction step and thereafter introducing the mixture to a centrifugal separator and continuously separating the soap stock and color impurities from the refined oil while the same is in a condition facilitating such separation.

16. In the art of removing free fatty acids and coloring material from animal and vegetable oils comprising the steps of mixing proportioned streams of oil and an alkaline refining reagent to effect neutralization of the free fatty acids contained in the oil and to form soap stock, breaking any emulsion which may exist as a result of said mixing with the aid of heat sufficient for that purpose, whereby to condition the mixture for the act of centrifugal separation, thereafter continuously delivering a stream of the thus broken emulsion to a color reduction zone of relatively large capacity whereby the rate of movement of said stream is reduced and the period of contact prolonged for a sufficient time to permit the softened soap stock particles to combine with color impurities to effect substantial color reduction of said oil and thereafter centrifugally separating the soap stock with the combined color impurities from said oil under such conditions as will permit such separation.

17. In the art of purifying animal and vegetable oils containing color impurities comprising the steps of admixing proportioned streams of an alkaline refining reagent and said oils to effect substantial neutralization of the free fatty acids contained in said oils and to form soap stock, conditioning the mixture for centrifugal separation with the aid of an emulsion breaking temperature, thereafter advancing the broken emulsion of oil and soap stock through a color reduction zone of relatively large capacity wherein the same is maintained for a period of time sufficiently long to permit color reduction by slowing down the rate of travel of the mixture as it passes through said zone and continuously separating the soap stock particles and the combined color impurities from the refined oil while the mixture is in a condition permitting such separation.

18. A process for refining glyceride type oils to remove impurities such as free fatty acids and color impurities, which process includes the steps of: forming a mixture of proportioned quantities of said glyceride type oil and an alkaline refining reagent capable of reacting very rapidly with said free fatty acids to form foots and used in excess of that amount theoretically required to complete reaction with the free fatty acids, the excess being available for reaction with said color impurities to produce a mixture containing oil, foots, color impurities and the excess of said refining reagent; introducing said mixture into a relatively wide stirring chamber and therein maintaining a relatively large volume thereof under such conditions of turbulence to maintain the foots uniformly distributed in the oil while avoiding turbulence in excess thereof and for a sufficient time and at a sufficient temperature to condition the mixture for the act of centrifugal separation and to effect substantial color reduction; flowing a stream of this conditioned mixture into a zone of centrifugal separation; separating the foots from the oil and applying additional heat to the foots sufficient to facilitate their discharge from the centrifugal machine.

19. A process for refining glyceride type oils to remove impurities such as free fatty acids and color impurities, which process includes the steps of: forming a mixture of proportioned quantities of said glyceride type oil and an alkaline refining reagent capable of reacting very rapidly with said free fatty acids to form foots and used in excess of that amount theoretically required to complete reaction with the free fatty acids, the excess being available for reaction with said color impurities to produce a mixture containing oil, foots, color impurities and the excess of said refining reagent; introducing said mixture into a relatively wide stirring chamber and therein maintaining a relatively large volume thereof under such conditions of turbulence to maintain the foots uniformly distributed in the oil while avoiding turbulence in excess thereof and for a sufficient time and at a sufficient temperature to condition the mixture for the act of centrifugal separation and to effect substantial color reduction; flowing a stream of this conditioned mixture into a zone of centrifugal separation; and there separating the foots from the oil at a temperature facilitating such separation.

20. The process of refining fatty oils which comprises the steps of mixing said oils with an alkaline refining reagent in a mixing zone, preheating at least one of the materials before the admixture thereof, thereafter delivering the mixture to a zone of relatively large cross section as compared with said mixing zone and therein decreasing the velocity of the mixture and prolonging the time of contact of said materials while under such a temperature and state of movement as to permit agglomeration of the soap stock resulting from the reaction of the alkaline refining reagent with said oils while avoiding such rapid agitation as would produce a centrifugally inseparable colloidal suspension and thereafter centrifugally separating the soap stock from the refined oil while the mixture is in a condition facilitating such separation.

21. The process as defined in claim 20 in which the application of substantial additional heat is avoided while the mixture passes through said zone.

22. The continuous process of refining fatty oils which comprises the steps of mixing an alkaline refining reagent with said oils in a mixing zone, maintaining a relatively large volume of said mixture in a relatively large receptacle as compared with said mixing zone to prolong the time of contact of said materials whereby to increase the time for the reaction of the materials comprising said mixture, thereby to permit the employment of a relatively low temperature during said reaction, maintaining the mixture in said relatively large receptacle in such a state of agitation as will prevent stratification of the foots resulting from said reaction and continuously, while said agitation continues while avoiding such rapid agitation as would produce a centrifugally inseparable colloidal suspension, withdrawing the mixture from the relatively large receptacle and separating the said foots from the refined oil while the mixture is in a condition permitting such separation.

23. The process as defined in claim 22 in which at least one of said materials is preheated before admixture with the other.

24. In the purification of vegetables and animal oils containing impurities including free fatty acids, gums and coloring matter, a process which comprises the steps of pumping together in generally angular directions relatively small metered streams of oil and an alkaline refining reagent in substantially constant predetermined proportions, preheating at least one of said materials prior to contacting the same, advancing said materials from their point of contact to the upper portion of a relatively large open receptacle whereby to decrease the velocity of the mixture passing downwardly through said receptacle to prolong the time of contact of said materials,

avoiding the application of additional heat to said receptacle as the mixture passes therethrough whereby to reduce refining losses, maintaining a state of movement sufficient to prevent stratification of the materials in said receptacle, continuously withdrawing a relatively small stream of the mixture from said relatively large receptacle, raising the pressure on said stream to force the same to a centrifugal separator whereby a substantially constant supply to said centrifugal may be maintained.

25. The process as defined in claim 24 in which additional heat is applied to the soap stock to facilitate its discharge from said centrifugal separators.

26. The process of refining fatty oils which comprises the steps of mixing an alkaline refining reagent with said oils in a mixing zone, preheating at least one of said materials before the admixture thereof, minimizing the temperature required for effecting the precipitation of said impurities by continuously introducing the mixture to a relatively large receptacle as compared with said mixing zone whereby to decrease the velocity thereof and prolong the time of contact of the materials contained in said admixture, while maintaining the mixture as it passes through said relatively large receptacle in a state of agitation sufficient to prevent stratification of the foots therein while avoiding such rapid agitation as would produce a centrifugally inseparable colloidal separation, continuously withdrawing the mixture from the receptacle and centrifugally separating the foots from the refined oil while the mixture is in a condition permitting such separation.

27. The process as defined in claim 26 in which the discharge of the soap stock is facilitated by applying additional heat thereto.

28. In the purification of fatty oils containing impurities including free fatty acids, gums and coloring matter, a process which comprises the steps of pumping together in generally angular directions relatively small metered streams of oil and an alkaline refining reagent in substantially constant predetermined proportions while excluding the presence of air, preheating at least one of said materials prior to contacting the same, advancing said materials from their point of contact to a relatively large receptacle whereby to decrease the velocity of the mixture passing through said receptacle to prolong the time of contact of said materials for at least several minutes, avoiding the application of substantial additional heat to the mixture as the same passes through said receptacle whereby to reduce refining losses, maintaining a state of movement sufficient to prevent stratification of the precipitated foots in said receptacle while avoiding such violent agitation as would produce a centrifugally inseparable colloidal suspension, advancing, under superatmospheric pressure, a stream of the mixture from said receptacle to a zone of centrifugal separation and there separating the foots from the mixture while correlating the rate of centrifugal separation with the rate of pumping of said streams whereby the mixture is caused to remain in said receptacle for a predetermined period of time.

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