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METHOD FOR REFINING ANIMAL AND VEGETABLE OILS

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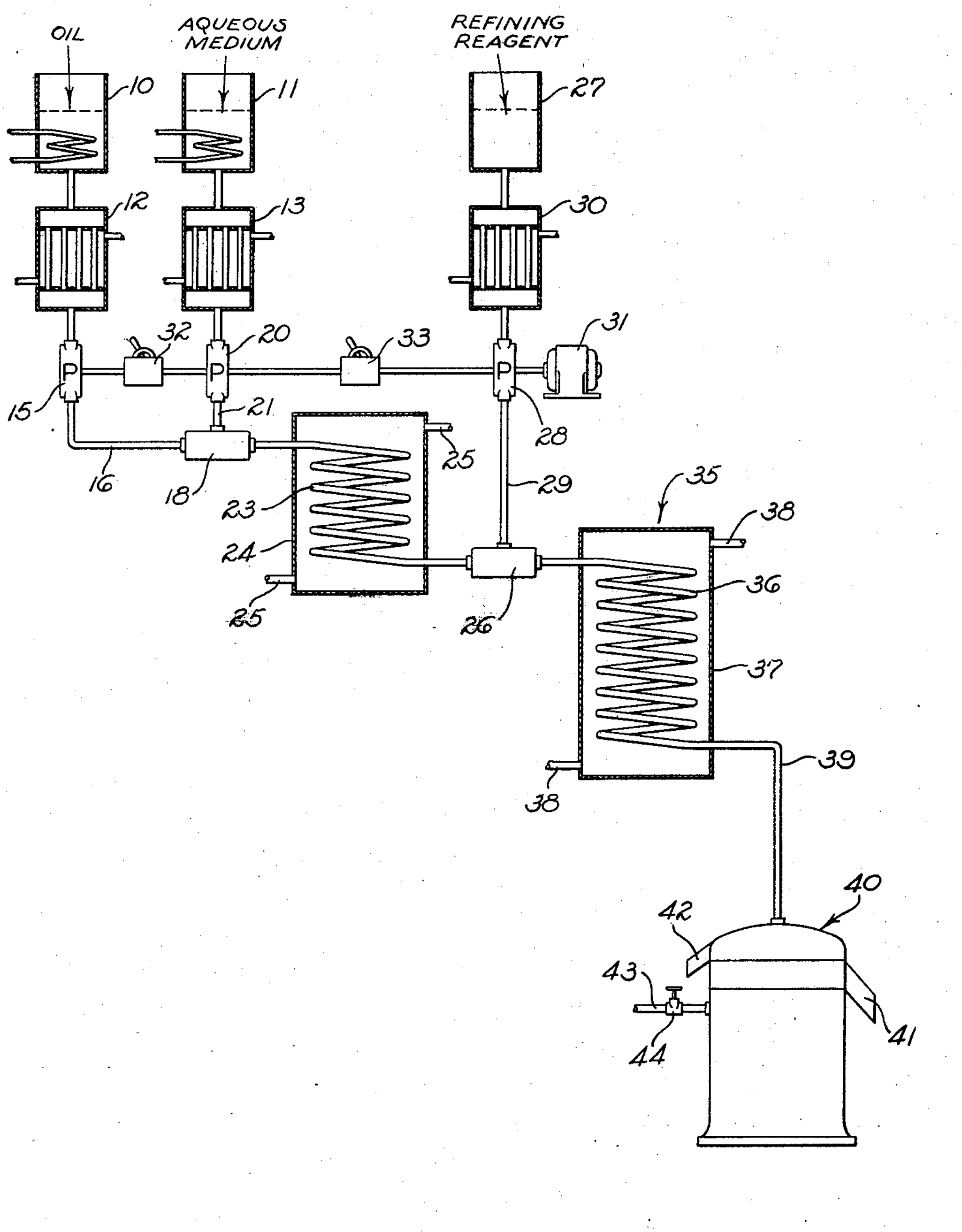

INVENTOR
BENJAMIN CLAYTON
BY
HARRIS, KIECH, FOSTER & HARRIS
Clarence F. Kiech
ATTORNEYS

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METHOD FOR REFINING ANIMAL AND VEGETABLE OILS

Benjamin Clayton, Houston, Tex., assignor to Refining, Inc., Reno, Nev., a corporation of Nevada

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This invention relates to a process and apparatus for purifying animal and vegetable oils, including the fish oils and including the fats and greases commonly classified under the general term of animal and vegetable oils. It particularly relates to a system, preferably continuous, for refining such animal and vegetable oils to remove various impurities and otherwise condition the oil for various uses. It will be described in detail with reference to the alkali refining of glyceride oils, particularly cottonseed oil, as an example.

Most of the animal and vegetable oils contain various materials, herein termed "impurities," which it is desired to remove. These may be of a fatty or non-fatty character, or both, and are removed by a process herein designated as refining.

It is an object of the present invention to provide a novel process and apparatus for refining animal and vegetable oils to remove fatty or non-fatty impurities, or both.

Such oils often contain fatty acids, mucilaginous matter and sometimes color impurities other than those which may be associated with the mucilaginous matter. By the term "micilaginous matter" as herein used, I have reference to those materials known to exist in such oils and variously designated in the art, among which are gums, resins, phosphatides, mucines, certain carbohydrates and like impurities, as well as color impurities which may be associated therewith. Some animal and vegetable oils will contain mucilaginous matter falling within only one or two of the above terms, while others may contain a larger number of these impurities herein classified as mucilaginous matter. Cottonseed oil, for example, commonly contains mucilaginous matter in the form of vegetable resins, a few carbohydrates, and phospho lipins, better known as phosphatides, in addition to the fatty acids and color impurities not associated with the mucilaginous matter.

In common practice, such impurities in animal and vegetable oils have been removed by use of a refining reagent, usually an alkaline reagent if the fatty acids are to be removed, though sometimes of an acidic character if the refining is not to involve neutralization. The term "refining reagent" is used herein as directed to any reagent capable of acting upon impurities to be removed to form foots which can be separated from the oil.

In prior knowledge in the field of alkali refining, the mucilaginous matter has either been precipitated and removed prior to the addition of the alkaline reagent, such as caustic soda, potash, etc., or has been allowed to remain unmodified in the crude oil until the alkaline reagent has been added so as to be acted upon by this reagent and appear in the resulting soap stock. If the oil is treated to precipitate and remove the mucilaginous matter before neutralization of the free fatty acids, the process is often made unduly expensive and inefficient, for the two separating steps necessarily involved each have a tendency to entrain oil with the matter separated, thus resulting in increased refining losses.

Specifically with reference to a glyceride-type oil such as cottonseed oil, the mucilaginous matter is probably colloidally dispersed in the crude oil and is not soluble in oil or water. If it is allowed to remain in the oil without modification and if, as is customary, an excess of alkaline refining reagent is utilized, tests indicate that the action is in the following sequence: The first action which takes place is a neutralization of the fatty acids, almost instantaneous, forming particles of soap stock which float in the oil. When the fatty acids are neutralized, a large portion of the excess alkaline refining reagent is absorbed by the mucilaginous matter and what is left acts upon the color impurities. That portion of the alkaline refining reagent which is absorbed by the mucilaginous matter undergoes little or no reaction. However, this mucilaginous matter, with its associated alkaline refining reagent, is capable of gathering and saponifying neutral oil until the reagent has partially or wholly become neutralized. This results in the production of additional soap-like materials which appear in the soap stock when separated. Similar actions take place if other types of refining reagents are used to associate or react with the impurities to form foots.

In refining any such oils, it is important to reduce to a minimum the refining loss resulting from action by the refining reagent on the oil itself or through entrainment of oil in the separated foots. In the refining of glyceride-type oils, this loss is made up partly of a loss of neutral oil due to saponification during the process and partly to neutral oil occluded in and separated with the soap stock. It is an object of the present invention to provide an improved process for refining animal and vegetable oils by which the refining loss is reduced.

It has now been ascertained that very advantageous results can be obtained by adding to the oil, before incorporation of the refining reagent, an aqueous medium having an affinity for the mucilaginous matter and capable of being imbibed thereby in whole or in part. The refining reagent is thereafter added without making any attempt to separate the impregnated mucilaginous matter, after which the foots are separated from the resulting oil. This aqueous medium may be of such character as to render the mucilaginous matter repulsive to the subsequently added refining reagent, thereby decreasing the refining loss due to the refining reagent which would otherwise be absorbed by the mucilaginous matter and thereby act upon the oil itself.

By such pre-treatment with an aqueous medium, it has been found that a better separation is obtained and that less oil is occluded in the separated foots. The superior separation is very noticeable when a centrifuge is used as the separating expedient. In such a centrifuge, the foots are thrown outward in the rotating bowl due to centrifugal force and the aqueous medium is, to some extent, squeezed out and tends to form an outer layer of liquid which facilitates continuous upward movement of the foots near this wall. Such a layer will permit the foots to move easily and uniformly upward and will retard the adherence of certain constituents of the foots to the wall of the bowl. Prior to the time that this action takes place, any excess of the aqueous medium tends to dilute the foots and, being of greater density than the particles of foots, tends later to increase the effectiveness of centrifugal separation.

Such improved separation will be found to take place even if the amount of aqueous medium added is insufficient or just sufficient to be completely taken up or imbibed by the mucilaginous matter. However, in some instances and with treatment of certain oils, it has been found desirable to introduce an excess of this aqueous medium over and above the amount which will be taken up by the mucilaginous matter. When an excess of the aqueous medium is added, the excess is immediately available to dilute, and in some instances act upon, the excess of the refining reagent and, consequently, tends to decrease the saponification of, or reaction with, the oil. At the same time, the diluted refining reagent is surprisingly effective in reducing the color to the desired degree.

Such an excess of the aqueous medium may be desirable during centrifugal separation in that it further dilutes the foots and facilitates formation of the layer adjacent the outer wall bounding the zone of centrifugal separation.

It is an object of the present invention to add to a vegetable or animal oil, before addition of a refining reagent, an aqueous medium facilitating the process in one or more of the ways mentioned above, the amount of the aqueous medium being either less than, equal to, or greater than that amount which will be taken up by the mucilaginous matter.

It is a further object of the invention to reduce the refining loss and facilitate separation by continuous or batch-operating means by adding a suitable aqueous medium to the oil before incorporation of the refining reagent.

It is a further object of the invention to provide a novel apparatus for refining oils.

Further objects and advantages of the invention will be made evident to those skilled in the art from the following description of one mode of performing the process as exemplified by the alkali refining of glyceride-type oil.

The drawing diagrammatically illustrates one apparatus by which the invention can be performed, though it will be clear that the method is not limited to such an apparatus. It is believed, however, that this apparatus is novel, as well as the process herein-disclosed.

The glyceride-type oil and an aqueous medium may be respectively contained in tanks 10 and 11 and may be heated therein, if desired, by the heating coils shown, or may be heated during flow through heaters 12 and 13, which may be of the tube or coil type. Proportioned quantities of the oil and aqueous medium are brought together and mixed by any suitable means. For instance, a pump 15 may continuously withdraw oil from the tank 10, through the heater 12 if desired, and discharge same at elevated pressure through a pipe 16 into a mixing means 18. Similarly, a stream of the aqueous medium may be withdrawn from the tank 11, through the heater 13 if desired, by a pump 20 and delivered to the mixer 18 through a pipe 21. Any suitable type of mixing means can be utilized relying upon mechanical agitation or turbulence or other actions to perform this mixing step. However, it has been found that a very satisfactory mixing action can be obtained by pumping into the stream of oil, at right angles, a proportioned stream of the aqueous medium.

The aqueous medium thus added to the oil will be absorbed in whole or in part by the mucilaginous matter and, if desired, the mixed ingredients can be moved through a pipe coil 23 positioned in a tank 24 wherein impregnation of the mucilaginous matter by the aqueous medium is carried forward during flow conditions. The temperature can be maintained or increased by circulation of a medium, such as water, through the tank 24 by use of connections 25. In some instances, such a coil can be eliminated, particularly if the mucilaginous matter is of a character to absorb the aqueous medium to the desired degree quickly.

The treated oil discharged from the pipe coil 23 enters a mixer 26 which may be of a type similar to the mixer 18. Here, the refining reagent is added to and mixed with the oil by any suitable means. As shown, the refining reagent is contained in a tank 27 equipped with a heating coil. This refining reagent is forced by a proportioning pump 28 through a pipe 29 and into the mixer 26. If desired, a heater 30 may be interposed between the tank 27 and this pump.

It is preferable to correlate the pumping action of the pumps 15, 20 and 28 so that properly proportioned streams are delivered to the system. This can be done by any suitable variable-speed connecting means. As diagrammatically shown, a variable-speed motor 31 drives each of these pumps and variable-speed means 32 and 33 serve to vary the relative proportions of the different liquids pumped into the system. It will be clear that the heaters 12, 13, and 30 are not always essential, and that, if used, these can be positioned on the discharge side of the pumps 15, 20, and 28 instead of on the intake side, as shown.

In the mixer 26, the refining reagent is intimately dispersed in and mixed with the treated oil and quickly neutralizes the fatty acids to produce foots, in this instance largely soap stock. The resulting mixture is preferably conditioned for separation by the presence of an emulsion-breaking temperature which may be imparted in whole or in part by the preheating of the materials or by the expedient of applying heat to the oil-foots mixture before separation. A conditioning means **35** is shown in the latter capacity and can be used to perform other desirable conditioning functions other than merely heating, as will be hereinafter mentioned. In the embodiment shown, this conditioning means includes a pipe coil **36** positioned in a tank **37** through which a heating medium may be circulated, if desired, through connection **38**.

The resulting products are delivered through a pipe **39** to a separating means **40**, shown as comprising a high-speed centrifugal separator. A conventional type of centrifuge may be used, providing a rotating bowl driven by a suitable high-speed motor or turbine, the centrifugal force acting to throw outward the foots containing the soap stock and other impurities, these foots then moving upward in the bowl to discharge through a heavy effluent spout **41**. The refined oil, being of lower density, occupies a more central position in the bowl and is continuously discharged through a lighter effluent spout **42**. If desired, this centrifuge may be of the heated-bowl type shown in my Patent No. 2,100,277, dated November 23, 1937. However, this expedient is usually not necessary though it can sometimes be used to advantage in bettering the action when processing certain oils. If used, the heating medium, such as steam, may be introduced to a position exterior of the bowl through a pipe **43** provided with a valve **44**.

The refined oil may be further processed in any way known to the art. For instance, it may be washed and dried and subsequently treated with known decolorizing agents. Similarly, the foots discharged from the spout **41** may be processed in known manners.

It will be noted that the system provides an elongated passage through which the oil may move continuously. For instance, the oil may enter this elongated passage as soon as it leaves the tank **10** and may be discharged therefrom only when it enters the centrifuge **40**. This flow of oil is induced by the pump **15** which develops sufficient pressure to force the oil completely through the elongated passage and into the centrifuge. During this flow in the elongated passage, the aqueous medium and the refining reagent are added and mixed therewith in succession. It has been found particularly desirable in a continuous process to utilize such an elongated passage closed from the atmosphere in conjunction with separate proportioning pumps for forcing thereinto the oil, aqueous medium and refining reagent.

The process will be found to work best if the following conditions and explanatory principles are kept in mind:

The oil to be refined may be any of the animal or vegetable oils or mixtures thereof and will contain mucilaginous matter as well as other impurities which it is desired to remove, for example fatty acids and color impurities. The process will work particularly well on some oils otherwise difficult of refining, for example Brazilian or Egyptian crude cottonseed oils, though it will, in general, improve the refining of all vegetable and animal oils.

The aqueous medium may be any one of a number of liquids. Pure water has been found to be very satisfactory. In some instances, an aqueous boric acid solution can be used, or very dilute aqueous solutions of other acids, such as acetic acid, sulphuric acid, etc. will often be found advantageous. Incorporation of a salt will often give desirable results. For instance, the aqueous medium may contain sodium acetate, potassium acetate, sodium chloride, or other salts in dilute solution. In other instances, the aqueous medium may comprise a solution imparting a tanning effect to the gums.

In general, this aqueous medium should be of such character that the mucilaginous matter will have an affinity for it. In other words, the aqueous medium will be imbibed by the mucilaginous matter in such a way that this mucilaginous matter will be impregnated therewith. This usually results in a swelling of the mucilaginous matter. Desirably, the aqueous medium should be of such character as to render the mucilaginous matter repulsive to the refining reagent when subsequently added.

As to the quantity of aqueous medium added, this will vary with different oils. Usually, it is desirable that the aqueous medium be added in quantity as much as the mucilaginous matter therein will take up or imbibe, though beneficial results can sometimes be obtained by use of smaller quantities. In other instances, the aqueous medium can be added in quantity greater than that which will be taken up by the mucilaginous matter, thus producing additional advantages in the process, both during the conditioning step and the subsequent separation step. It will thus be apparent that no definite limits applicable to all oils can be set forth, for the quantity of aqueous medium utilized will depend upon the quantity and the character of the mucilaginous matter present. Preliminary tests can be made on the oil to be refined to determine the optimum quantity of the aqueous medium and the amount which will be taken up by the mucilaginous matter, though it can be said as a general approximation that the mucilaginous matter will usually imbibe aqueous medium to an extent about equal to its own weight. Thus, with many oils, one or two per cent of the aqueous medium will give desirable results, though even with these oils more may be used.

As to the refining reagent, any of the various reagents now known in the art for reacting with or associating with the impurities to form foots can be used. If the oil contains fatty acids which it is desired to remove, this reagent is preferably an aqueous alkaline solution of such character as to neutralize the fatty acids. The usual excess, or slightly less, can desirably be used so as to combine color impurities with the foots to render them separable therewith and produce a desired bleach of the resulting refined oil. Solutions of caustic soda, caustic potash, etc. have been found very effective. If acid refining, sometimes known as partial refining, is desired, the refining reagent may be any of those acidic materials known to the art as being useful in this connection.

If the refining reagent is added to the oil without pre-treatment with the aqueous medium, it will be found that the mucilaginous matter will imbibe this reagent with no immediate reaction. Such mucilaginous matter floating along in the oil and impregnated with the refining reagent will gather and react with valuable neutral oil. On the other hand, if the mucilaginous matter is first impregnated with the aqueous medium, it will be repulsive to the refining reagent, thereby largely eliminating the above source of refining loss.

As a further consequence, it is sometimes possible to use smaller excesses of the refining reagent than would be the case in an ordinary refining process in view of the fact that some of this refining reagent will not be taken up by the mucilaginous matter which has already imbibed the aqueous medium to about its full extent.

There is usually a time element involved in the impregnation of the mucilaginous matter by the aqueous medium. Thus, while an intimate mixture can be formed in the mixer 18, it is usually desirable to maintain the mixture for a time sufficient to effect substantially complete impregnation. An excellent way of maintaining the aqueous medium dispersed, as well as the partially or completely impregnated mucilaginous matter, is to move the mixture through a conduit, for example the coil 23. In other instances, the mixture can be retained in the mixing zone for a longer period of time and thus eliminate the coil 23 from the system. With some oils, the mucilaginous matter will imbibe the aqueous medium with sufficient rapidity to make possible the use of a short conduit in place of the coil 23, even if the actual time in the mixer is quite short.

When the refining reagent is added to the mixer 26, it is intimately dispersed in the pretreated oil and quickly becomes associated with impurities. In the alkali refining of oils containing fatty acids, the neutralization is practically instantaneous and uses up the theoretical amount of the refining reagent. The resulting stream of oil thus contains refined oil, foots (formed mainly by the reaction between the free fatty acids and the refining reagent and composed largely of soap stock), the swollen mucilaginous matter, a small excess of the refining reagent, and the color impurities.

It is desirable to condition this mixture preparatory to centrifuging. This conditioning may involve several actions, among them the presence of an emulsion-breaking temperature to be later discussed. This conditioning may also involve reaction between the excess refining reagent and the coloring matter or an absorption or combining of the coloring matter with the foots. The time required for this action will vary with different oils, depending upon the color impurities therein. On some oils, the necessary time will be relatively short or even negligible, though on other oils, such as Egyptian or Brazilian crude cottonseed oils, the conditioning time in which the foots and excess alkali are dispersed in the oil will be somewhat longer. The length of the chamber formed by the conditioning means may be varied to give the desired conditioning time and produce a desired bleach. During the conditioning step, it is desirable that the foots and swollen mucilaginous matter be maintained quite uniformly dispersed in the oil. Flow through an elongated passage, or through a means which will maintain the uniformity of the mixture, is desirable in this regard and will prevent separation of the foots or soap stock particles from the oil and deliver a uniform mixture to the separating means. In addition, this conditioning may involve a breaking of the emulsion formed by the step of mixing the refining reagent if preheated materials are not used and if heat is applied during the conditioning step. Further, it may involve an agglomeration of the foots or soap stock particles in some instances, though not necessarily in all. Flow through an elongated passage, such as is provided by the conditioning means shown, is very effective in this regard, for the mild turbulence due to flow through such a passage appears to effectively agglomerate these particles in such way as to facilitate separation either continuously or in batches.

Various expedients can be used in separating the conditioned mixture into oil and foots. The addition of an aqueous medium to the oil is particularly advantageous when separating centrifugally. Assuming first that the amount of aqueous medium used has been only sufficient to meet the demands of the mucilaginous matter, it will be clear that the resulting products entering the centrifuge will be composed in the main of refined oil in which is dispersed the swollen mucilaginous matter existing independently or combined with dispersed particles of foots with which are associated the absorbed or reacted color impurities. When subjected to high centrifugal force in a rotating bowl of the centrifuge, all of those materials which are heavier than the refined oil will be thrown outward by centrifugal force and will occupy a zone in the outer portion of the rotating bowl. The centrifugal action is such as to squeeze from the swollen mucilaginous matter some of the water which, being heavier, assumes a position immediately adjacent the wall of the rotating bowl. Such water can become associated with the foots or soap stock to dilute same and thus effect a very uniform discharge from the bowl. On the other hand, a portion of the water may form a layer along which the foots or soap stock move upward, thus tending to prevent sticking of certain constituents thereof to the wall of the bowl. In some continuous refining processes as now practised, difficulty has been encountered with such sticking of some of the constituents to the bowl wall, resulting in an accumulation which prevents uniform discharge of the foots and which shifts the neutral zone of the centrifuge. Without the application of heat to the exterior of the bowl, it has been found that the process must be shut down every six or eight hours to permit cleaning of this accumulation from the bowl. In accordance with the present invention, the layer of water in the outermost portion of the bowl serves to prevent such adherence and facilitates continuous discharge of the soap stock constituents over long periods of time without shutdown. Even better action can sometimes be obtained by supplementing this action with the application of heat to the exterior of the bowl.

If the amount of aqueous medium utilized is in excess of that which will be imbibed by the mucilaginous matter, this excess will usually be in the form of dispersed droplets and will be present during the conditioning and separating steps. When the refining reagent is added, the excess thereof will, to some extent, be diluted by these dispersed droplets of the aqueous medium and the diluted refining reagent will not have as marked a tendency to react with the oil during the color-removing period as would be the case if no such dilution took place. If the excess of aqueous medium is slightly acid and an alkali refining reagent is used, it will react with some of the excess refining reagent and form a corresponding salt. The excess of the refining reagent may be determined with this in mind so as to still leave some excess refining reagent to perform a bleaching function if this action is desired. A salt thus formed or initially present in the aqueous medium will often be found beneficial in facilitating separation in that it will further increase the specific gravity or density of the soap stock constituents, thus making for better separation. Such beneficial action is particularly pronounced if the aqueous medium is used in excess of that required to swell the mucilaginous matter.

Use of such an excess of the aqueous medium is beneficial in the centrifugal separation for the same reasons as set forth above, the excess tending to form the layer of water in the outermost portion of the bowl.

Heat can beneficially be used in the process, being applied at one or more points. In general, it can be said that an elevated temperature sufficient to facilitate separation is desirably present or applied during that step; also that an emulsion-breaking or opposing temperature is desirably present or applied during this separation step. The most desirable temperature present or applied during centrifugal separation will vary with different oils and will depend in part on the character of materials to be separated. In the alkali refining of animal and vegetable oils, separating temperatures of between about 120° F. and 160° F. will usually be found desirable, though temperatures both higher and lower have been used with success on some oils. Similar temperatures can be used in acid refining. Such a temperature may be present in the mixture entering the centrifuge as a result of heat applied to one or more of the materials before mixing or applied to the oil-foots mixture, or heat derived from both sources, following the teachings of Patents Nos. 2,100,274 and 2,100,275. On the other hand, it may be the partial result of heat added adjacent the zone of centrifugal separation, following the teachings of my patent supra and Patent No. 2,100,276. Application of heat to the exterior of the rotating bowl of the centrifuge will, in general, raise the temperature of the heavier effluent much more than the temperature of the refined oil. For instance, if heat is thus applied and the temperature of the incoming constituents is 140° F., the temperature of the heavier effluent may be 150° F. or more, and the temperature of the refined oil discharged will be approximately 140° F.

In many instances, it is desirable to preheat one or more of the incoming materials. For instance, the incoming oil can often be preheated to a temperature usually between about 120° F. and 160° F. and desirably above 100° F. with advantageous results though, in other instances, the oil can be mixed with the aqueous medium and with the refining reagent at about room temperature and heat applied thereafter. If a preheating expedient is utilized, it will desirably be so controlled as to maintain the resulting mixture at an emulsion-breaking or opposing temperature. This will additionally decrease refining losses in preventing or quickly reversing the water-in-oil type of emulsion which commonly forms when the oil and refining reagent are mixed at substantially room temperature and which must later be broken or reversed by expedients such as the application of heat. Such preheating will often decrease the conditioning time, making it possible on some oils to substitute a short conduit for the coil **36**.

If the incoming oil is preheated, it is usually, though not invariably, desirable to preheat the aqueous medium. Best results are obtained if the aqueous medium is heated to about the same degree as the oil though, in some instances, it is possible to pump the oil into the system at substantially room temperature and introduce the aqueous medium at an elevated temperature. The use of a heated aqueous medium facilitates swelling of the mucilaginous matter and the temperature of the oil flowing from the mixing means **18** will in this instance be somewhat above the temperature of the incoming oil, depending upon the temperature of the aqueous medium and the proportion thereof utilized.

If desired, the refining reagent may also be preheated though this is not essential in view of the fact that only small quantities of this reagent are utilized.

Regardless of whether the incoming materials are preheated, but particularly if they are mixed at substantially room temperature, heat may be applied to maintain or raise the temperature of the oil-foots mixture during flow through the coil **36**. Several of the factors involved in the conditioning step are thus bettered or accelerated, and, if desired, the mixture can be brought to the temperature facilitating separation by heat applied at this point in the process.

In some instances, it is desirable to apply heat to the oil and its impregnated mucilaginous matter during flow through the pipe coil **23**. If the oil or the aqueous medium is introduced at substantially room temperature or with some degree of preheat, heat applied during flow through the coil **23** will facilitate impregnation of the mucilaginous matter and will also be useful in the latter part of the process. If constituents sufficiently preheated are used, the temperature thereof can be maintained during flow through the coil **23** by circulation of a suitable heated medium through the tank **24**.

It will thus be apparent that the invention is not limited to heat applied at any particular point in the system and that heat may be applied at one or more of the points shown without departing from the spirit of this invention.

It will be understood that various materials can be added to the process in addition to those described. Such additional materials may perform other beneficial functions without materially changing the mode of operation herein defined. In some instances, such materials can be pumped into the system by use of the pumps shown, or they may be introduced by auxiliary means.

While best results have been obtained by application of centrifugal force to effect separation, the invention is not in all instances limited thereto. For instance, the resulting products discharged through the pipe **39** may be moved into various types of separating means operating either on the batch or continuous principle.

In other instances, it is not essential to continuously mix with the oil the aqueous medium or the refining reagent, though best results have been obtained by such continuous introduction, particularly of the refining reagent. Thus, in some instances, it is possible to mix the aqueous medium with the oil before the mixture is pumped into the system and even to add the refining reagent during batch mixing. Even then, however, it is desirable to separate the products centrifugally.

By the employment of the term "aqueous medium" or "water," as used in the claims, we mean to define and embrace either the employment of water alone or such dilute aqueous solutions as to permit substantial hydration or impregnation of the gums or mucilaginous matter.

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

I claim as my invention:

1. A process of refining oils of the animal or vegetable type containing mucilaginous matter and other impurities, which process includes the steps of: mixing with said oil an aqueous medium for which said mucilaginous matter has an affinity and which is capable of impregnating said mucilaginous matter; then adding to and mixing with the resulting product while the impregnated mucilaginous matter remains uniformly suspended therein a refining reagent capable of acting upon said impurities to form foots; conditioning the resulting mixture of oil and foots by flowing same through an elongated passage while maintaining such flow conditions therein as to prevent said foots from separating out of said oil; subjecting the conditioned products to centrifugal action as fast as they issue from said elongated passage to continuously separate the oil from the remaining constituents of said conditioned products; and maintaining such temperature conditions in the process as will deliver the conditioned products to the zone of centrifugal separation in non-emulsified condition.

2. A process of refining oils of the animal or vegetable type containing mucilaginous matter and other impurities, which process includes the steps of: adding to and mixing with said oil a quantity of water to impregnate said mucilaginous matter; then adding to and mixing with the oil while said impregnated mucilaginous matter is uniformly suspended therein a refining reagent capable of acting upon said impurities to form particles of foots; subjecting the mixture to continuous centrifugal separation while the same is in a condition facilitating such separation, thereby to continously separate the refined oil from said foots.

3. A process of refining oils of the animal or vegetable type containing mucilaginous matter and other impurities, which process includes the steps of: adding to and mixing with said oil a quantity of an aqueous medium sufficient to impregnate said mucilaginous matter; then adding to and mixing with the oil while said impregnated mucilaginous matter is uniformly suspended therein a refining reagent capable of acting upon said impurities to form suspended particles of foots; flowing the resulting oil and the suspended foots and impregnated mucilaginous matter through an elongated passage at such rate as to maintain the foots and mucilaginous matter uniformly associated with the oil; and continuously centrifugally separating the refined oil from the foots.

4. A process as defined in claim 1 in which said aqueous medium is added in quantity greater than that which will be imbibed by said mucilaginous matter whereby the excess present is dispersed in the oil at the time said refining reagent is added and facilitates conditioning and centrifugal separation.

5. A process as defined in claim 2 in which said water is added in quantity greater than that which can be imbibed by said mucilaginous matter.

6. A process as defined in claim 1 in which said aqueous medium is added while at an elevated temperature.

7. A process as defined in claim 1 in which said aqueous medium is added while at an elevated temperature, and centrifugally separating said conditioned products while at an elevated temperature well suited to that step.

8. A process of refining oils of the animal or vegetable type containing mucilaginous matter and fatty acids, which process includes the steps of: heating said oil; adding thereto while in heated condition an aqueous medium for which said mucilaginous matter has an affinity and capable of impregnating this mucilaginous matter; then adding to and mixing with the hot oil while said impregnated mucilaginous matter is uniformly suspended therein a refining reagent capable of neutralizing the fatty acids to form particles of soap stock, while utilizing at least in part the heat of said oil to produce an emulsion breaking or opposing temperature before ultimate separation of the oil from the materials dispersed therein; and continuously centrifugally separating the resulting products into refined oil and a material containing said mucilaginous matter and said soap stock.

9. A process of refining oils of the animal or vegetable type containing mucilaginous matter and fatty acids, which process includes the steps of: mixing with the oil a small quantity of a hot aqueous medium for which said mucilaginous matter has an affinity and capable of impregnating this mucilaginous matter; then adding to and mixing with the oil while said impregnated mucilaginous matter is uniformly suspended therein an alkali refining reagent capable of neutralizing the fatty acids to form particles of foots and added in excess of that amount theoretically required for such neutralization; conditioning the resulting mixture of oil, foots and excess refining reagent by flow through a conduit; subjecting the oil to an emulsion breaking or opposing temperature before the time that it is ultimately separated from the foots; and centrifugally separating the conditioned mixture while at an elevated temperature into oil and foots.

10. A process of refining oils of the animal or vegetable type containing mucilaginous matter and other impurities, which process includes the steps of: introducing into a flowing stream of said oil and mixing therewith during said flow an aqueous medium for which said mucilaginous matter has an affinity and capable of rendering said mucilaginous matter repulsive to the action of a refining reagent; adding to the resulting stream a proportioned stream of a refining reagent capable of acting upon said impurities to produce a stream of products including oil, dispersed foots and said mucilaginous matter impregnated by said aqueous medium; subjecting the oil to an emulsion breaking or opposing temperature before the time that it is ultimately separated from the foots; and continuously centrifugally separating said oil from said products.

11. A process of continuously refining oils of the animal or vegetable type containing mucilaginous matter and other impurities, which process includes the steps of: introducing into a flowing stream of said oil and mixing therewith during said flow an aqueous medium for which said mucilaginous matter has an affinity and capable of rendering said mucilaginous matter repulsive to the action of a refining reagent; continuously adding to and mixing with the resulting stream a proportioned stream of a refining reagent capable of acting upon said impurities to produce foots and thus forming a stream of products including oil, foots and said mucilaginous matter impregnated by said aqueous medium; subject-

ing the oil to an emulsion breaking or opposing temperature before the time that it is ultimately separated from the foots; and subjecting said stream of products to centrifugal force to separate said oil from the remainder of said products.

12. A process of refining oils of the animal or vegetable type containing mucilaginous matter and other impurities, which process includes the steps of: pumping a stream of said oil along and completely through an elongated passage; pumping into said elongated passage a stream of an aqueous medium for which said mucilaginous matter has an affinity to impregnate this mucilaginous matter and form a stream of oil containing said impregnated mucilaginous matter flowing along a subsequent portion of said passage; pumping into said subsequent portion of said elongated passage and mixing with said oil containing said impregnated mucilaginous matter a refining reagent capable of acting upon said impurities to form foots; discharging the products into a separating zone as fast as they move from said elongated passage; subjecting the oil to an emulsion breaking or opposing temperature before the time that it is ultimately separated from the foots; and continuously centrifugally separating refined oil from the products while in this zone.

13. A process as defined in claim 12 including the steps of applying heat to said passage to heat the material flowing therein.

14. A process of refining oils of the animal or vegetable type containing mucilaginous matter and fatty acids, which process includes the steps of: pumping a stream of said oil along and completely through an elongated passage; pumping into said elongated passage a stream of an aqueous medium for which said mucilaginous matter has an affinity to impregnate this mucilaginous matter and render it repulsive to an alkali refining reagent, thus forming a stream of oil containing said impregnated mucilaginous matter flowing along a subsequent portion of said passage; pumping into said subsequent portion of said elongated passage and mixing with said oil containing said impregnated mucilaginous matter an alkali refining reagent capable of neutralizing said fatty acids to form particles of foots; subjecting the resulting products as fast as produced to centrifugal action to separate the refined oil therefrom; and applying heat to said elongated passage to produce an emulsion breaking or opposing temperature to discharge the resulting products into the zone of centrifugal separation while at a temperature facilitating this separation.

15. A process for refining oils of the animal or vegetable type containing mucilaginous matter and other impurities, which process includes the steps of stream mixing with the oil an aqueous medium for which the mucilaginous matter has an affinity and which is capable of impregnating said mucilaginous matter; then adding to and mixing with the resulting product a refining reagent capable of combining with said impurities to form foots, the impregnation of said mucilaginous matter preventing substantial taking up of said refining reagent by said mucilaginous matter, developing such temperature prior to the ultimate separation of the oil from its suspended materials as will cause the oil to be at an emulsion breaking or opposing temperature; and centrifugally separating from the oil a material comprising said foots and said mucilaginous matter while using such amount of said aqueous medium in the process that some of this medium will be squeezed out of said mucilaginous matter during centrifugal separation to facilitate continuous discharge of the foots from the zone of centrifugal separation.

BENJAMIN CLAYTON.