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METHOD FOR PURIFYING REFINED OILS

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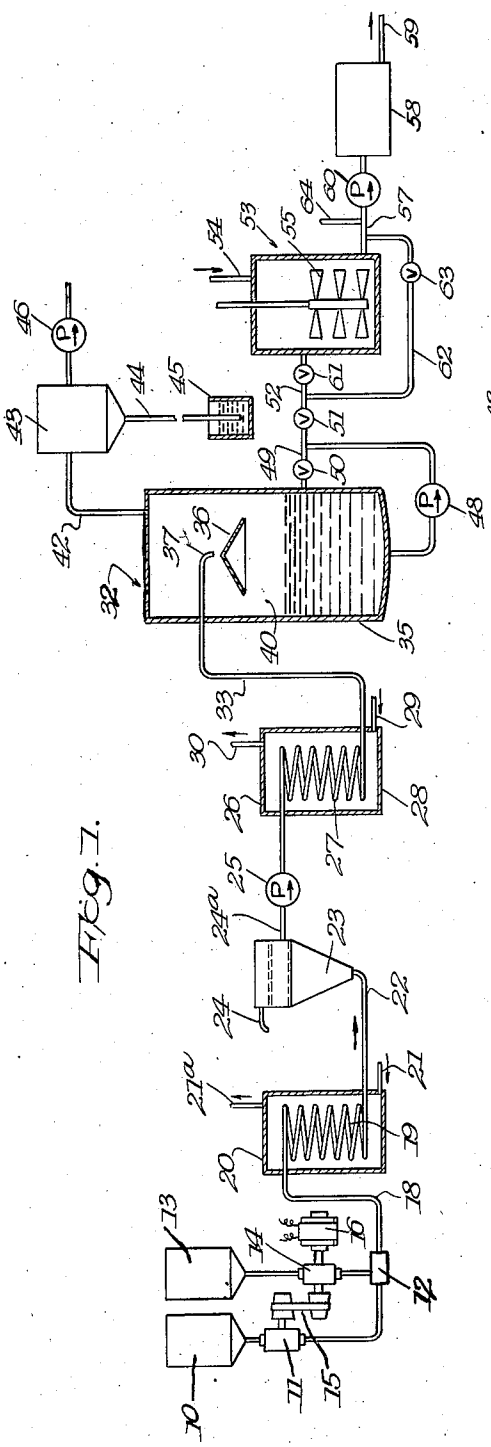


Fig. 1.

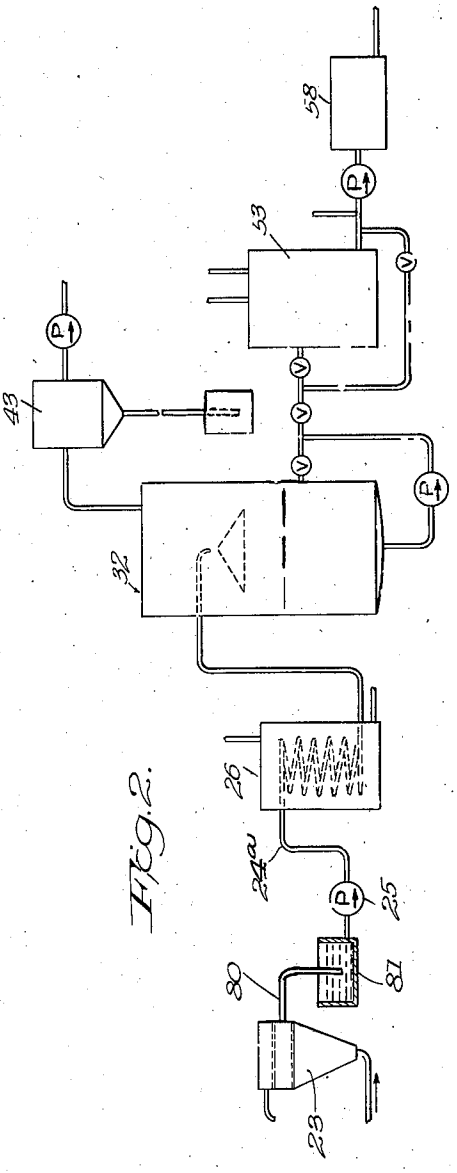


Fig. 2.

Inventor

Benjamin Clayton.

By Harris, Kiech, Foster & Harris

Attorneys

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METHOD FOR PURIFYING REFINED OILS

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

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12 Claims. (Cl. 260—425)

My invention relates to the refining of glyceride-type oils, of which vegetable oils are examples.

Such oils, fats, and greases herein classified under the term "glyceride-type oils" are those which contain free fatty acids which are removed by suitable refining steps. Usually various other impurities, such as coloring matter, etc., are also present and are removed in the refining process. Such refining is usually conducted by adding a refining agent capable of reacting with the free fatty acids and associating with other impurities to form foots which are in large measure composed of soap but which may also contain other substances. Usually such refining agents are aqueous alkali solutions, though the term as hereinafter used includes any material capable of combining with and neutralizing the free fatty acids and associating with other impurities to form foots.

Batch refining, as at present practiced, involves addition of an alkali in excess of that theoretically required for actual combining with the free fatty acids, the mixture being heated until the "break" occurs, after which the foots are allowed to settle. In continuous refining, the oil and alkali solutions are suitably mixed in a continuous manner, the reaction products being continuously introduced into a centrifuge or other means for separating the foots from the refined oil. Either process produces a refined oil which still contains traces of soap stock and water, and one phase of the present invention deals with this problem of removing these traces of soapstock and water to produce a refined oil of a quality desired by the trade.

In removing such traces of soapstock and water, it has been customary in some instances to collect a mass of the refined oil and repeatedly wash it with pure water or a lye solution in an attempt to remove the soapstock. The resulting refined oil contains moisture which is later removed by a batch-operated vacuum drying system, after which the oil is filtered.

Heretofore, it has not been considered good practice by those skilled in the art to heat the oil while the traces of soapstock are present therein to the temperature necessary for drying. In ordinary systems this has been shown to seriously damage the oil in numerous ways, the more serious of which are evidenced by a material increase in the free fatty acid content and a setting, and often an increasing, of the color. Consequently, resort has been had to batch washing, usually repeated several times, to remove the soapstock before heating, after which the moisture is removed by vacuum drying.

I have found it possible to entirely eliminate the washing step or steps in such purification of oils, and have found that the free fatty acid content will not increase, nor will the color set or increase, if a continuous process is utilized in this capacity, and if heating of the refined oil containing the traces of soapstock and water is carried on in a closed system in which air is excluded. It is an object of the present invention to provide such a method.

I prefer not only to heat the oil containing this soapstock and moisture in a closed space, but also to heat this oil as quickly as possible to a temperature desirable for the vacuum-drying step, and then immediately remove the water by subjection to a low pressure such as may be maintained in a vacuum-drying chamber. That such quick heating of a refined glyceride-type of oil out of contact with the atmosphere will not increase the free fatty acid content, or increase or set the color, is a discovery which I believe to be fundamentally new in the art, and the provision of such a method of treating glyceride-type oils, and especially vegetable oils, is an important object of the present invention.

Another object of the invention is to provide a novel process of purifying refined glyceride-type oils which will actually improve the quality of the oil, and which eliminates the washing step entirely with a consequent very material saving in cost.

Another object of the invention is to provide a process in which the trace of moisture in the refined oil is removed to dry the trace of soapstock therein so that this dried soapstock can be subsequently removed by any suitable step such as filtering.

I have further found that the presence of such dried soapstock will not interfere with the action of later-added bleaching materials or filter aids, and it is an object of the invention to first remove the traces of water from a refined oil and dry the soapstock, and then add a bleaching material or filter aid or both prior to filtering the oil to remove the trace of dried soapstock.

Another object of the invention is to provide a continuous process in which a stream of heated oil is moved from a batch or continuous-refining system, the heat therein being utilized to assist in removing the trace of water present, this heat being supplemented in certain instances by additional heat.

Another object of the invention is to provide a process of treating refined oil which results in a

very material saving in the total amount of heat required and which effects further economies. Thus, by immediately conducting the refined oil into a closed system for vacuum-drying while this oil is still in heated condition due to the refining operation, any waste of heat resulting from the now-practiced cooling of the refined oil is eliminated. Further, my system eliminates heating of the wash water heretofore found necessary. It also eliminates the increased moisture content present in washed oils, and thus eliminates the additional expense incident to removing this increased moisture in the vacuum drying step.

Still another object of the invention is to provide a process which may be truly continuous from the mixing of the glyceride-type oil and the reagent, to the removal of the dried soapstock, and which reduces many fold the total time necessary to produce the ultimate commercial product.

Further objects and advantages of the invention will be evident to those skilled in the art from the following example of the process.

Referring to the drawing:

Figure 1 is a pipe line diagram of a complete refining-purifying system of a continuous character.

Figure 2 is a pipe line diagram of a modified purifying system.

In the continuous refining system shown in Figure 1, the glyceride-type oil is contained in a tank 10 from which it is withdrawn by a pump 11 and delivered as a stream to a mixer 12. The refining agent is contained in a tank 13 and is withdrawn therefrom by a pump 14 and delivered to the mixer 12. Various types of mixers can be utilized to disperse the refining agent in the oil, but it is preferable to conduct this mixing step out of contact with the atmosphere. I have found it quite satisfactory to secure this mixture by bringing together flowing streams of the oil and refining agent in a mixing chamber defined by the mixer 12, though it will be clear that other expedients such as closed mechanical agitators may be utilized to effect the desired dispersion mixing action which intimately disperses the refining reagent in the oil to neutralize the free fatty acids. It is desirable, however, that the oil and refining agent be delivered to the mixer 12 in properly proportioned quantities. For this reason the pumps 11 and 14 are preferably driven at proportioned speeds by any suitable means such as a variable-speed means 15 shown as being of the cone pulley type. An electric variable-speed motor 16 or other means may be used to drive the pumps 11 and 14, or other expedients may be used to supply proportioned quantities of the oil and refining agent to the mixer 12.

The resulting mixture is moved from the mixer 12 through a pipe 18 and is delivered to an elongated chamber which may conveniently be formed by a pipe coil 19 disposed in a shell 20. During flow through this elongated chamber under the influence of the pressure developed by the pumps 11 and 16, heat may be added by any suitable means. External heating of the pipe coil 19 is very satisfactory and can be accomplished by the use of products of combustion from a suitable burner or by circulating a heated material, such as hot oil, into and from the shell 20 as by connections 21 and 21*a*.

The resulting oil containing the foots and properly conditioned for the subsequent centrifuging step, is delivered through a pipe 22 to a centrifuge 23 which acts to separate a major portion of the foots from the refined oil. These foots are delivered from the centrifuge through a pipe 24, and the refined oil containing traces of soapstock and water is moved from the centrifuge and directly into a pipe 24 in this embodiment of the invention. A pump 25 may be utilized to deliver the refined oil as fast as produced by the centrifuge 23 to a heater 26 in the event that the temperature is not sufficiently high for the subsequent vacuum-drying step. This heater is of a type which will heat the oil as quickly as possible to the desired temperature, and is preferably a heater which will perform this quick heating step out of contact with the atmosphere. A pipe coil 27 in a shell 28 is very satisfactory in this regard, heating being effected by products of combustion rising around the coil 27 or by the use of a suitable heating medium circulated through the shell 28 as by connections 29 and 30.

The heated oil is delivered as quickly as possible to a vacuum-drying means 32 through a pipe 33. Various vacuum-drying means can be used in this capacity, the embodiment shown including a container 35 including one or more baffles 36 which act to spread the incoming heated oil delivered by a downward-bent portion 37 of the pipe 33, thus spreading the oil to form same into thin streams or sheets in a manner to facilitate moisture removal. The interior of the container 35 provides a low-pressure chamber 40 in which pressure conditions are sufficiently low to insure vaporization of the moisture at the temperature of the refined oil delivered through the pipe 33. The water vapors which separate from the oil are drawn through a pipe 42 into a condenser 43 which may be of any suitable type. The condensate moves downward in a column 44 into a tank 45, the lower end of this column being submerged in a body of the condensate in a manner well known in the art. This column is of sufficient height to compensate for the vacuum maintained in the system. Any uncondensed or uncondensable material is withdrawn by a vacuum pump 46 which maintains a low pressure in the chamber 40. This pump may also be used to maintain a sub-atmospheric pressure in at least a portion of the coil 27. Thus, in the chamber 40 the trace of moisture is removed from the refined oil, and the soapstock is dried, the oil containing this dried soapstock accumulating in the lower portion of this chamber.

A pump 48 withdraws this refined oil and may either recirculate same into the chamber 40 through a pipe 49 including a valve 50, or may force this oil through valves 51 and 61 in a pipe 52, thus delivering the oil to a bleaching tank 53. Here, bleaching or filter aids may be introduced through a pipe 54 and mixed with the oil by an agitator 55 suitably driven by means not shown.

Thereafter the refined oil containing the dry soapstock and the bleaching or filter aid moves through a pipe 57 to a filter press or other separating means 58, being discharged therefrom in purified state through a pipe 59, this separating means removing the dry traces of soapstock and any solid or immiscible material added through the pipe 54. A pump 60 may be installed to force the oil through the pipe 57.

In some instances it is not necessary to use the bleaching tank 53. In this instance the valve 61 may be closed, thus moving the refined oil from the chamber 40 through a by-pass pipe 62, a valve 63 therein being open at this time. This by-pass pipe communicates with the pipe

57. With this mode of operation, if it is desired to add bleaching or filter aids, such materials may be added directly to the material flowing in the pipe 57 by use of a means such as a pipe 64 or other introduction means delivering a controlled quantity of the bleaching or filter aids or both to the stream of refined oil before it reaches the filter press 58. It will be clear, however, that in some instances it is not necessary to add such bleaching or filter aids.

In considering the operation of this complete system, it should be kept clearly in mind that the stream of oil-foots mixture moving through the pipe 24 may be obtained from any suitable refining system, batch or continuous. However, marked advantages accrue from use of a continuous refining step to produce this mixture, especially in view of the resulting better refining with less refining loss, and in view of temperature and time factors. In a continuous process the temperatures utilized may be considerably higher and refining losses materially lower than in the usual batch process, and the increased temperature, and continuous flow conditions, are taken advantage of in the subsequent steps of the process.

By way of illustration, the operation of the system shown in Figure 1 may be as follows:

The glyceride-type oil and the refining agent are continuously delivered in proportioned quantities to the mixer 12. The usual excess of refining agent is usually utilized, the excess acting upon the color and other impurities. When the mixture of oil and refining agent is formed in the mixer 12, the free fatty acids are very quickly acted upon, especially if the refining agent is well dispersed in the oil as is desired. The material discharged from the mixing zone may thus comprise a mixture of refined oil, foots formed by the reaction between the free fatty acids and the refining reagent, various impurities such as coloring matter, gums, etc., not yet acted upon and the excess of the refining reagent.

During flow through the elongated passage defined by the coil 19, this mixture is conditioned for subsequent centrifuging. This conditioning may involve several factors. In the first place, during this flow the excess refining reagent can act upon the color and other impurities to complete the refining action, it being clear that with many oils such color-removing and similar reactions proceed slower than the reaction between the refining reagent and the free fatty acids. The products of these slower reactions appear in the foots. Then, too, heat supplied at this point reduces the viscosity of the oil to such an extent that centrifugal separation may be very efficiently accomplished. Further, flow through this elongated passage causes some swirling of the mixture moving therethrough to maintain such mild turbulent flow as will maintain a uniform dispersion of the foots in the oil without permitting actual separation of the foots from the oil before reaching the centrifuge. Any such separation of foots from a stream of the mixture might tend to deliver to the centrifuge a mixture of non-uniform character—a result which is to be avoided in this type of continuous refining. In addition, such flow appears to change the physical character of the foots, causing such agglomeration thereof as will make for better separation.

The centrifuge 23 is of such a type as to satisfactorily separate most of the foots from the refined oil. The foots are continuously delivered through the pipe 24. It has been found, however, that it is usually impossible to separate all traces of soapstock and water from the refined oil in a centrifugal separator. Similarly, in batch refining methods the separated refined oil still contains traces of soapstock and water.

Instead of washing the refined oil with one or more washings of water, I move this refined oil while still containing the traces of soapstock and water to the vacuum-drying means 32, and deliver this oil to the low-pressure chamber 40 at a rate corresponding to the rate at which the refined oil was discharged from the centrifuge 23. In some instances it may not be necessary to add additional heat to the hot refined oil delivered by the centrifuge 23, for temperatures developed during the refining and/or centrifuging step may often be relatively high. Temperatures as high as 160° F. are often used, though even higher temperatures may sometimes be used. For instance, if the oil-foots mixture is increased in temperature in the coil 19 to between 120 and 160° F., and if no heat is subsequently added, the temperature of the oil discharged from the centrifuge 23 will be only slightly lower. It is only necessary to maintain the temperature of the refined oil entering the low-pressure chamber 40 at such a value that the moisture will be in vapor form when at the pressure existing in this chamber. Thus, if the refining step delivers oil at sufficiently high temperature, and if the vacuum in the chamber 40 is sufficiently high, it is sometimes unnecessary to supply additional heat by utilization of the heater 26.

However, in most instances I find it desirable to add additional heat to the refined oil before it is delivered to the vacuum-drying means 32. If this heat is supplied I have found it important to heat the refined oil as quickly as possible and immediately discharge it into the low-pressure chamber 40. I have also found it preferable to heat the oil while out of contact with the atmosphere. Both of these expedients assist in preventing increase in free fatty acid content and increase or settling of color. Further, I prefer to heat the oil during flow thereof in a stream of restricted cross-sectional area, flow conditions being then such as to give a uniform heating of all portions of the oil and preventing localized over-heating effects which would detrimentally affect the oil. By use of such expedients I find it possible to heat the refined oil while the traces of soap stock are still present without increasing the free fatty acid content and without increasing or even setting the color. In this respect I depart from the long-recognized belief of those skilled in the art that it is inadvisable to heat such a refined oil while the traces of soap-stock are present in view of the inevitable increase in free fatty acid content and the increase or setting of the color.

If the oil is heated as quickly as possible, and immediately moved into the vacuum-drying means 32, I have found it possible to heat the oil to as high as 220° F. and with some oils even as high as 400° F., without detrimental results if the system is properly controlled. With some oils the higher temperatures bleach and deodorize the oils but are not essential for moisture removal, temperatures between 160° F. to 180° F. giving very good dehydration. This temperature will, of course, depend upon the degree of vacuum maintained in the low-pressure chamber 40. With a higher degree of vacuum, the temperature may be made correspondingly lower. By way of example, a temperature of 180° F. has been found to

be very satisfactory with a vacuum of 27 inches of mercury.

The vacuum conditions in the low-pressure chamber 40 will carry back into the coil 27. My tests have not shown that the inlet pressure to this coil is critical. It will be clear, however, that the pressure in the coil 27 progressively decreases toward the exit end, a factor which is often advantageous in this system. Thus, even during passage through that portion of the coil 27 near the exit end, some of the moisture may assume a vaporous state. In some instances it is possible to dispense with the pump 25, permitting the vacuum conditions in the chamber 40 to draw the refined oil through the heater 26. In other instances, however, it is desirable to utilize such a pump. The size of the pipe forming the coil 27 will be a factor in this regard, as will also the rate of flow of the oil. These factors should preferably be correlated in order to give the oil sufficient velocity while passing through the coil to have a mild turbulence effective in bringing about efficient heat transfer and in keeping the side walls of the pipe clean by preventing soapstock from settling out against these walls.

Some cooling of the oil takes place in the vacuum-drying means 32 due to radiation and to vaporization which may take place therein. The container 35 may be suitably jacketed or a heating coil positioned therein for the purpose of supplying additional heat if desired. Thus, all of the additional heat may be supplied in the chamber 40 and the heater 26 eliminated. Successful results have been obtained by circulating the refined oil into and from the lower portion of the chamber 40 by means of the pump 48 until the temperature of this oil is in the neighborhood of 160° F. though this temperature is not critical. The valve 51 is then opened and the valve 50 closed so that the oil moves through the pipe 52. If the valve 61 is open and the valve 63 is closed, this oil will move into the bleaching tank 53 where a bleaching and/or filter aid may be added through the pipe 54 and suitably agitated, the resulting oil being moved through the pipe 57. While batch operation is possible at this stage of the process, I prefer to continuously perform this step by withdrawing the oil at a rate corresponding to the rate at which the oil enters through the pipe 52. Any suitable bleaching materials and filter aids may be utilized, these being well known in the art. If desired, a heating coil may be installed in the bleaching tank 53, though this is usually not necessary. The pressure in this bleaching tank may be at or above atmospheric pressure, though in some instances it is preferable to maintain vacuum conditions in this tank.

If the valve 61 is closed and the valve 63 open, this oil by-passes the tank 53 and the bleaching and/or filter aids may be added during flow in the pipe 57, this being accomplished through the means 64 which may comprise any means delivering the bleaching and filter aids, if used, to the oil in the pipe 57. A suitable screw conveyor or other means may be utilized for introducing such materials directly into the stream of oil, flow conditions in the pipe 57, supplemented by the mixing action of the pump 60 if used, serving to uniformly mix such materials in the oil. If desired, any suitable mixing means may be utilized at the junction of the means 64 in the pipe 57. With some oils it is possible to filter the dehydrated soapstock from the oil without the employment of a filter aid to produce a clear light colored oil so that the addition of bleaching or filter aids is unnecessary.

In addition, it is possible to use both the bleaching tank 53 and the means 64. For instance, a bleaching material may be added through the pipe 55, and a suitable filter aid may be added through the means 64. In addition, a cooling coil may be inserted in the pipe 52 or in the pipe 57, if desired, to cool the material passing therethrough. Usually, however, this is not necessary.

The refined oil containing the dried soapstock and the bleaching and filter aids, if used, is moved to the filter press 58 or other separating means by the action of the pump 60. Here, these contaminating materials are removed from the refined oil which is delivered continuously through the pipe 59. With certain oils it is desirable to cool the oil before passing the same through the filter press in order to reduce the solubility of the soap in the oil. This may be accomplished by any suitable cooling means, for example, by passing the oil through a cooling coil. The temperature to which the oil should be cooled will depend upon the viscosity of the particular oil, as low viscosity is desirable during filtering.

This process effects not only very material savings in cost of refining and purification, but also produces a superior oil, and does this in a time much shorter than heretofore thought possible.

It is desirable to move the refined oil from the centrifuge and to the vacuum-drying means 32 at corresponding rates. In Figure 1 the refined oil is not exposed to the atmosphere after leaving the centrifuge 23 and until after it passes through the vacuum-drying means 32. Further, even if the bleaching tank 53 is used, this tank may be closed from the atmosphere, thus making it possible to maintain the refined oil out of contact with the air until it is discharged in purified condition through the pipe 59. However, it is not invariably necessary to directly connect the coil 27 to the refined oil discharge of the centrifuge 23. Thus, in Figure 2 I have shown a system in which this refined oil is discharged from the centrifuge through a pipe 80 and flows into a temporary storage tank 81 from which it is withdrawn through the pipe 24. The rate of withdrawal substantially corresponds to the rate of delivery through the pipe 80 under normal conditions of operation. However, it is not desirable to allow the refined oil to remain in contact with the atmosphere for any prolonged time and the tank 81 serves merely as a temporary receptacle. Usually, it can be stated that it is desirable to immediately purify the refined oil, and within this concept the refined oil will ordinarily never remain in the tank 81 for more than a fraction of an hour, and will often remain therein for only a few minutes. With certain oils this slight delay in removing the water does not detrimentally affect the oil to any commercially objectionable extent.

I conceive of my process as being broadly new in the elimination of the washing step in the continuous purification of refined glyceride-type oils, and have set forth two embodiments of the invention for illustrative purposes. It will be clear, however, that various modifications may be made therein without departing from the spirit of this invention.

I claim as my invention:

1. A method of removing traces of soapstock and water from a refined glyceride-type oil from which soap stock containing water has been separated to leave said traces, which method in-

cludes the steps of: continuously flowing a stream of said oil containing only traces of soapstock and water through a heating zone from which the atmosphere is excluded; heating said oil in said flowing stream during flow through said heating zone; immediately moving the stream of heated oil from said heating zone into a low-pressure chamber while maintaining said stream of heated oil out of contact with the atmosphere; maintaining the pressure in said chamber sufficiently low that said trace of water vaporizes and said trace of soapstock is dried; and removing the dried soapstock from the refined oil.

2. A method of producing a refined oil of the glyceride type which is substantially free of soapstock and water, which method includes the steps of: continuously refining a glyceride type oil by use of an alkali refining agent to produce a hot refined oil with water and soapstock therein; immediately and continuously centrifuging said hot refined oil to separate a major portion of said soapstock and water leaving a hot refined oil with traces of soapstock and water therein; immediately vacuum-drying said hot refined oil to remove said water and dry said trace of soapstock by moving said hot refined oil substantially as fast as it is delivered by said centrifuging step into a low-pressure chamber while still containing only said traces of soapstock and water and maintaining the pressure in said chamber sufficiently low to vaporize the trace of water in said hot refined oil reaching said chamber; continuously withdrawing the refined oil from said chamber; and continuously filtering the refined oil thus withdrawn.

3. A method of producing a refined oil of the glyceride type which is substantially free of soapstock and water, which method includes the steps of: continuously refining a glyceride-type oil by use of an aqueous alkali refining agent to produce a refined oil with water and soapstock therein; immediately and continuously centrifuging said refined oil to separate a major portion of said soapstock and water leaving a refined oil with traces of soapstock and water therein; immediately heating the refined oil with said traces of soapstock and water therein out of contact with the atmosphere and substantially as fast as it is separated by the centrifugal action to a temperature between 160° and 220° F.; immediately moving a stream of the heated oil while still out of contact with the atmosphere into a low-pressure chamber in which the pressure is sufficiently low to vaporize said trace of moisture to leave a refined oil with traces of dried soapstock therein; and removing said dried soapstock from said refined oil.

4. A method of producing a refined oil of the glyceride type which is substantially free of soapstock and water, which method includes the steps of: continuously refining a glyceride-type oil by use of an aqueous alkali refining agent to produce a refined oil with soapstock and water therein; immediately and continuously centrifuging said refined oil to separate a major portion of said soapstock and water and continuously produce a refined oil with traces of soapstock and water therein; immediately flowing a stream of the refined oil with said traces of soapstock and water therein through an elongated passage out of contact with the atmosphere; heating said stream of refined oil during flow through said passage; progressively decreasing the pressure on said refined oil during flow through said elongated passage; flowing said stream of oil at increased temperature and reduced pressure into a drying chamber while still out of contact with the atmosphere; maintaining a pressure in said drying chamber sufficiently low to vaporize said trace of water and dry said trace of soapstock; and removing said trace of dry soapstock from said refined oil.

5. A method of producing a refined glyceride-type oil substantially free of water and soapstock, which method includes the steps of: continuously bringing together in mixing relationship proportioned streams of said oil and an aqueous alkali reagent to refine said oil and form soapstock; moving the oil-soapstock mixture containing water through an elongated passage; immediately and continuously subjecting the oil-soapstock mixture discharged from said elongated passage to centrifugal action to separate a major portion of said soapstock and water to produce a refined oil containing traces of soapstock and water; continuously moving a stream of said refined oil substantially as fast as it is separated by said centrifugal action to a vacuum zone in which the pressure is so related to the temperature of said refined oil that said trace of water is vaporized and said trace of soapstock is dried; and filtering the dried soapstock from said refined oil.

6. A method of producing a refined glyceride-type oil substantially free of water and soapstock, which method includes the steps of: continuously bringing together in mixing relationship proportioned streams of said oil and an aqueous alkali reagent to refine said oil and form soapstock; moving the oil-soapstock mixture containing water through an elongated passage; immediately and continuously subjecting the oil-soapstock mixture discharged from said elongated passage to centrifugal action to separate a major portion of said soapstock and water to produce a refined oil containing traces of soapstock and water; continuously moving a stream of said refined oil containing said traces of soapstock and water through a heating zone; heating said stream in said heating zone and while out of contact with the atmosphere; moving the heated stream while still out of contact with the atmosphere into a vacuum zone maintained at sufficiently low pressure that the heated trace of water in said refined oil will vaporize thus drying said trace of soapstock; and filtering the dried soapstock from said refined oil.

7. The method of removing traces of soapstock and water from a refined glyceride oil from which soapstock containing water has been separated to leave said traces, which comprises, rapidly heating said oil to a temperature at which said moisture will be separated in vapor form when subjected to vacuum conditions, subjecting said oil to vacuum treatment at a pressure sufficiently low to separate said water from said oil, and removing the dried soapstock from the refined oil.

8. The method of removing traces of soapstock and water from a refined glyceride oil from which soapstock containing water has been separated to leave said traces, which comprises: subjecting said oil to a treatment in a low pressure chamber at a temperature sufficiently high to vaporize said moisture and dry said soapstock and removing the dried soapstock from the refined oil.

9. The method of removing traces of soapstock and water from a refined glyceride oil from

which soapstock containing water has been separated to leave said traces, which comprises: subjecting said oil to a treatment in a low pressure chamber at a temperature sufficiently high to vaporize said moisture and dry said soapstock, and filtering said dried soapstock from said oil.

10. The method of removing traces of soapstock and water from a refined glyceride oil from which soapstock containing water has been separated to leave said traces, which comprises: subjecting said oil to a treatment in a low pressure chamber at a temperature sufficiently high to vaporize said moisture and dry said soapstock, adding a filter aid to said oil and filtering said oil to remove said dried soapstock.

11. A method of removing traces of soapstock and water from a refined glyceride-type oil from which soapstock containing water has been separated to leave said traces, which method includes the steps of: continuously flowing a stream of said oil containing only traces of soapstock and water through a heating zone from which the atmosphere is excluded; heating said oil in said flowing stream during flow through said heating zone; immediately moving the stream of heated oil from said heating zone into a low-pressure chamber while maintaining said stream of heated oil out of contact with the atmosphere; maintaining the pressure in said chamber sufficiently low that said trace of water vaporizes and said trace of soapstock is dried; and filtering said dried soapstock from the refined oil.

12. A method of removing traces of soapstock and water from a refined glyceride-type oil from which soapstock containing water has been separated to leave said traces, which method includes the steps of: continuously flowing a stream of said oil containing only traces of soapstock and water through a heating zone from which the atmosphere is excluded; heating said oil in said flowing stream during flow through said heating zone; immediately moving the stream of heated oil from said heating zone into a low-pressure chamber while maintaining said stream of heated oil out of contact with the atmosphere; maintaining the pressure in said chamber sufficiently low that said trace of water vaporizes and said trace of soapstock is dried; adding a filter aid to said oil and filtering the same to remove the dried soapstock therefrom.

BENJAMIN CLAYTON.