Nov. 8, 1927. 1,648,367

J. W. SPENSLEY

TREATMENT OF OILS AND FATS FOR THE NEUTRALIZATION AND REMOVAL OF THEIR FATTY ACID CONTENT

Filed March 5, 1923 2 Sheets-Sheet 1

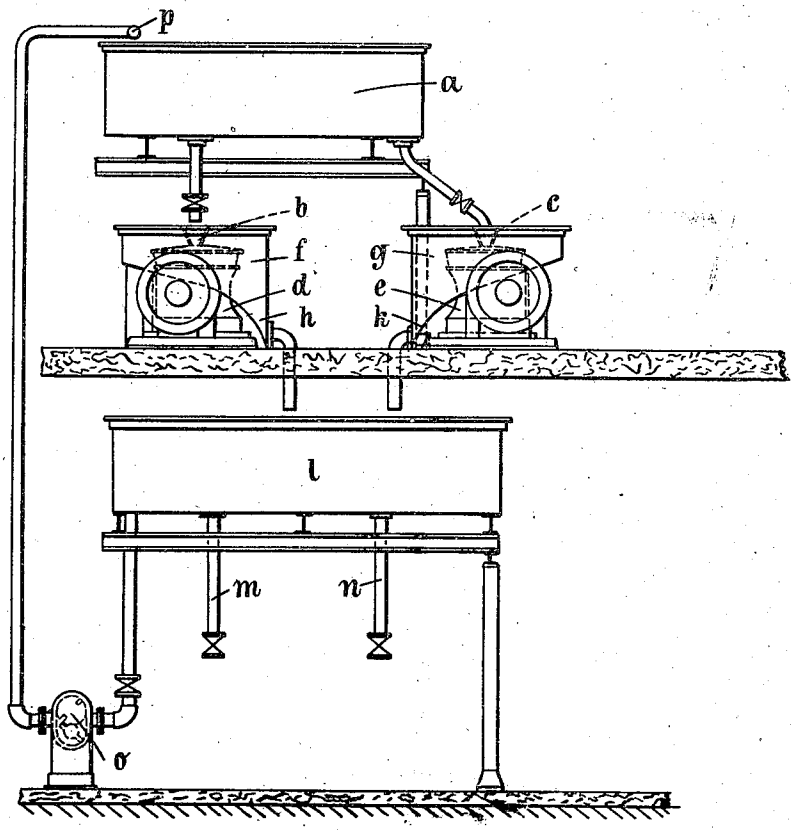

Fig. 1.

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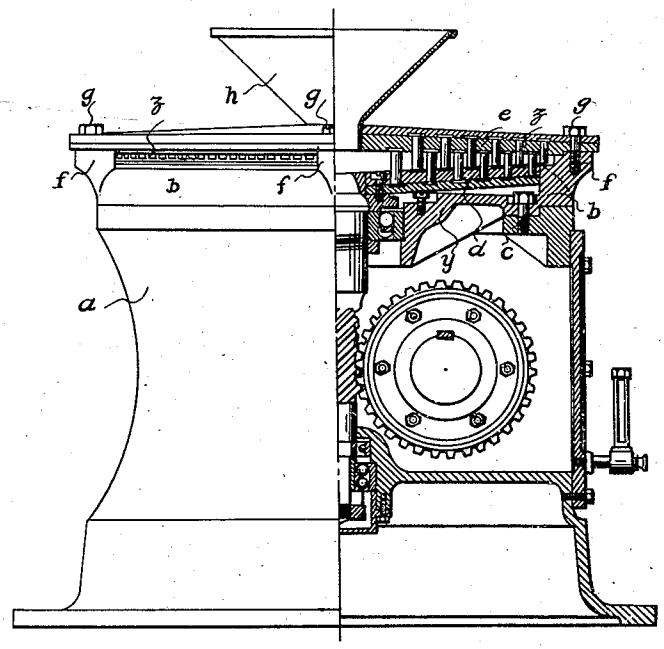

Fig. 2

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UNITED STATES PATENT OFFICE.

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TREATMENT OF OILS AND FATS FOR THE NEUTRALIZATION AND REMOVAL OF THEIR FATTY ACID CONTENT.

Application filed March 5, 1923, Serial No. 623,069, and in Great Britain May 5, 1922.

This invention relates to the treatment of oils and fats for the neutralization and removal of the whole or any required proportion of their fatty acid content. The invention is particularly applicable to the production of edible oils and fats, but its use is not limited thereto. Oils as delivered from the crushers always contain a percentage of fatty acids, and before they can be sold as edible oils and fats, this fatty acid content must be eliminated. Hitherto the usual method of attaining this result has been to add caustic soda in substantial excess of the amount theoretically required for saponification of the fatty acids and to boil the oil, when the saponified product which is formed sinks to the bottom. The separation however is not complete, some of the neutral fats being contaminated with the soap, so that a proportion of the neutral fat also has to be taken out for use as soap stock. Further, in order to complete the removal of the fatty acids so much caustic alkali must be added that about as much of the neutral fat is saponified as the amount of fatty acid present, and this represents a substantial loss of oil. It is therefore a desideratum to provide a process whereby only about so much alkali need be used as is required to saponify the free fatty acid, and whereby none or but very little of the neutral fat is saponified or contaminated. It is the principal object of the invention to attain this result.

The desired result is attained according to the invention by bringing the oil and alkali into extremely intimate contact by passing them through a high speed centrifugal pinned disc mill and then separating out the saponified product formed. Very little if any excess of alkali need be used, and practically none of the neutral fat is saponified.

The preferred type of mill for intimately mixing the oil and alkali for the purposes of the present invention is that set forth in my Patent No. 1,515,798, dated November 18, 1924. In this mill the discharge from the rotating pinned disc is free to take place substantially all around the circumference of the mill, the discharged product being received in a suitable surrounding vessel or hopper. The rotating disc can be run up to a speed of about 20,000 feet per minute at the circumference of the disc, and at such speeds the oil and alkali passing through the mill are broken up and intermixed so finely that the reaction between the alkali and the fatty acid is almost instantaneous. There is no risk of overheating although the mechanical action is a violent one because the mill draws in a strong current of air which passes through with the oil and alkali mixture, and if the receiving chamber around the open discharge of the mill were left open at the top, the air around would be filled with a mist or spray of finely divided particles. The receiving chamber is of course enclosed with suitable means for permitting of escape of air and separation of the oil spray therefrom.

Instead of caustic soda for the saponifying process I can use soda ash (Na_2CO_3) or other forms of alkali, and this represents a substantial economy in raw materials.

The process is applicable to the removal of fatty acids from animal oils such as whale oil, and from vegetable oils such as cotton seed oil, palm kernel oil, cocoanut oil, soya bean oil and so forth. An incidental advantage of the process is that the oil is substantially deodorized in passing through the mill, this effect being probably due to the fine subdivision effected coupled with the intimate mixture with the strong air current which carries off the volatile scented essences.

In addition to the use of the process for producing edible oils and fats, it is applicable also for raising the qrality of oils by the partial neutralization and removal of their fatty acid content. For example, a low quality whale oil may contain about 10 to 15% fatty acid, and if this could be reduced to say 3% or less by simple and rapid operations, it would greatly enhance the value of the oil. The same would apply to other oils, vegetable oils and so forth. This result is attained according to the invention by adding to the oil rather less of the alkali, preferably soda ash, than that required for complete saponification, before the treatment in the pinned disc mill, and then separating out by any suitable method the soap stock formed by the treatment in the pinned disc mill. Separation may be effected by passing through a sieve or a filter or by decantation of the oil. The process has the great advantage that the ash content of the crude whale oil is largely removed in the saponification and subsequent separation.

One suitable form of apparatus for carrying out the present invention is illustrated

in Fig. 1 of the annexed drawing; and Fig. 2 is a half elevation of a mill with the open discharge ring which I prefer to use in my process disclosed herein and which is covered by my said Patent No. 1,515,798.

Referring to Figure 2, *a* represents the shell or standard of the mill in which the driving gear is contained. At the top of this shell is a plate *y* secured by screws *c* and whose circumference constitutes the delivery ring *b*. The rotating disc *d* of the mill is secured to the driven vertical shaft which is carried in ball bearings in a suitable manner in the plate *y*, as indicated by way of example. The stationary top disc *e* is supported by a number of lugs *f*, four in the example shown, on the delivery ring *b*, and is secured by screws *g* engaging in these lugs. The bottom disc *b* which rotates has concentric rows of upwardly projecting pins upon it, while the top disc *e* which is stationary has similar concentric rows of pins intercalating with those on the disc *d*. Hitherto, in pinned disc mills, the lower disc which rotates, has always carried the outermost row of pins, this being essential in the case of mills with a tangential discharge in order to insure the throwing out of the ground materials through such discharge. A feature of my disintegrating mill is that it enables me to apply an additional annular row of pins *z* to the upper fixed disc *e*, outside the last row of pins on the lower disc *d*, and so to improve the efficiency of the mill. I find that with the addition of this row of pins *z*, the material is ground to a greater degree of fineness in one passage through the mill, without the consumption of appreciably more power, and without any risk of choking the mill owing to the open circumferential discharge. The current of air which the rotation of the lower disc induces through the mill is quite sufficient to insure that the material is blown cleanly through the additional outermost row of stationary pins. *h* is a feed hopper at the centre of the top disc for delivering the materials to be treated on to the surface of the rotating disc *d*.

It will be realized that with this construction practically the whole circumference of the annular gap between the pinned discs is open, the lugs *f* being the only obstruction, and as these are of small dimensions in fact no materials can accumulate against them so as to cause any blocking of the discharge. For practical purposes therefore the whole of the discharge area is directly open so that the materials can be thrown out from the circumference of the revolving disc without collecting anywhere inside of the mill.

As an example of the removal of free fatty acid from oils the following may be given: A certain whale oil contains 10.3% of fatty acid which it is desired to remove as far as possible. A solution is made containing 4.3 parts by weight of soda ash dissolved in 28 parts by weight of water, and this and 224 parts by weight of the whale oil to be treated are run simultaneously from the tank *a* to the inlet hoppers *b*, *c* of two pinned disc mills *d*, *e*. The majority of the free fatty acid in the whale oil is saponified and the amount of free fatty acid is reduced down to 0.5% on a single passage through the mills. The products are discharged into the casings *f*, *g* of the mills and run down the chutes *h*, *k* into the tank *l* and the saponified product separated out by any suitable method as already mentioned. The oil may be run out through the pipes *m*, *n*. Substantially none of the neutral fat in the whale oil will have been attacked by soda ash in the treatment.

The oil to be treated may be passed through the mill in a cold condition or it may be preheated if desired, but it need not be heated in any case to a temperature nearly as high as the boiling point of the oil, and the reaction can be completed without any heating of the oil.

Many variations in the practical details of the application of the process can be made without departing from the scope of the invention, and of course the oil and alkali may be passed more than once through the pinned disc mills before the separation of the soap stock. For this purpose, a circulating pump *o* is shown for raising the liquid from the tank *l* so that it flows again into the tank *a* at *p*.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. The process of preparing a neutral oil substantially free from fatty acid, which consists in treating animal and vegetable oils containing free fatty acid and substantially only the amount of alkali required for neutralization of the fatty acid thereof to combined high speed mechanical disintegration and centrifugal expulsive force, whereby the alkali combines with the free fatty acid content of the oil and simultaneously saponifies it, and then separating the substantially neutral oil from the soap stock formed.

2. The process for preparing a neutral oil substantially free from fatty acid, which consists in treating animal and vegetable oils containing free fatty acid, with a solution of soda ash substantially only sufficient in amount for neutralization of the fatty acid content thereof, subjecting the mixture to combined high speed mechanical disintegration and centrifugal expulsive force, whereby the soda ash combines with said free fatty acid content of the oil and saponifies it, and then separating the substantially neutral oil from the soap stock formed.

3. The process for preparing a neutral oil substantially free from fatty acid which consists in treating animal and vegetable oils containing free fatty acid, with a solution of soda ash substantially only sufficient in amount for neutralization of the fatty acid content thereof, subjecting the mixture to combined high speed mechanical disintegration and centrifugal expulsive force, between agitating and disintegrating members having a relative peripheral speed up to 20,000 feet per minute, whereby the soda ash combines with said free fatty acid content of the oil and saponifies it, and then separating the remaining oil from the soap stock formed.

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