July 15, 1941. G. F. WHEELWRIGHT, JR 2,249,263

APPARATUS FOR TREATING OILS

Filed Sept. 20, 1937

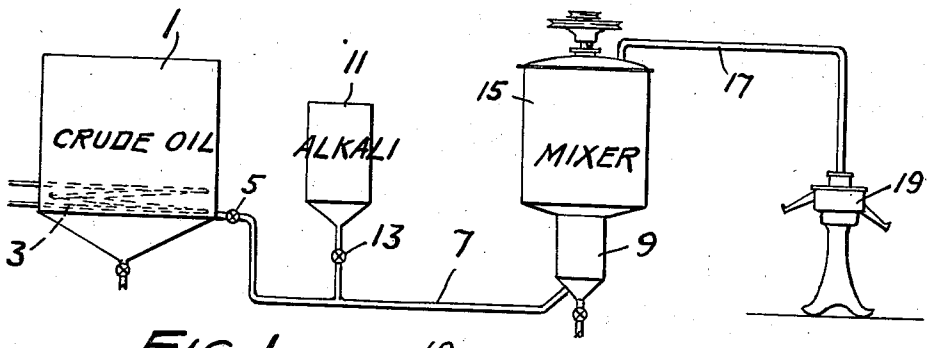

FIG. 1.

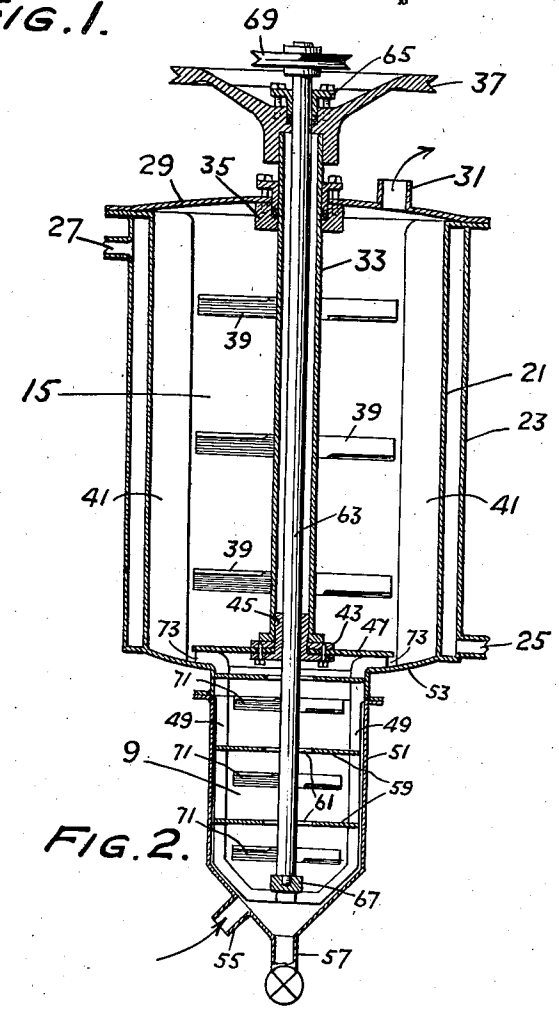

FIG. 2.

WITNESS:
Robt. R. Mitchell

INVENTOR
George Frederick Wheelwright, Jr.
BY
Busser & Harding.
ATTORNEYS.

Patented July 15, 1941 2,249,263

UNITED STATES PATENT OFFICE

2,249,263

APPARATUS FOR TREATING OILS

George Frederick Wheelwright, Jr., Westfield, N. J., assignor to The De Laval Separator Company, New York, N. Y., a corporation of New Jersey

Application September 20, 1937, Serial No. 164,659

3 Claims. (Cl. 259—6)

This invention is directed to an improved process and apparatus for treating oils, particularly animal and/or vegetable oils containing free fatty acids.

Vegetable, and occasionally animal, oils containing free fatty acids are customarily refined by intimately mixing the crude oil with a saponifying agent, usually an alkali, as, for example, caustic soda, and then separating the oil from the soaps by settling or centrifugation. The oil is ordinarily heated to temperatures which vary with the duration of the treatment and the character of the oil, and such heating has been carried out at various stages in the course of treatment. Ordinarily this refining process has been practiced largely in batch, but it has been proposed to utilize continuous refining processes.

The present invention involves an improved process for the refining of these oils in which the crude oil, warmed if necessary to give it proper fluidity, and alkali solution, in proper proportion, are passed continuously to a zone in which they are intimately admixed, preferably by positive and relatively violent mechanical agitation, from which zone the intimate mixture flows continuously to a second zone in which it is heated to the desired temperature while being gently agitated, and is then continuously discharged to a centrifugal separator in which refined oil is separated from the soaps formed.

The present invention likewise involves, from the apparatus standpoint, the means for carrying out the process described and, in particular, a novel type of two-speed agitator in which the continuously flowing mixture of oil and acid is subjected to the two types of agitation described above.

In accordance with the present invention the oil and alkali are first continuously intimately admixed by rather violent agitation at, preferably, a relatively low temperature, so that there may be rapid and complete reaction between the alkali and free fatty acids, but as little saponification of the neutral oil as possible. The mixture is then continuously heated to a temperature, ranging from about 80° F. to about 140° F., which will cause a more or less complete deemulsification of the oil and alkali solution and facilitate the subsequent separation, but the mixture being heated is nevertheless subjected to positive, though gentle, agitation, which serves to insure completion of the reaction and to prevent premature sedimentation or separation. Thus a continuous, and so economically advantageous, process for refining these oils is made to give substantially optimum results.

Figure 1 of the accompanying drawing illustrates in diagrammatic form apparatus for carrying out this improved process; and Figure 2 is a vertical section through the two-speed agitator used in preference in carrying out the process.

Referring to Fig. 1, crude oil from tank 1 (warmed, if desired, to give it proper fluidity by means of the steam coil 3) flows through valve 5 into the conduit 7 and so into the lower chamber 9 of the mixer. From tank 11 a solution of caustic soda, or other alkali or saponifying agent, flows through valve 13 into conduit 7, where it mingles with the oil.

Any suitable proportioning device adapted to insure a uniform ratio of oil feed to alkali feed may be used, but this is well known and forms no part of the invention, and I have merely shown the two valves 5 and 13 which may be hand regulated to govern the proportioning.

In the lower chamber 9 of the mixer the oil and alkali are subjected to intense agitation by means which will be described in detail below, and from this chamber the intimate mixture formed passes to the upper chamber 15 in which it is heated to a temperature of, for example 80° F.–140° F., and is subjected to gentle agitation, as will be described in more detail hereinafter. From the chamber 15 the mixture of oil, soap and alkali passes through conduit 17 to a centrifugal separator 19 in which the refined oil is separated from the soap and any residual alkali. The refined oil, if not sufficiently soap and alkali free, may be given a water wash and a second centrifugal separation by the addition of conventional pieces of equipment.

If desired, although I consider it less preferable, the crude oil may be heated in tank 1 to the desired temperature of 80° F.–140° F. and the mixture of oil and alkali cooled, rather than heated, in the upper chamber 15. Or it may prove desirable to introduce a cooling unit in conduit 17 between chamber 15 and separator 19, in which the mixture is cooled to a temperature which will minimize the solubility of soaps in the oil.

Fig. 2 illustrates in detail the construction and operation of the mixer shown diagrammatically in Fig. 1. As indicated, the mixer comprises a lower chamber 9 and an upper chamber 15. The upper chamber 15 has a cylindrical inner wall 21 and outer wall 23, between which heating or cooling fluid is circulated, entering through the inlet 25 and escaping through outlet 27. The

chamber 15 is closed at the top by a cover 29 welded or otherwise secured to the wall 21 and provided with an outlet 31 through which liquid may leave the chamber 15. A hollow vertical shaft 33 passes through a stuffing box 35 centrally positioned in the cover 29 and is provided at its outer end with a driving pulley 37. Secured to the shaft 33 within the chamber 15 are a plurality of paddles 39, which, in cooperation with vertical wing baffles 41 secured to the inner side of the wall 21, serve on rotation of shaft 33 to impart a gentle agitation to the contents of chamber 15 and deflect the flowing liquid toward the center of the chamber. The lower end of shaft 33 is guided and supported by the bearing members 43 and 45 secured to circular plate 47 which also serves to substantially close the bottom of chamber 15.

Plate 47 rests upon and is secured to a pair of U-shaped frame members 49 which extend downwardly into the lower chamber 9, the outer wall 51 of which is welded or otherwise secured to an extension 53 of the inner wall 21 of chamber 15. Chamber 9 is provided with a fluid inlet 55 and a valved outlet 57 used for draining sediment from the mixer.

Positioned within chamber 9 and secured in place in the frame members 49 are a plurality of annular plate baffles 59 provided with central openings 61. A shaft 63 passes through the interior of the hollow shaft 33 and enters chamber 9, being guided at its upper end by stuffing box 65 secured in pulley 37, intermediately by bearing member 45 and at its lower end by bearing block 67 secured to the frame members 49. A driving pulley 69 is secured to the upper end of shaft 63 and a plurality of paddles 71 to its lower end within chamber 9, the paddles operating between the baffles 59 and co-acting with them to violently agitate the contents of chamber 9.

In operation the oil and alkali solution flow through inlet 55 into the lower chamber 9 and are there violently agitated and intimately admixed by the paddles 71 which are driven at a high rate of speed through shaft 63 and pulley 69. The mixture flows upwardly through the openings 61 in the baffles 59 and is each time beaten thoroughly by the paddles 71. The mixture then escapes from chamber 9 through clearance 73 into chamber 15, where it is gently agitated and moved inwardly by the action of the paddles 39 and baffles 41. Paddles 39 are rotated slowly through shaft 33 and pulley 37. As the mixture passes slowly through chamber 15 it is heated by means of steam or other heating fluid circulated in the space between walls 21 and 23. The mixture heated to the temperature which will best promote separation in the centrifugal separator then passes out of the mixer through outlet 31.

It will be understood that the details hereinbefore set forth are merely illustrative of my invention and may be readily modified, and that accordingly they are in no way in limitation of the invention as herein broadly described and claimed.

What I claim and desire to protect by Letters Patent is:

1. In apparatus for the continuous refining of vegetable and animal oils, a mixer comprising a first chamber, a plurality of vertically spaced horizontal plate baffles provided with central openings positioned therein, an agitator provided with rotatable paddles extending between said plate baffles positioned in said chamber, a second chamber in communication with said first chamber, means positioned in said second chamber for agitating the contents thereof, and means for varying the temperature of the contents of said second chamber.

2. In apparatus for the continuous refining of vegetable and animal oils, a mixer comprising a first chamber, means positioned in said chamber for agitating the contents thereof, a second chamber in communication with said first chamber, a plurality of vertically disposed wing baffles secured to the inner wall of said second chamber, rotatable paddles positioned in said second chamber, and means for varying the temperature of the contents of said second chamber.

3. In apparatus for the continuous refining of vegetable and animal oils, a mixer comprising a first chamber, a plurality of vertically spaced horizontal plate baffles provided with central openings positioned therein, an agitator provided with rotatable paddles extending between said plate baffles positioned in said chamber, a second chamber in communication with said first chamber, a plurality of vertically disposed wing baffles secured to the inner wall of said second chamber, rotatable paddles positioned in said second chamber, and means for varying the temperature of the contents of said second chamber.

GEORGE FREDERICK WHEELWRIGHT, JR.