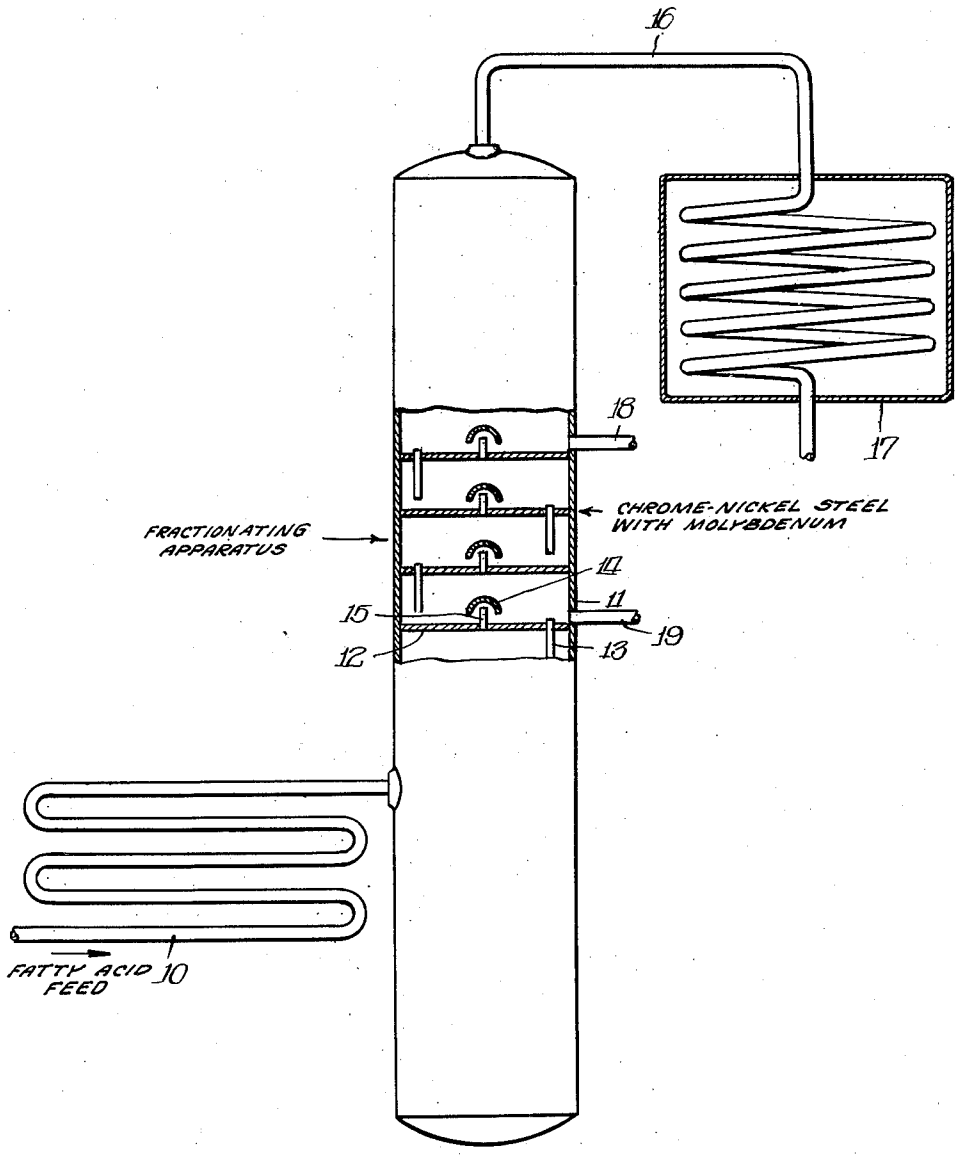
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PROCESS OF FRACTIONATING FATTY ACIDS

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PROCESS OF FRACTIONATING FATTY ACIDS

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2 Claims. (Cl. 202—57)

The present invention relates to the fractionation of a mixture of fatty acids such as are obtained by the hydrolysis of animal, vegetable and marine oils and refers in particular to an improved fractionating and distilling apparatus and the metallic composition of which it is constructed. This application is a continuation in part of our copending application Serial No. 96,732, filed August 19, 1936.

Heretofore considerable difficulty has been encountered in providing fatty acid distillation equipment which will withstand the corrosive action of the acids at the elevated temperatures involved. This difficulty is particularly apparent in the case of fractionation where side streams of liquid fatty acids are removed. If corrosion has occurred, its products in the form of metallic compounds pass off in and contaminate the liquid side streams.

A principal object of the present invention is the provision of distillation equipment including a fractionating tower composed of a metal which will withstand the disintegrating action of fatty acids of high molecular weight at temperatures involved in fractionation.

An additional object is the provision of a fatty acid fractionating column composed of an alloy of ferrous metal and molybdenum, the fractionating apparatus being able to withstand the action of the fatty acids for indefinite periods without contaminating the acids or becoming weakened or destroyed by the acids.

These and other objects will become apparent upon a consideration of the following description and with reference to the accompanying drawing in which the single figure represents, somewhat diagrammaticaly, apparatus constructed in accordance with the present invention.

As shown in the drawing the coil indicated at 10 represents a still for continuous distillation of fatty acids and may be of any suitable construction such as described in the aforesaid copending application or of the pipe still type where the coils are directly exposed to the action of the combustion gases.

In the fractionation of fatty acids the feed stock generally comprises a mixture of fatty acids and there usually is present some neutral oil. The entire mixture is heated to a temperature above that at which the acids will distill at reduced pressure and from the heater 10 the mixture is flashed into a fractionating column indicated at 11. This temperature may be of the order of 450° F. In the column 11 the unvaporized portions of the fatty acid mixture flow downwardly toward the bottom of the column and the vaporized portions of the mixture pass upwardly in a countercurrent manner with respect to a descending reflux liquid composed of condensed portions of the vapors passing from the top of the tower.

The heat exchange between the vapor and liquid is obtained by a series of bubble plates 12 having overflow pipes 13 which transfer the descending liquid from one plate to the next lower plate and the bubble caps 14 which direct gases passing upwardly through the vapor pipes 15 into the body of reflux liquid flowing across the plate.

From the top of the column the vapors pass off through the outlet 16 and are liquefied in condenser 17, a portion then being returned as reflux liquid.

In the fractionating column the chemical nature of the products on any particular plate will depend upon the position of the plate in the column. That is, plates in the upper portion of the column are richer in relatively low boiling point fatty acids, while the lower plates are richer in relatively high boiling point fatty acids. Thus, side streams of liquid fatty acids of differing composition may be withdrawn through intermediate lines 18 and 19.

An unusual amount of heat is required for the repeated distillation of the fatty acid vapors in the fractionating process. The fatty acid vapors under the conditions described have a particularly deleterious or corrosive tendency with respect to the metallic structure composing the fractionating column. The usual corrosion-resisting metals such as stainless steel of the 18% chromium and 8% nickel type, copper and Monel metal are attacked by the fatty acids at the elevated temperatures involved. The bubble caps of the fractionating column are particularly susceptible to deterioration under the influence of the fatty acid vapors. As the vapors pass upwardly through the restricted vapor outlets 15 they impinge upon the under side of the bubble caps at a high velocity and the action of the vapors is particularly corrosive under these conditions. Products of the corrosive action remain in the fatty acids and contaminate the liquid side streams which are withdrawn.

We have found that the disintegrating action of the vapors may be prevented by combining with the chrome-nickel steel a small quantity of molybdenum. The resulting alloy may be used for extended periods without breaking down under the influence of the fatty acid vapors. In a preferred embodiment of the invention a stain-

less steel containing iron, about 18% chromium and 8% nickel is alloyed with about 3% molybdenum. The quantity of chromium and nickel in steels of the "chrome-nickel" type varies in accordance with established formulae. For example, some steels of this type contain 19% chromium and 9% nickel, while others contain 24% chromium and 12% nickel. Molybdenum imparts to all steels of this type a resistance to corrosion by fatty acids at the elevated temperatures of distillation and fractionation which permits the withdrawal of liquid side streams uncontaminated by metallic products of corrosion, and makes possible continuous operation of the distillation and fractionation equipment for extended periods without replacement of parts or repairs due to corrosion.

Apparently, the resistance of the molybdenum chrome-nickel steel alloy to the fatty acids is due to an affinity on the part of the molybdenum for oxygen which results in the formation of a molecular film of oxide on the metal, this oxide providing a protective coat which prevents attack of the metal by the fatty acids. Unsaturated fatty acid vapors have a pronounced reducing effect under the conditions of the fractionating process, but it appears that the action of the molybdenum is such as to produce a protective effect even in the presence of this reducing tendency on the part of the fatty acids.

The alloy from which the fractionating column is constructed may contain molybdenum in somewhat varying quantities. In steels of the particular type specified herein the quantity of the molybdenum employed in the alloy preferably is about between 2% and 4%. The particular quantity utilized will depend upon such factors as the chemical and physical nature of the ferrous alloy with which it is utilized. Thus for metal which is particularly susceptible to the destructive effect of the fatty acids it will be desirable to utilize a larger quantity of molybdenum than in the case of metals having more resistance to the fatty acid vapors.

The various changes which may be made in the invention as described herein without departing from the scope thereof are intended to be included in the appended claims.

We claim:

1. The process of producing relatively pure fatty acid products, which comprises subjecting a mixture of fatty acids to distillation to produce a vaporous mixture thereof, and separating said mixture into component fractions of different boiling points by rectification in an enclosure composed of a steel alloy containing substantially 18 per cent chromium, 8 per cent nickel and 2 to 4 per cent molybdenum.

2. The process of producing relatively pure fatty acid products, which comprises subjecting a mixture of fatty acids to distillation to produce a vaporous mixture thereof, and separating said mixture into volatile fractions of different boiling points by fractional distillation through a series of spaced contact zones formed from a steel alloy containing substantially 18 per cent chromium, 8 per cent nickel and 2 to 4 per cent molybdenum.

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