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PROCESS OF HYDROGENATING OILY MATERIAL.

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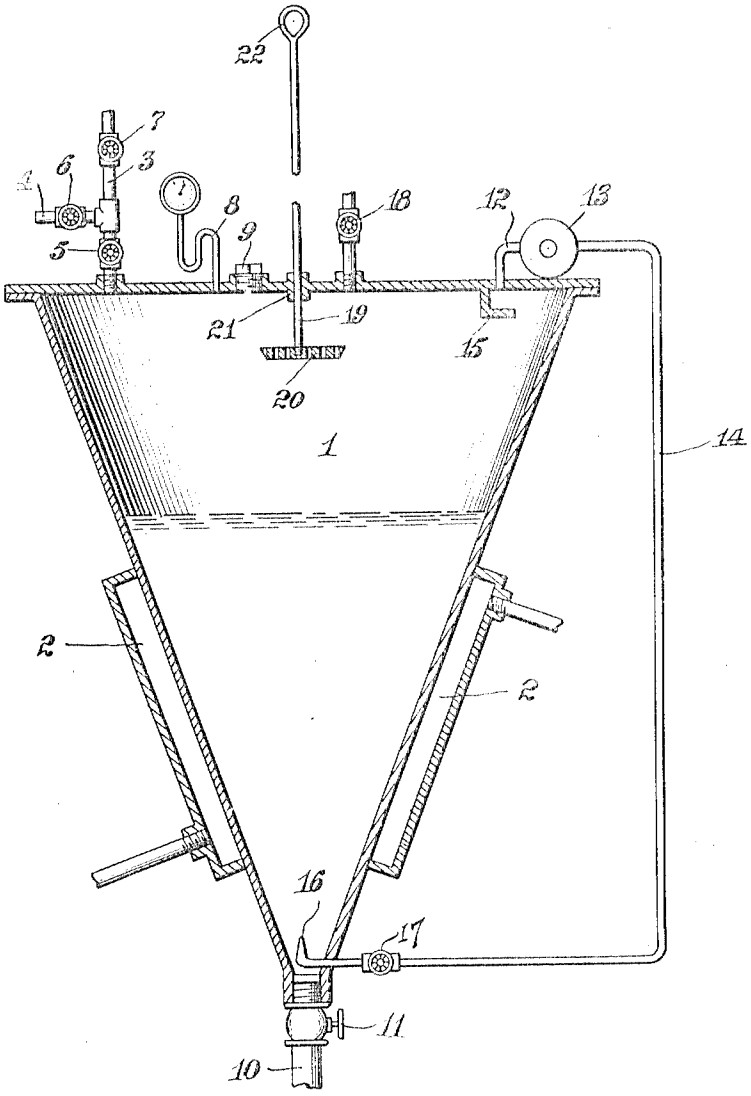

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Application filed July 23, 1912. Serial No. 711,039.

To all whom it may concern:

Be it known that I, CARLETON ELLIS, a citizen of the United States, and a resident of Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Processes of Hydrogenating Oily Material, of which the following is a specification.

This invention relates to a process of hydrogenating oils and relates in particular to a method of treating oils and similar fatty materials containing unsaturated bodies with hydrogen or a hydrogen-containing gas in the presence of a catalyzer under conditions lending to the retention of activity by the catalyzer for a protracted and indefinite period. To this end I pass a strong current of hydrogen or other suitable gas through a body or pool of oleic acid or other oily material such as various animal and vegetable oils and fats in the presence of a catalyzer and remove the hydrogen or other gas from the surface of the pool at a very rapid rate so as to maintain above the pool a gaseous atmosphere preferably slightly under ordinary atmospheric pressure; and I so ordain the process that the oily material may be removed from the seat of the reaction without withdrawal of the catalyzer. Thereby I am enabled to suitably saturate the oily material with hydrogen without the occurrence of undesirable side reactions such as the formation of lactones or similar bodies which have a tendency to form in some oils when using high gaseous pressures. Furthermore the tendency to form steam and thus contaminate the hydrogen as well as tending to decrease the activity of certain catalyzers is diminished by operation without pressure; any pressure employed to drive the hydrogen through the oil being immaterial.

The accompanying diagrammatic drawing shows a vertical sectional view of an apparatus suitable for carrying out the process of the present invention.

In the drawing 1 is a tank, of a more or less conical shape, having the heating jacket 2. The inlet pipes 3 and 4 serve for the admission of supplies of oil and hydrogen respectively.

5, 6 and 7 are valves.

8 is a pressure gage and 9 a plug-closed aperture which may be used for the introduction of catalyzer.

10 is an oil outlet provided with the valve 11. A pipe 12 extends from the top of the tank to the pump 13, the discharge outlet of the latter communicating by the pipe 14 with the nozzle 16. The pipe 14 is provided with the valve 17.

15 is a baffle placed just beneath the outlet to the pipe 12.

18 is an exhaust pipe or blow-off.

19 is a rod or stem carrying a filter plate or disk 20. This stem is movable vertically in or through the stuffing box 21.

22 is a loop or handle.

The operation of the process with this illustrative apparatus is as follows: Oil is run into the tank by the pipe 3 until the tank is about two-thirds filled therewith (thus leaving an ample collecting space for the gas), and the valve 7 is closed. Hydrogen or hydrogen-containing gas is introduced by the pipe 4, the pump 13 put in motion and the exhaust valve 18 opened to blow or flush out all the air which may be present in the apparatus. The exhaust valve 18 is then closed, the plug 9 removed and catalyzer introduced. The plug 9 is then replaced. Meanwhile superheated steam is passed through the heating jacket 2 to heat the oil to the temperature best suited for the reaction. This for nickel catalyzers is usually between 150° C. and 200° C. At this stage the porous plate 20 is kept at a point near the top of the tank. By the operation of the pump 13 hydrogen is withdrawn from the collecting space in the top of the tank and introduced at the bottom, from that point bubbling freely through the pool of heated oil and catalyzer. The unabsorbed hydrogen thus travels in a cyclic path in which the oil-pool is interposed. Fresh supplies of hydrogen are admitted as required, to replace the portions absorbed. In the space above the oil-pool a vacuum

represented by about one millimeter of mercury preferably is maintained.

When the oil has been hydrogenated to the degree desired, the stem 19 is pushed downward until the filter disk 20 registers nicely with the walls of the tank just above the nozzle 16. The pump is stopped and the valve 11 opened. The valve 6 also is opened to allow hydrogen to flow in as the oil discharges. The catalyzer collects in the main on the filter disk and thus remains in the tank out of contact with air. A fresh supply of oil is now introduced and the stem 19 is moved up and down rapidly for a few times to wash off the catalyzer adhering to the disk and the latter is then brought to rest in the upper part of the tank. The operation of hydrogenation is conducted as before, on the fresh supply of oil, and repetition of the operation may go on indefinitely without removal of any material amount of the catalyzer. Of course, as needed, fresh catalyzer may be added; or spent catalyzer drawn off and the tank washed out with oil. Although bubbling through the pool of oil a strong current of hydrogen, the rapid removal of the gas by the pump from the space above the oil eliminates the danger of accession of pressure and precludes the formation of undesirable lactones or similar bodies, reducing steam formation to a minimum and affording the catalyzer protracted activity. Retention of the catalyzer in the same receptacle obviates troublesome handling and liability of exposure to air and this also adds greatly to the longevity of the catalyzer material.

Suitable catalyzers for the purpose of the present invention are finely divided metals such as metallic nickel or nickel supported on a material of a more or less active character, such as charcoal which is capable of absorbing or occluding a considerable amount of hydrogen, and of transmitting it to the nickel or oil as the case may be.

This application is in part a continuation of my copending application Serial No. 695,206, filed May 4, 1912, which relates to the cyclic travel of a body of a hydrogen-containing gas through a body of oil, and specifically to the simultaneous tangential and lateral introduction of the gas within the body of oil.

To recapitulate; my invention relates to a process of hydrogenating oily material such as fatty material, containing unsaturated bodies which comprises or involves repeatedly, preferably continuously, bubbling a strong current of hydrogen or hydrogen-containing gas through a pool of said oily material carrying a catalyzer and maintained under thermal conditions adapted to the absorption of hydrogen, in collecting the unabsorbed portion of the gas in a space above said pool and out of essential or substantial contact with the oily material, in rapidly withdrawing the gas from said space to avoid accession of pressure in again and repeatedly bubbling said gas through said pool; whereby unsaturated bodies are saturated by absorption of hydrogen; and preferably in subsequently removing the oily product from the seat of said pool without substantial removal of said catalyzer.

What I claim is:—

1. The process of hydrogenating oily material containing unsaturated bodies which comprises repeatedly and continuously bubbling a strong current of hydrogen through a pool of said oily material carrying a catalyzer and maintained under thermal conditions adapted to the absorption of hydrogen, in collecting the unabsorbed portion of the hydrogen in a space above said pool and out of essential and substantial contact with the oily material, in rapidly withdrawing the gas from said space; whereby any substantial accession of pressure in said space is prevented; in again and repeatedly bubbling the hydrogen through said pool; whereby unsaturated bodies are saturated by absorption of hydrogen; and in subsequently removing the oily product from the seat of said pool without substantial removal of said catalyzer.

2. The process of hydrogenating oily material containing unsaturated bodies which comprises repeatedly bubbling a strong current of hydrogen-containing gas through a pool of said oily material carrying a catalyzer, in collecting the unabsorbed portion of the gas in a space above said pool and out of substantial contact with the oily material, in rapidly withdrawing the gas from said space; whereby any substantial accession of pressure in said space is prevented in again and repeatedly bubbling the body of gas through said pool; whereby unsaturated bodies are saturated by absorption of hydrogen; and in subsequently removing the oily product from the seat of said pool without substantial removal of said catalyzer.

3. The process of hydrogenating oily material containing unsaturated bodies which comprises repeatedly bubbling a strong current of a hydrogen-containing gas through a pool of said oily material carrying a catalyzer, in collecting the unabsorbed portion of the gas in a space above said pool and out of substantial contact with the oily material, in rapidly withdrawing the gas from said space, whereby any substantial accession of pressure in said space is prevented and in again bubbling the gas through said pool.

4. The process of hydrogenating oily material containing unsaturated bodies which comprises repeatedly bubbling a strong current of hydrogen through a pool of said oily material carrying a catalyzer and main-

tained under thermal conditions adapted to the absorption of hydrogen, in collecting the unabsorbed portion of the gas in a space above said pool and out of substantial contact with the oily material, in rapidly withdrawing the gas from said space; whereby any substantial accession of pressure in said space is prevented, and in again and repeatedly bubbling the gas through said pool.

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Witnesses:
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