

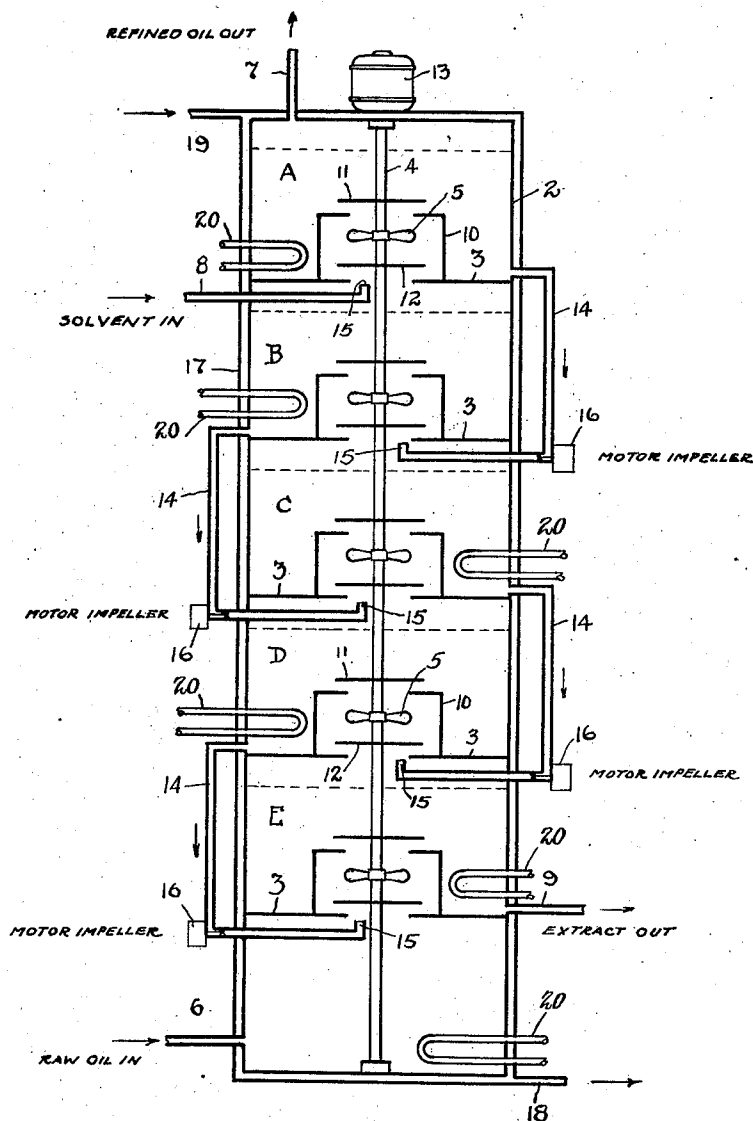
Aug. 31, 1937.

E. B. McCONNELL

2,091,645

APPARATUS FOR EXTRACTING PETROLEUM, ETC

Filed Nov. 16, 1934



INVENTOR.

Elliott B. McConnell

BY

Fay, Oberlin & Fay

ATTORNEYS

UNITED STATES PATENT OFFICE

2,091,645

APPARATUS FOR EXTRACTING PETROLEUM, ETC.

Elliott B. McConnell, Cleveland Heights, Ohio,
 assignor to The Standard Oil Company (Ohio),
 Cleveland, Ohio, a corporation of Ohio

Application November 16, 1934, Serial No. 753,338

10 Claims. (Cl. 196—46)

In the preparation of petroleum products, as lubricating oils, and kerosene, it has been a practice to extract undesirable matters from the petroleum by mixing with an extracting liquid and then allowing the liquids to separate to obtain the purified product. In accordance with the present invention, there is now provided an apparatus making possible the extraction of petroleum products and analogous materials, with expedition and thoroughness and a minimum of ground space.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described, and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail an illustrative embodiment of the invention, this being indicative however, of but one of the various ways in which the principle of the invention may be employed.

In said annexed drawing:—

The sole figure is a semi-schematic vertical sectional view of apparatus contemplated.

In general, this provides a series of compartments, for instance in the form of a tower 2, having partitions 3, each with an opening for communication, and through which a shaft 4 may extend so as to serve all compartments, A, B, C, D, etc., with agitating means, for instance impellers 5, which may desirably be pitched at an angle to provide a desirable rate of progression of the liquid toward the top. An inlet 6 for the oil or the like to be treated is provided near the bottom, and an outlet 7 for the refined product is located at the top. The treating liquid may be introduced through a feed inlet 8, preferably at the feed point of the last compartment of the series. An outlet 9 serves for the withdrawal of the extract or spent reagent.

By arranging the series of impellers 5 on the shaft at a corresponding point for each compartment, the feed or supply therefore is facilitated, as well as the mixing of the liquid components. Around each impeller a partial housing 10 may be arranged in order to facilitate the mixing action within, while above and exterior thereto a zone of quiescence and separation of the liquids can occur. The rate of feed is so maintained as to provide an inter-face between the separating liquids near the top of each compartment, the lighter liquid above, and the heavier below, and thus in rapid succession a quick mixing of the liquid components is brought about, and then a separating in the zone of quiescence. Baffles are desirably arranged in relation to the

opening through the partitions 3 and the opening through the upper part of the housings 10, and these may comprise baffles 11, 12, respectively, above and below each impeller, and for instance just above each opening. These baffles may be mounted in any convenient way as desired, and it is usually more convenient to mount them movably rather than stationarily, and in the form shown they are carried by the shaft 4. The shaft may be rotated by suitable means, for instance an electric motor at a convenient position, top or bottom as preferred, the motor 13 in the drawing being illustrated as on the top of the unit.

As indicated, the mixed liquids forwarded from the impeller housing 10 are allowed to separate and stratify in the compartments, and the heavier liquid which is routed generally countercurrently to the lighter liquid and travels from top to bottom of the tower, is facilitated in this movement by conduit means 14 leading from the lower part of each compartment to discharge into the feed of the compartment preceding or below, the conduit being conveniently directed as at 15 to the opening in the partition 3 and below the baffle 12. While in certain instances gravitational flow is adequate to forward the heavy liquid from compartment to compartment, preferably I incorporate in each conduit an impeller of convenient form, for instance a motor-impeller unit 16 at the entrance to the horizontal branch of conduit 14. If each impeller has its own separate motor control, the rate of drive thereof may be closely adjusted to suit the optimum feed conditions for each stage or succession of compartments.

The mode of operation of the apparatus will be understood from the foregoing. The liquid to be treated, for example a lubricating oil stock, is fed into the inlet 6, and the treating liquid, for example liquefied sulphur dioxide with or without an admixed organic oil-thinner, is fed in at the upper inlet 8, and the shaft 4 being in rotation, the liquids pass countercurrently through the tower, the purified oil being discharged at the top outlet 7, and the treating liquid being discharged at the lower outlet 9. In travel through the apparatus, the light or treated liquids, and the heavy or treating liquid, are churned together in thorough admixture in the impeller housing 10, and passing through the top thereof come into the zone of quiescence in the compartment, for instance compartment E, the liquids there separating and stratifying and maintaining an inter-face at the upper part of the compartment,

whence the heavier liquid or treating solvent proceeds down and out through the outlet 9, while the lighter liquid or oil proceeds on up through the impeller housing 10, heavier liquid from the compartment above, D, being simultaneously injected and admixed in the impeller housing. In the zone of quiescence in the compartment above, stratification again occurs, the heavier liquid settling down and outside the impeller housing 10 and being carried off by the conduit 14 to feed into the compartment below, while the light liquid or oil proceeds on up to the impeller housing, being mixed with the heavy liquid as brought down from the compartment above by the conduit 14, and so on through the series of compartments C, B, A, each providing in succession a thorough mixing of light and heavy liquid, and then a separation an a forwarding of each respectively in its own direction of travel.

In some instances, it is advantageous to apply heat-regulating or temperature-control means, as for instance a jacket 17 which may have inlet and outlet connections 18, 19, for supply of temperature-regulating liquids, as steam or other. This is of particular advantage for example where operating with lubricating stocks containing wax which is prone to deposit on the container surfaces. By maintaining the temperature of the apparatus at a sufficiently elevated point by means of the temperature-control however, difficulties from wax accumulation and deposit are wholly avoided. With individual temperature control coils 20 in each stage, a regulation of the conditions of each stage may also be had.

As readily apparent, particularly effective placement of successive mixing zones and zones of quiescence and separation is had, the number of such in series being as preferred in any given case, and at the same time the ground space requirement is very small.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. Apparatus for extracting petroleum, etc., which comprises a chamber having a series of compartments each with an inlet opening, means for mixing and impelling liquid therethrough, means for supplying a heavy liquid to the last compartment of the series, means for withdrawing the heavy liquid after it has traversed the series, means for supplying a light liquid to the first compartment of the series, means for withdrawing the light liquid after it has traversed the series, housings about selected compartment inlet openings for maintaining a zone of quiescence with separation of the liquids in part of each compartment, and a conduit for returning one separated liquid to the feed of the preceding compartment.

2. Apparatus for extracting petroleum, etc., which comprises a chamber having a series of compartments each with an inlet opening, means for regulating the temperature thereof, means for mixing and impelling liquid therethrough, means for supplying a heavy liquid to the last compartment of the series, means for supplying a light liquid to the first compartment of the series, means for withdrawing the light liquid after it has traversed the series, housings about selected compartment inlet openings for maintaining a zone of quiescence with separation of the liquids

in part of each compartment, and a conduit for returning one separated liquid to the feed of the preceding compartment.

3. Apparatus for extracting petroleum, etc., which comprises a chamber having a series of compartments each with an inlet opening, means for mixing and impelling liquid therethrough, means for supplying a heavy liquid to the last compartment of the series, means for withdrawing the heavy liquid after it has traversed the series, means for supplying a light liquid to the first compartment of the series, means for withdrawing the light liquid after it has traversed the series, an impeller near each inlet opening from one compartment to the next, a housing about each such impeller for maintaining a zone of quiescence with separation of the liquids in part of each compartment, a conduit for returning one separated liquid to the feed of the preceding compartment, and impelling means in each conduit.

4. Apparatus for extracting petroleum, etc., which comprises a chamber having a series of partitions each with an opening, a rotatable shaft extending through such openings and carrying an impeller near each partition, a horizontal baffle above and a housing around each impeller, a conduit from a space outside such housing to a point of discharge in the feed of the preceding impeller, connections respectively at opposite ends of said chamber for introducing respective liquids, and connections in counter-arrangement at opposite ends of said chamber for withdrawing the respective liquids.

5. Apparatus for extracting petroleum, etc., which comprises a chamber having a series of partitions each with an opening, means for regulating the temperature of said chamber, a rotatable shaft extending through such openings and carrying an impeller near each partition, a horizontal baffle above and a housing around each impeller, a conduit from a space outside such housing to a point of discharge in the feed of the preceding impeller, connections respectively at opposite ends of said chamber for introducing respective liquids, and connections in counter-arrangement at opposite ends of said chamber for withdrawing the respective liquids.

6. Apparatus for extracting petroleum, etc., which comprises a chamber having a series of partitions each with an opening, a rotatable shaft extending through such openings and carrying an impeller near each partition, a baffle below and above each impeller, a partial housing around each impeller, a conduit from a space outside such housing to a point of discharge in the feed of the preceding impeller, connections respectively at opposite ends of said chamber for introducing respective liquids, and connections in counter-arrangement at opposite ends of said chamber for withdrawing the respective liquids.

7. Apparatus for extracting petroleum, etc., which comprises a chamber having a series of partitions each with an opening, a rotatable shaft extending through such openings and carrying an impeller near each partition, a temperature-regulating jacket about said chamber, a partial housing around each impeller, a conduit from a space outside such housing to a point of discharge in the feed of the preceding impeller, connections respectively at opposite ends of said chamber for introducing respective liquids, and connections in counter-arrangement at opposite ends of said chamber for withdrawing the respective liquids.

8. Apparatus for extracting petroleum, etc.,

which comprises a chamber having a series of partitions each with an opening, a rotatable shaft extending through such openings and carrying an impeller near each partition, a partial housing around each impeller leaving an opening to the compartment, a baffle above such opening, another baffle below the impeller in the housing, a conduit from the space outside such housing to a point of discharge in the feed of the preceding impeller, connections respectively at opposite ends of said chamber for introducing respective liquids, and connections in counter-arrangement at opposite ends of said chamber for withdrawing the respective liquids.

9. Apparatus for extracting petroleum, etc., which comprises a chamber having a series of partitions each with an opening, a rotatable shaft extending through such openings and carrying an impeller near each partition, a partial housing around each impeller leaving an opening to the compartment, a baffle carried by said shaft above each impeller, a conduit from the space

outside such housing to a point of discharge in the feed of the preceding impeller, connections respectively at opposite ends of said chamber for introducing respective liquids, and connections in counter-arrangement at opposite ends of said chamber for withdrawing the respective liquids.

10. Apparatus for extracting petroleum, etc., which comprises a chamber having a series of partitions each with an opening, a rotatable shaft extending through such openings and carrying an impeller near each partition, a partial housing around each impeller leaving an opening to the compartment, baffles carried by said shaft respectively above and below each impeller, a conduit from the space outside such housing to a point of discharge in the feed of the preceding impeller, connections respectively at opposite ends of said chamber for introducing respective liquids, and connections in counter-arrangement at opposite ends of said chamber for withdrawing the respective liquids.

ELLIOTT B. McCONNELL.