Dec. 11, 1934. B. D. COMYN 1,984,057

APPARATUS FOR SEPARATING LIQUIDS

Filed Aug. 18, 1932 3 Sheets-Sheet 1

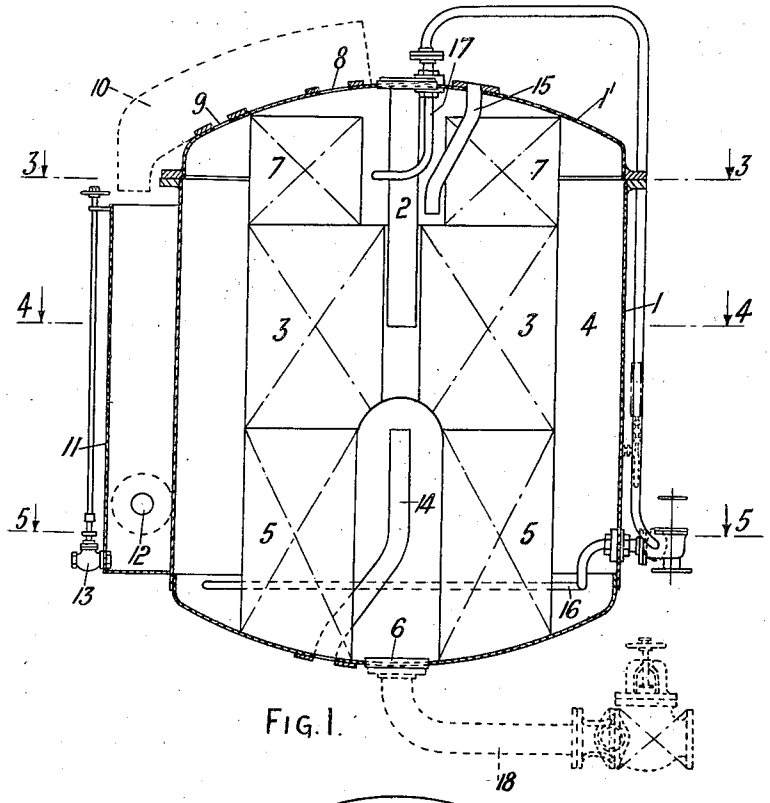


FIG. 1.

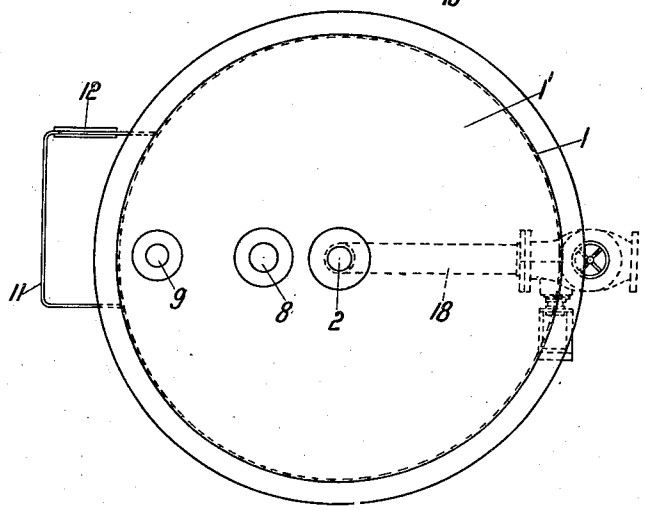


FIG. 2.

Inventor
Bernard Daly Comyn
By Pennie Davis Marvin & Edmonds
Attorneys

Dec. 11, 1934. B. D. COMYN 1,984,057

APPARATUS FOR SEPARATING LIQUIDS

Filed Aug. 18, 1932 3 Sheets-Sheet 2

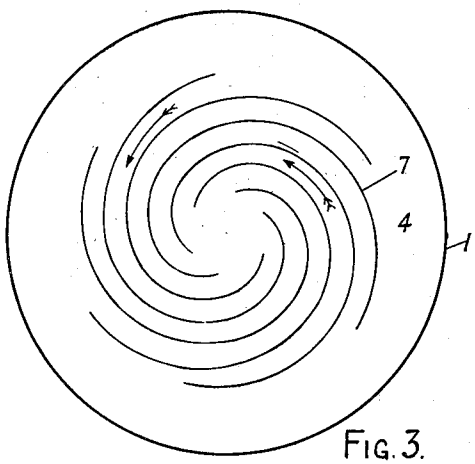


FIG. 3.

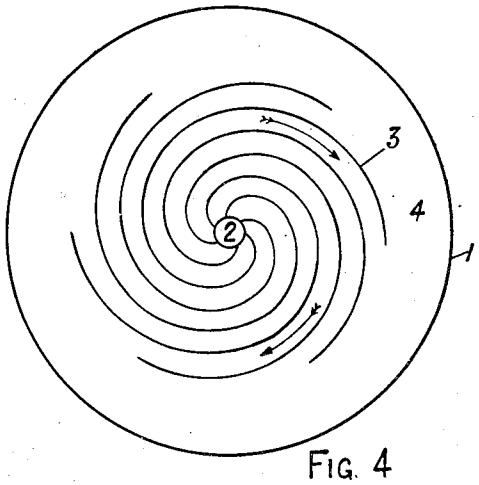


FIG. 4

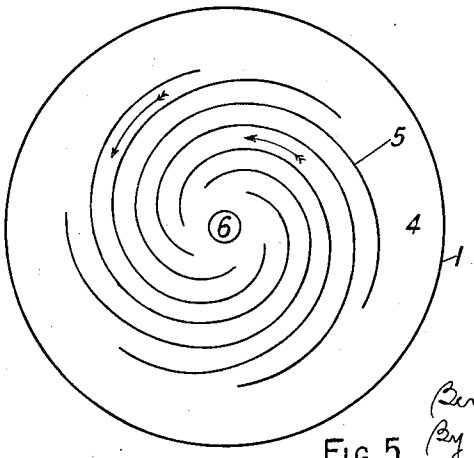


FIG. 5.

Inventor
Bernard Daly Comyn
By
Pennie Davis Marvin & Edmonds
Attorneys

Dec. 11, 1934. B. D. COMYN 1,984,057

APPARATUS FOR SEPARATING LIQUIDS

Filed Aug. 18, 1932 3 Sheets-Sheet 3

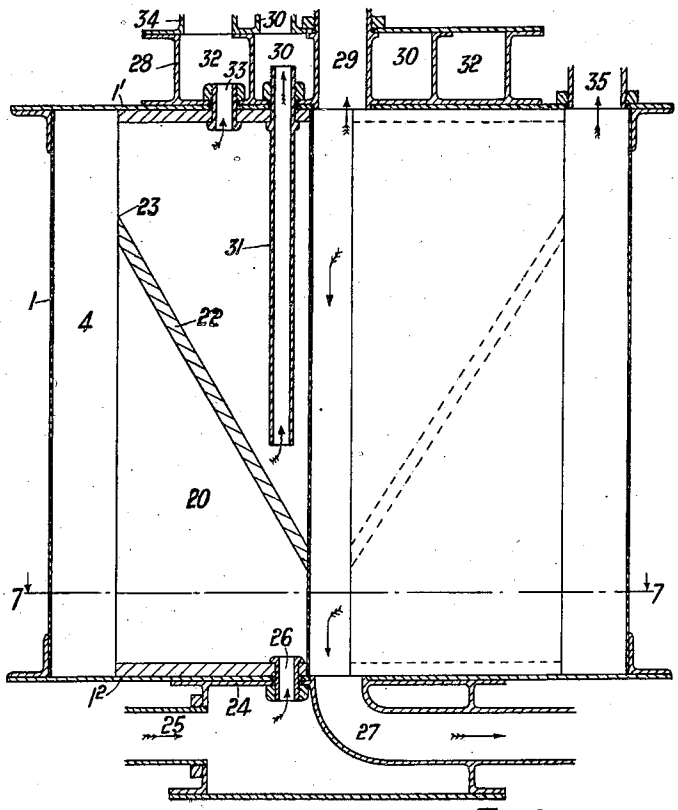


FIG. 6.

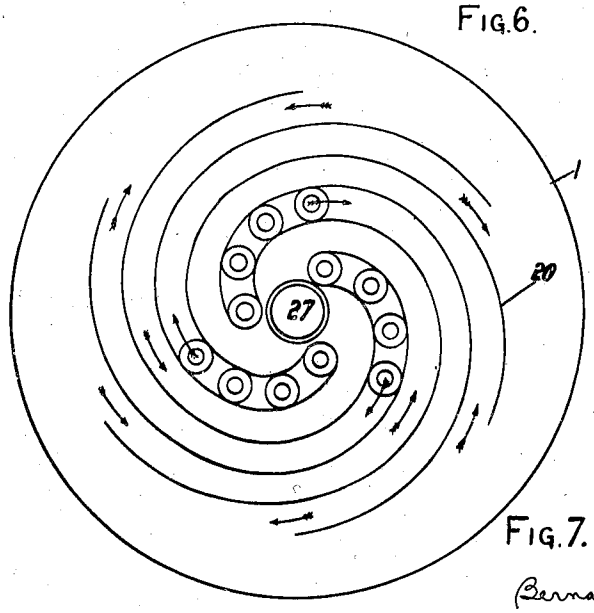


FIG. 7.

Inventor
Bernard Daly Comyn
By Dennie Davis Marvin & Edmonds
Attorneys

Patented Dec. 11, 1934 1,984,057

# UNITED STATES PATENT OFFICE

1,984,057

## APPARATUS FOR SEPARATING LIQUIDS

Bernard Daly Comyn, Glasgow, Scotland

Application August 18, 1932, Serial No. 629,340
In Great Britain August 25, 1931

1 Claim. (Cl. 210—58)

This invention relates to apparatus for separating the constituents of a mixture of liquids of unequal specific gravities, say a mixture of oil and water, and is a further development of that described in the specification of the prior U. S. Patent No. 1,707,077 dated March 26, 1929.

Apparatus to which the invention relates comprises a stationary container having an inlet or inlets for liquid mixture, and fixed spiral or like guides within the container extending from the centre to a surrounding outer chamber, whereby the liquid is caused to flow spirally clockwise or counter-clockwise free from eddies and surges through the spiral passage or passages defined by said guides.

As the speed of flow through the apparatus is a function of the power of the pump employed for pumping the liquid it becomes in certain cases important to guard against excessive speed of withdrawal of the separated constituents which may result in the setting up of eddies and turbulence and defeat the purpose served by this construction of separator.

In this connection it is to be kept in mind that considerations of space render it necessary to limit the diameter of the separator and that it is not always practicable to make the separator of a diameter, and therefore the length of the spiral passages bounded by the spiral guides, sufficient to preclude the setting up of eddies and ensure steadiness of the liquid.

I now find, contrary to expectation, that advantageous results are obtained when the liquid is caused to flow from the peripheral outer chamber inwards, to an outlet or outlets through the passage or passages formed by the spiral guide or guides within the container.

Preferably there are employed multiple spiral guides so as to afford multiple paths for the liquid.

The arrangement described may be combined with an arrangement such as described in the specification of the said prior patent; that is to say, liquid which has been caused to flow in a spiral path or paths from the centre of the container to an outer chamber may be caused to return towards the centre along a spiral path or paths of the same hand or of the opposite hand.

At least one of the constituents of the liquid mixture is returned to about the centre of the apparatus in a substantially spiral path either generally clockwise or counterclockwise.

Thus, I may tap the outer chamber aforesaid at one or more points and withdraw from these tapping points the aqueous constituent of the mixture, said aqueous constituent being thence led in a spiral path or paths to about the centre of the apparatus and thence withdrawn. Or I may return the two constituents along separate spiral passages or sets of passages to about the centre of the apparatus, whether the liquids flow in the same circular direction or in opposite directions.

I may locate the tapping points aforesaid in such relation to the exit ends of the spiral passages traversed by the mixture as are found by experiment to be in the regions of minimum disturbance or otherwise most suitable for the purpose.

When restriction of the axial length of the apparatus is not imperative, the return spiral guides may be arranged in a group or groups above or below or above and below the guides for liquid mixture.

Alternatively, certain spiral passages of a set of passages disposed side by side may serve for the flow of mixture from the centre of the apparatus to the periphery and other passages of said set may serve as return passages to the centre.

I prefer to use an arrangement of spiral guides such that the passages are of uniform horizontal cross-sectional area over a substantial distance from the circumference of a circle on which lie the outer edges of the spiral guides to the centre, so that the liquid flows towards the centre with the substantially uniform velocity.

In flowing out of the outer chamber the least possible disturbance is caused to the liquid in the chamber if the liquid is drawn from a number of equispaced points.

With such sub-division of the flow coupled with the provision for uniform rate of change of the direction of flow undue turbulence of the liquid and gulping at the outlets are prevented.

Apparatus constructed in accordance with the invention is illustrated in the accompanying drawings in which Fig. 1 is a vertical section, Fig. 2 a plan view, Figs. 3—5 horizontal sections on the lines 3—3, 4—4 and 5—5, respectively, of Fig. 1, Figs. 6 and 7 are a vertical section and a horizontal section on the line 7—7 of Fig. 6, respectively, showing a modified form of apparatus.

In the apparatus shown in Figs. 1–5 water and oil mixture entering a cylindrical container 1 by way of a central inlet pipe 2 flows spirally outwardly in multiple streams through spiral passages defined by spiral guides 3 into an annular chamber 4 from which the water constituent of the mixture flows spirally inwardly in multiple streams through similar passages defined by spiral guides 5 disposed below the guides 3 to an

outlet 6 and from which the oil constituent of the mixture flows spirally inwards in multiple streams through similar passages defined by spiral guides 7 disposed above the guides 3 for discharge through an outlet 8 in the cover 1' of the container.

9 denotes an oil outlet in the cover 1' above the chamber 4 and opening together with the outlet 8 into a conduit 10 which discharges into an oil sump 11 attached to the exterior of the container 1 and provided with an oil draw off connection 12 and with a drain valve 13.

14 denotes an internal oil drain pipe whose inner end communicates with the top of the water outlet space surrounded by the guides 5.

15 denotes an internal water drain pipe whose inner end communicates with the bottom of the oil outlet space surrounded by the guides 7.

16, 17 denote steam heating coils within the bottom of the chamber 4 and within the oil outlet space surrounded by the guides 7.

18 denotes a valved water discharge pipe connected to the outlet 6.

As indicated by the arrows in Figs. 3–5 the mixture flows in clockwise direction through the passages defined by the guides 3 and the water and oil flow in counter-clockwise direction through the passages defined by the guides 5 and 7, respectively, all the guides being of the same hand.

As will readily be understood, the chamber 4 being of comparatively large volume and being remote and screened from the inlet 2 and outlet 6, the liquid within the chamber 4 is subjected to minimum turbulence, resulting in efficient separation of the oil from the water within the chamber 4.

The modified apparatus shown in Figs. 6 and 7 comprises a set of spiral guides 20 housed within a container 1 and intersected by a conoidal partition 22 whose upper peripheral edge 23 terminates some distance below the cover 1' of the container 1.

Attached to the base $1^2$ of the container 1 is a box 24 provided with an inlet pipe 25 for mixture and communicating by way of nipples 26 with the origins of alternate spiral passages defined by the guides 20, said alternate spiral passages being closed at their inner ends while the complementary spiral passages are open at their inner ends to a water discharge passage 27 unitary with the box 24. Attached to the cover 1' is a box 28 presenting a central secondary oil outlet 29, an intermediate annular water compartment 30 connected to a submerged region by way of pipes 31 depending between the guides 20, the compartment 30 having an outlet 30', and an outer annular oil compartment 32 open to the region at the top of the guides 21 by way of nipples 32 and provided with a main oil outlet 34. 35 denotes another secondary oil outlet in the cover 1' above the annular chamber 4 surrounding the guides 20, 21.

In operation, the flow of liquid is as indicated by the arrows, liquid passing outwardly and inwardly between the guides 20.

By arranging and shaping the guides as shown in the drawings, each of the streams is confined at the bottom, and each stream is of uniform cross-sectional area.

I claim:—

Apparatus for separating the constituents of a mixture of liquids comprising a container presenting an outer chamber for reception of the mixture of liquids, a cover for said container, a plurality of substantially equi-spaced vertical spiral guides for causing the mixture of liquids to flow spirally in multiple streams from said outer chamber to the centre of said container, some at least of said guides extending to the cover of said container, an outlet in the cover of said container for the lighter constituent of the mixture, and a central outlet in the bottom of said container for the heavier constituent of the mixture.

BERNARD DALY COMYN.