Sept. 18, 1945. E. M. F. GUIGNARD 2,385,074

APPARATUS FOR CONTINUOUS FRACTIONAL DISTILLATION

Filed Aug. 30, 1941

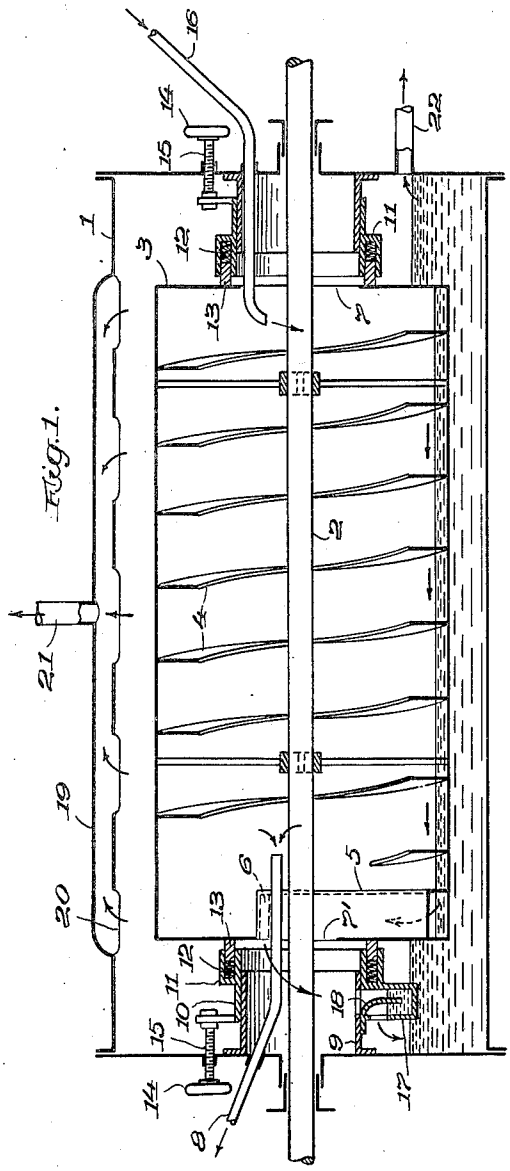


Fig. 1.

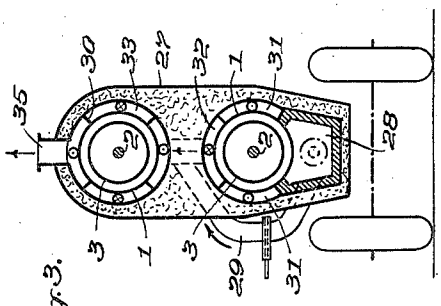


Fig. 3.

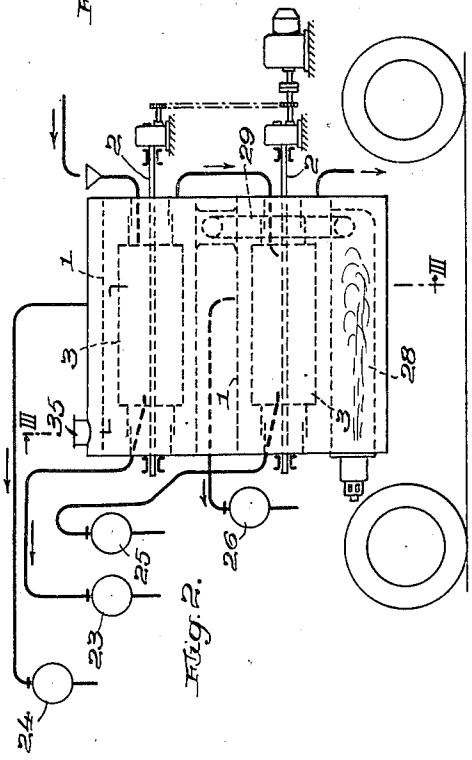


Fig. 2.

Inventor:

Edwin M. F. Guignard

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APPARATUS FOR CONTINUOUS FRACTIONAL DISTILLATION

Edwin M. F. Guignard, Berlin-Dahlem, Germany; vested in the Alien Property Custodian

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9 Claims. (Cl. 202—238)

This invention relates to apparatus for the continuous fractional distillation of liquids, more especially to apparatus of the type comprising a still and a rotatable helical vessel located in the still, the liquid to be distilled being conveyed through the helical vessel in one direction and then streaming backwards through the still in counter-current. One object of the invention is to separately withdraw the vapors developed in the helical vessel and in the still. Another object of the invention is to combine two or more of these apparatus so that more than two distillates can be withdrawn. A further object of the invention is to assemble one or more of such units including the heating means on a common truck so that the whole plant can be readily transported from one place to another.

The invention is illustrated, by way of example, in the annexed drawing, of which

Fig. 1 is a vertical longitudinal cross-section of a distilling apparatus constructed according to the invention;

Fig. 2 is a diagrammatical cross-sectional view showing two units including a burner arranged above one another on a common truck;

Fig. 3 is a vertical cross-section on the line III—III of Fig. 2.

In the still 1 a rotatable shaft 2 is journaled on which a cylinder 3 is mounted. A helical band or partition 4 of moderate width is attached to the inner wall of the cylinder 3. The liquid to be distilled is supplied by a pipe 16 conducted through an opening 7. It spreads on the bottom of the cylinder 3 and is conveyed by the rotation to the other end of this cylinder where its residue is raised by a horn-like pipe or vessel 5 to a point above the shaft 2. The inner end 6 of the horn 5 is open at its left side and pours the liquid into the cylinder 1. The vapors developed during the travel of the liquid through the cylinder 3 are withdrawn through a pipe 8 conducted through a central opening 7' in the front wall of the cylinder 3 and fixed in the front wall of the cylinder 1.

To obtain a tight joint between both ends of the cylinder 3 and the outer cylinder 1 sleeves 9 and 10 telescoping in each other are provided, of which the inner one 9 is fixed to the front walls of the still 1 whereas the outer one 10 is freely displaceable in horizontal direction and carries in an extension 11 a cast iron ring 13 pressed by springs 12 against the front walls of the cylinder 3. The outer ends of the sleeves 10 are kept by screw spindles 15 provided with handwheels 14. By turning these spindles the force with which the rings 13 are pressed against the front walls of the cylinder 3 may be adjusted.

At the left side of the figure the lower part of the outer sleeve 10 is extended to a trough 17 divided by a partition 18 whereby a liquid seal is formed allowing the liquid to flow over to the still 1 but preventing the escape of the vapors formed in the cylinder 3. An opening is provided in sleeve 9, arranged to register with the open end of trough 17 regardless of the displacement of the inner sleeve enabling the liquid to enter the trough 17.

The vapors formed in the still 1 pass through openings 20, roofed by a cap 19, to the discharge pipe 21. The liquid flows from the left to the right in the lower part of the still 1 and leaves it through the pipe 22.

Figs. 2 and 3 show two stills arranged one above the other. Both stills are traversed by the liquid in the same way, except that the lower still is not fed with the raw material, but with the liquid leaving the upper still. 23, 24, 25, and 26 are four condensers from which in the case of raw tar to be distilled a light oil, a middle oil, a heavy oil and an anthracene oil may be withdrawn. In contradistinction to the scheme represented in the drawing in order to save space, the condensers may be arranged at the sides of the jacket 27 provided to envelop the stills with an insulating material such as asbestos wool.

The fire place is denoted by 28. By the fire the lower still is immediately heated, but the upper still may be exposed also to the immediate action of the combustion gases by means of a connecting tube 29. By baffle plates 30 the heating gases are directed in such a manner that the whole surface of the stills is met by them, as appears from Fig. 3, in which the heating flues are denoted by small circles including either a point or a cross, the point meaning an arrow directed toward the spectator, and the cross meaning an arrow in inverse direction. The heating gases at first flow along the still from front to back, then through the two lateral parts 31 from back to front, then through the upper part 32 from front to back, then along the lower part of the upper still from back to front, then through the lateral parts 33 from front to back, and finally along the upper part 34 of the upper still from back to front, and at last are discharged by the chimney 35.

Such distilling plant may be stationary or it may be mounted, as diagrammatically shown in Figs. 2 and 3, on a truck.

I claim:

1. An apparatus for continuous fractional distillation, comprising a cylindrical chamber, a second cylindrical chamber disposed within said first chamber and spaced from the inner walls thereof, said second chamber being journaled for rotation about its longitudinal axis in the end wall of said first chamber, means for rotating said second chamber, means for sealing the interiors of the said chambers from each other to prevent the passage of gases from one to the other, means for feeding a liquid to the interior of the inner chamber at one end thereof, means for withdrawing liquid from said inner chamber at the opposite end and for feeding it to the interior of the outer chamber at one end thereof, means within said inner chamber to effect movement of the liquid from one end thereof to the other upon rotation of said chamber, means for withdrawing liquid from the outer chamber at the end opposite the place of its injection, separate means for withdrawing vapors from the two chambers, and means for heating the chambers.

2. In an apparatus in accordance with claim 1 in which said sealing means comprises a pair of sleeves secured to the inner faces of the end walls of the outer cylindrical chamber and a second pair of sleeves telescopically associated with the first pair and bearing against the end walls of the inner cylindrical chamber.

3. In an apparatus in accordance with claim 1 in which said sealing means comprises a pair of sleeves secured to the inner faces of the end walls of the outer cylindrical chamber, a second pair of sleeves telescopically associated with the first pair, said second pair of sleeves being provided with yielding bearing rings for engagement with the end walls of the inner cylindrical chamber.

4. In an apparatus in accordance with claim 1 in which said sealing means comprises a pair of sleeves secured to the inner faces of the end walls of the outer cylindrical chamber, a second pair of sleeves telescopically associated with the first pair, said second pair of sleeves being provided with yielding bearing rings for engagement with the end walls of the inner cylindrical chamber, a liquid seal in the sleeves located at the end of the inner chamber provided with means for discharging liquid.

5. An apparatus for continuous fractional distillation, comprising a chamber to be heated, a second elongated chamber disposed within said first chamber and spaced from the inner walls thereof, said second chamber being journaled in the walls of said first chamber for rotation therein, means for rotating said second chamber, means for sealing the interiors of the said chambers from each other to prevent the passage of gases from one to the other, means for feeding a liquid to the interior of the inner chamber at one end thereof, means within said inner chamber to effect movement of the liquid from one end thereof to the other upon rotation of said chamber, means for withdrawing liquid from said inner chamber at the opposite end thereof and for feeding it to the interior of the outer chamber at one end thereof, means for withdrawing liquid from the outer chamber at the end opposite the place of its injection, separate means for withdrawing vapors from the two chambers, and means for heating the chambers.

6. In an apparatus in accordance with claim 5 in which said sealing means comprises a pair of sleeves secured to the inner faces of the end walls of the outer cylindrical chamber and a second pair of sleeves telescopically associated with the first pair and bearing against the end walls of the inner cylindrical chamber.

7. In an apparatus in accordance with claim 5 in which said sealing means comprises a pair of sleeves secured to the inner faces of the end walls of the outer cylindrical chamber, a second pair of sleeves telescopically associated with the first pair, said second pair of sleeves being provided with yielding bearing rings for engagement with the end walls of the inner cylindrical chamber.

8. In an apparatus in accordance with claim 5 in which said sealing means comprises a pair of sleeves secured to the inner faces of the end walls of the outer cylindrical chamber, a second pair of sleeves telescopically associated with the first pair, said second pair of sleeves being provided with yielding bearing rings for engagement with the end walls of the inner cylindrical chamber, a liquid seal in the sleeves located at the end of the inner chamber provided with means for discharging liquid.

9. An apparatus for continuous fractional distillation, comprising a cylindrical chamber, a second cylindrical chamber disposed within said first chamber and spaced from the inner walls thereof, said second chamber being journaled for rotation about its longitudinal axis in the end wall of said first chamber means for rotating said second chamber, means for sealing the interiors of the said chambers from each other to prevent the passage of gases from one to the other, means for feeding a liquid to the interior of the inner chamber at one end thereof, means comprising a helical baffle strip secured to the inner wall of said inner chamber to effect movement of the liquid from one end thereof to the other upon rotation of said chamber, means for withdrawing liquid from said inner chamber at the opposite end thereof and for feeding it to the interior of the outer chamber at one end thereof, means for withdrawing liquid from the outer chamber at the end opposite the place of its injection, separate means for withdrawing vapors from the two chambers, and means for heating the chambers.

EDWIN M. F. GUIGNARD.