E. H. WRIGHT & E. H. ATWOOD.

PROCESS FOR FRACTIONATING LIQUIDS.

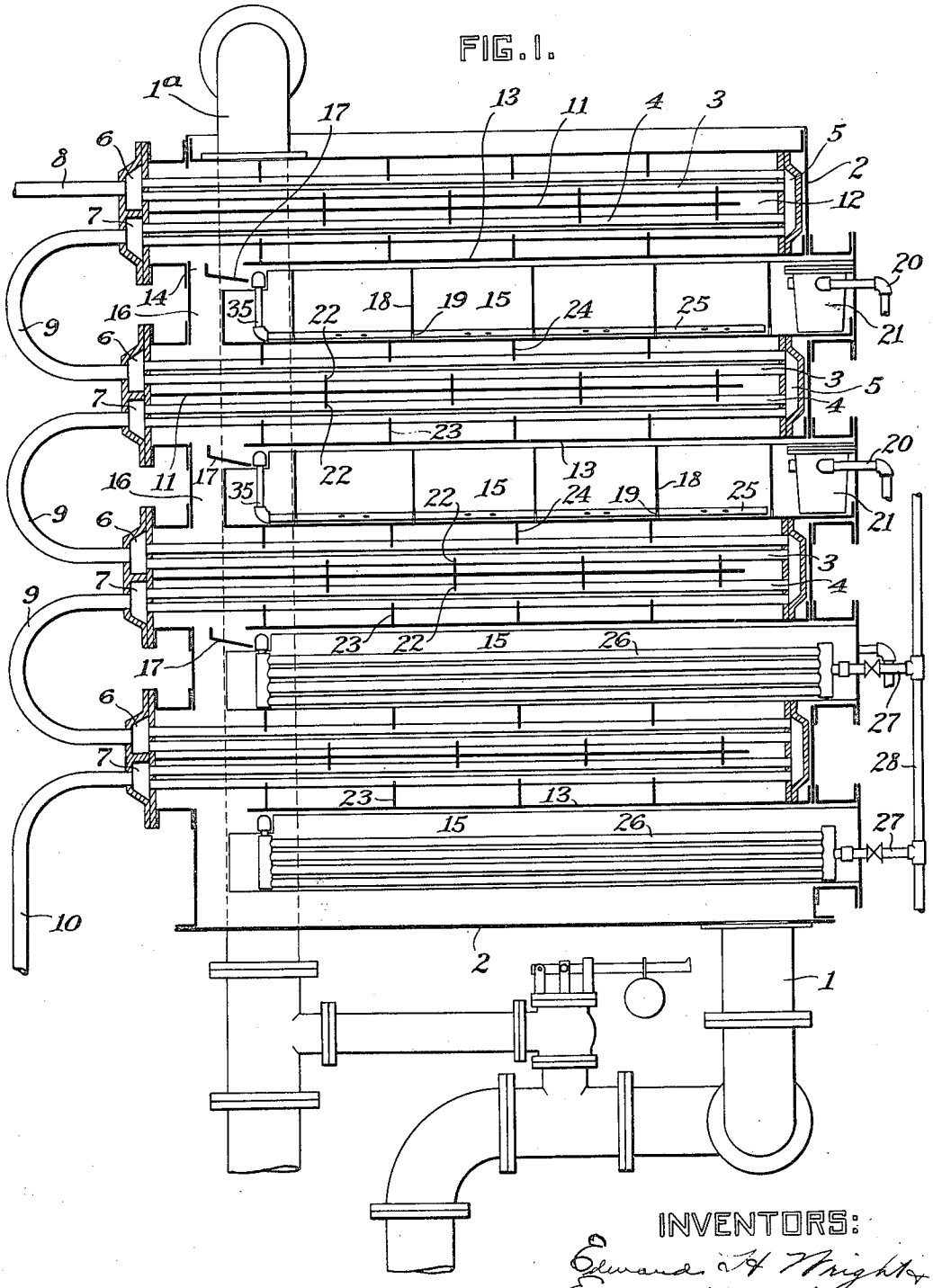
APPLICATION FILED DEC. 19, 1917.

1,278,280.

Patented Sept. 10, 1918.

2 SHEETS—SHEET 1.

FIG. 1.



INVENTORS:

Edward H. Wright &
Elmin H. Atwood
by Davis & Simmons
their attorneys

E. H. WRIGHT & E. H. ATWOOD.

PROCESS FOR FRACTIONATING LIQUIDS.

APPLICATION FILED DEC. 19, 1917.

1,278,280.

Patented Sept. 10, 1918.

2 SHEETS—SHEET 2.

FIG. 2.

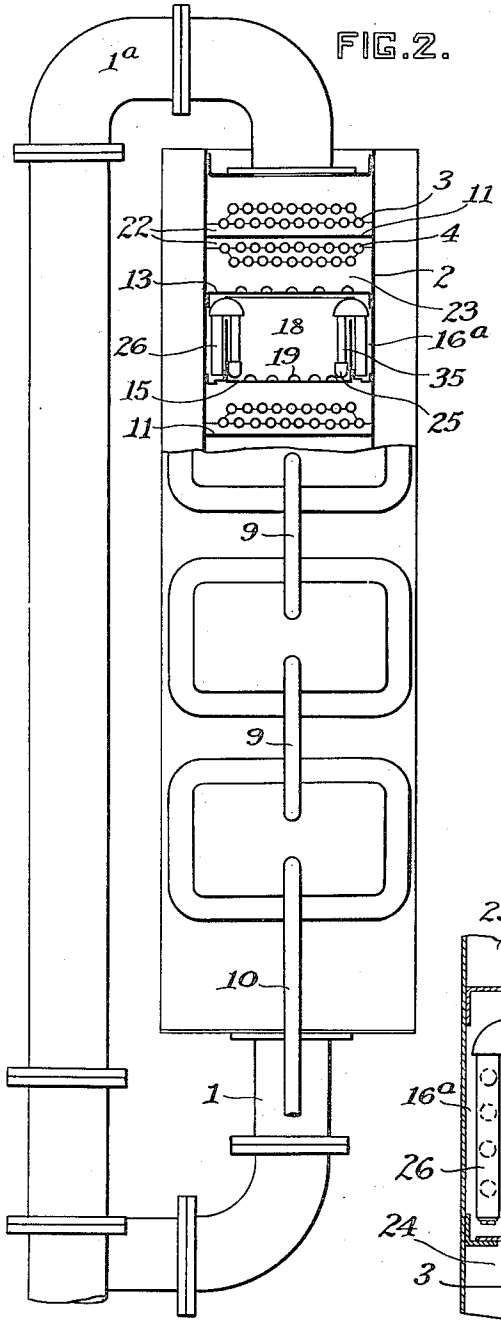


FIG. 3.

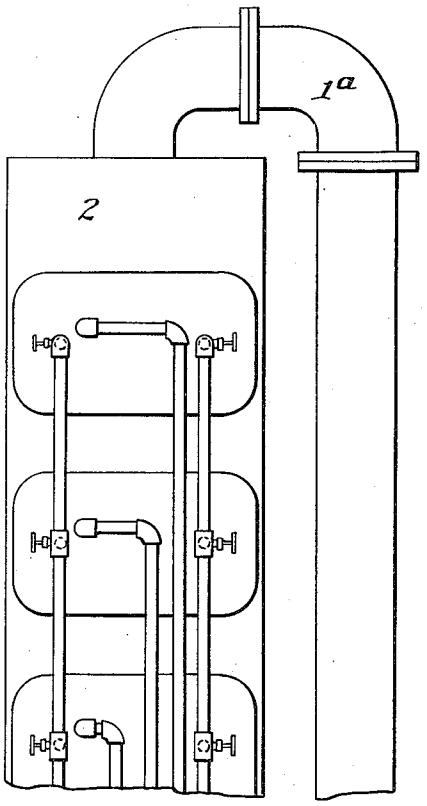
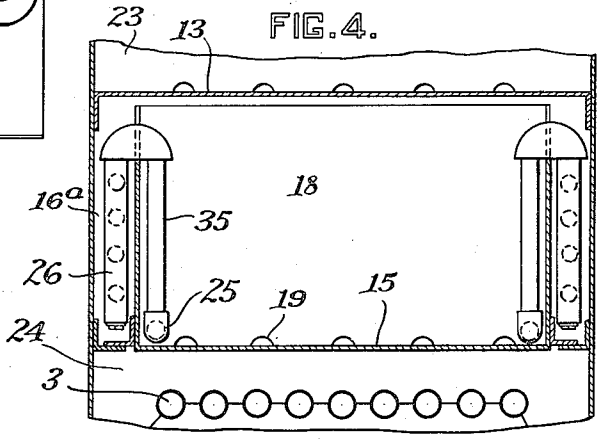


FIG. 4.



INVENTORS:

Edward H. Wright &
Edwin H. Atwood
by Davis & Simmons
their attorneys

UNITED STATES PATENT OFFICE.

EDWARD H. WRIGHT AND EDWIN H. ATWOOD, OF OLEAN, NEW YORK, ASSIGNORS TO VACUUM OIL COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

PROCESS FOR FRACTIONATING LIQUIDS.

1,278,280. Specification of Letters Patent. Patented Sept. 10, 1918.

Application filed December 19, 1917. Serial No. 207,925.

To all whom it may concern:

Be it known that we, EDWARD H. WRIGHT and EDWIN H. ATWOOD, citizens of the United States, and residents of Olean, in the county of Cattaraugus and State of New York, have invented certain new and useful Improvements in Processes for Fractionating Liquids, of which the following is a specification.

The present invention relates to a process of fractionating liquids, and more particularly to such a process in which a vapor is continuously discharged from the still into a condensing apparatus, an object of this invention being to provide a process by which the fractions obtained are not apt to vary in range, but instead irregularities in fractionation are corrected.

Another object of the invention is the retention of the condensed vapor from each section of the fractional condensing appliance in a separate compartment or collector in such a position that the collector or compartment continues to receive heat for an appreciable interval from the hot vapor coming from the still.

Still another object of the invention is to cause the reëvaporation and escape of the lighter fractions of the condensate into the main vapor to cooler parts of the condenser.

A further object is to heat and agitate the condensate as by jets of steam in order to drive off lighter fractions into the main vapor.

A still further object of the invention is to heat the crude oil fed to the still by means of the vapor, the conductor of the crude oil acting as a condenser for the vapor.

To these and other ends the invention consists in the processes and subprocesses as set forth in the appended claims.

In the drawings:

Figure 1 is a sectional view through an appliance by which the present invention may be carried out;

Fig. 2 is an end view showing the upper part in vertical section;

Fig. 3 is a view of the opposite end of the apparatus; and

Fig. 4 is an enlarged vertical sectional view through one of the collectors of the condensates.

The liquid is distilled in a still of any suitable construction (not shown) and the vapor is conducted by a pipe 1 to the bottom of the casing 2 of the appliance, the uncondensed vapors issuing from the top of the appliance at 1^a being conducted to another condenser (not shown) where condensation is completed. This appliance may have any desirable number of sections, but in this instance it employs four, one arranged directly above another. Each section in the illustrated appliance comprises a condensing device and a collector for the condensate of such device.

In this instance, the condensing devices are formed by an upper set of pipes 3 and a lower set of pipes 4, which are connected at one end by a common chamber or passageway 5, while the opposite ends connect with chambers 6 and 7, respectively. To the chamber 6 of the uppermost condensing device, a condensing fluid is introduced by an inlet pipe 8, the condensing fluid, in this instance, being crude oil, while the chamber 7 of each condensing device except the lowermost one connects by a pipe 9 with the chamber 6 of the condensing device next below it. From the chamber 7 of the lowermost condensing device the outlet pipe 10 leads to any suitable source, as the still, in which the crude oil is conducted or carried for distillation. It will thus be seen that the condensing fluid enters at the top of the appliance and after passing successively through the upper and lower pipes of the successive condensing devices is discharged at the bottom of the appliance.

To the end that the vapor entering the casing through the inlet 1 will take a circuitous path, the upper and lower pipes or portions of the condensing devices are separated as by partitions 11, which at one end, that is, the end adjacent the inlet of the condenser, prevent the passage of the vapor upwardly, but at the opposite end, or the end where the upper portion of the condenser connects with the lower portion, a passageway 12 is provided, so that the uncondensed vapor, after impinging the lower portion of the condenser, may pass upwardly and travel toward the outlet of the section along the upper portion of the condenser. The casing of the appliance is also provided interiorly with partitions or baffles 13, each of which, at one end of the casing, close the latter against the passage of the vapor upwardly, while at the opposite end are spaced at 14, in order that the vapor

may pass along the lower coils of the respective condensing devices in a direction opposite to the flow of the crude oil through such condensing device, in order to reach the passageway 12 formed by the partitions 11.

In slightly spaced relation to and beneath the baffles or partitions 13, the condensate collectors 15 are arranged, the bottom of each collector being arranged directly above the uppermost set of coils of the condenser next beneath such collector, and the collector being spaced at 16 from that end wall of the casing of the appliance adjacent to the opening 14, and also from the sides of the casing at 16^a, so that a passageway is provided by way of the spaces 16 and the opening 14 through which the vapors may escape from one condenser to the condenser next above. At the same time the bottom of the collector is subjected to the heat of the vapors within the next lower condenser, this heat being greater than that within its own condenser, thus tending to drive off from the collector any fractions not intended for such collector. Each collector 15 projects slightly beyond the partition or baffle 13, so that the condensates collecting on the baffles 11 and 13 of any one condenser will be directed into the collector 15, a drip baffle 17 being situated so as to receive the condensate from the baffle 13 and direct it to the collector 15. Each collector 15 is provided with a number of transverse baffling partitions 18 having small openings 19 near their lower edges through which the condensate may flow slowly toward the outlet pipe 20 which leads to any suitable condenser, the outlet pipe 20 having a trap 21 which prevents the escape of any vapor from the collector. It will be noted that the condensate flows in the collector in a direction opposite to the direction of the flow of the vapor on the under side of the collector, or in the top part of the condenser next below such collector. In this way the hottest vapors will impinge the collector wall at the outlet of the collector, thus tending to drive off any fractions not intended for such collector.

To the end of causing the vapor to pass not only in the direction of the length of the pipes of the condenser, but also in a zigzag course over said pipes, the partitions 11 are provided with transverse baffles 22 projecting upwardly and downwardly from such partitions 11. Furthermore, the partitions 13 are provided with transverse baffles 23 which are spaced midway between the baffles 22 on the under side of the partitions 11, while the collectors 15 are provided with transverse baffles 24 on their under side projecting downwardly and midway between the baffles 22 on the upper side of the partitions 11. The baffles 22 on the upper side of the partitions 11, as well as the baffles 23 on the partitions 13, are provided with openings to permit the flow of the condensates along the partitions 11 and 13, the transverse baffles on these two sets of partitions 11 and 13 also acting to retard the flow of the condensates.

To provide still further for reëvaporating from the collectors the light fractions which it is desired to eliminate from the condensates, a heating means is employed for each of the collectors, this heating means also preferably acting to agitate the condensates. In this instance, steam or other heating or carrying medium, or both heating and carrying mediums, is discharged into each collector, preferably in the form of spray. As illustrated, each collector is represented as being provided with two longitudinally extending steam spray pipes 25, which, in turn, are connected with two superheaters 26 (see Fig. 4). Each superheater, in this instance, comprises a coil located between the casing and the side of the collector, so as to be heated by the vapors about the pan. The superheaters receive steam by way of the pipes 27 from steam pipes 28, and are connected with the spray pipes 25 through the pipes 35. The vapor superheats the steam, and the steam is blown through the condensate in the collector, heating it and agitating it so that lighter fractions than those that belong in the collector are driven off.

The process will be understood from the foregoing description, but it may be summarized as follows: Vapor from the still enters the casing at the lower part thereof through the inlet 1 and uncondensed vapors issue from the casing at the top through the outlet 1^a. Crude oil passes into the condensing coils through the inlet pipe 8 and issues through the outlet pipe 10, after having passed through the upper and lower pipes of each of the condensers and traveling in a direction opposite to the travel of the vapor, so that the vapor gradually becomes cooler due to the fact that the top or uppermost condenser is cooler than the lowermost condenser. This action also gradually heats the crude oil to a condition to be passed to the still. The vapor impinges the collector for a condensate before coming in contact with the condenser of such condensate, and in this way the collector is maintained at a higher temperature than the condenser, thus tending to prevent the accumulation in the condenser of fractions that do not belong in the collector. Furthermore, the condensate is caused to travel or flow in the collector and the vapor travels over the collector in a direction opposite to such flow, so that the outlet end of the collector is warmer than the inlet end, thus still further providing for the driving off of fractions not intended for the collector. The flow through the collector is retarded due to the baffling partitions in

such collector. The further driving off of the fractions not intended for the collector is obtained by an auxiliary heating device which also tends to agitate the condensate in the collector, thus still further freeing undesirable fractions in the collector.

What we claim as our invention and desire to secure by Letters Patent is:—

1. The process of fractionating liquids consisting in distilling the liquid and causing the vapor to flow in zigzag course beneath a series of condensate collectors and over a series of condensers in alternate arrangement, a condenser over each collector, and also causing the vapor to flow in the direction with respect to each collector from the end from which the condensate is discharged to the opposite end where the condensate is received by the collector, maintaining the several condensers at progressively decreased temperatures, and drawing off the condensate from the collectors.

2. The process of fractionating liquids consisting in distilling the liquid, causing different fractions of the vapor to be condensed by contact with a series of condensers maintained at different temperatures, collecting the condensate in a series of collectors located, respectively, below the condensers, and reëvaporating from the condensate within the collectors fractions lighter than those desired, by spraying steam into the condensate within the collectors.

3. The process of fractionating liquids consisting in distilling the liquid, causing different fractions of the vapor to be condensed by contact with a series of condensers maintained at different temperatures, collecting the condensate in a series of collectors located, respectively, below the condensers, reëvaporating from the condensate within the collectors fractions lighter than those desired, by spraying steam into the condensate within the collectors, and re-condensing the reëvaporated fractions with fractions of the same gravity.

4. The process of fractionating liquids consisting in distilling the liquid, causing different fractions of the vapor to be condensed by contact with a series of condensers maintained at different temperatures, collecting the condensate in a series of collectors located, respectively, below the condensers, superheating steam by the vapor to be next condensed, and reëvaporating from the condensate within the collectors fractions lighter than those desired, by spraying the steam thus superheated in the condensate within the collectors.

5. The process of fractionating liquids which consists in distilling the liquid, directing the vapor successively on a number of condensers of successively lowering temperatures and also successively on collectors for the respective condensates, and causing the condensates to flow in their collectors in directions opposite to the direction of flow of the vapor on the respective collectors.

6. The process of fractionating liquids which consists of directing the vapor from the still on a number of condensers of successively lowering temperatures, collecting the condensate in different receptacles, and heating and agitating the condensate in the different receptacles to drive off undesirable fractions.

7. The process of fractionating liquids which consists in directing the vapor from the still on a number of condensers of successively lowering temperatures, collecting the condensates in different receptacles, and injecting steam into the condensates in the different receptacles to drive off lighter fractions.

8. The process of fractionating liquids which consists in distilling the liquid, directing the vapor on the collectors for the different condensates prior to causing such vapor to impinge the condenser of such condensate, and causing the condensates to flow in their collectors in directions opposite to the flow of the vapor impinging such collectors.

EDWARD H. WRIGHT.
EDWIN H. ATWOOD.