J. G. P. EVANS.

CRUDE OIL REFINING PROCESS.

APPLICATION FILED NOV. 11, 1919.

1,366,642.

Patented Jan. 25, 1921.

2 SHEETS—SHEET 1.

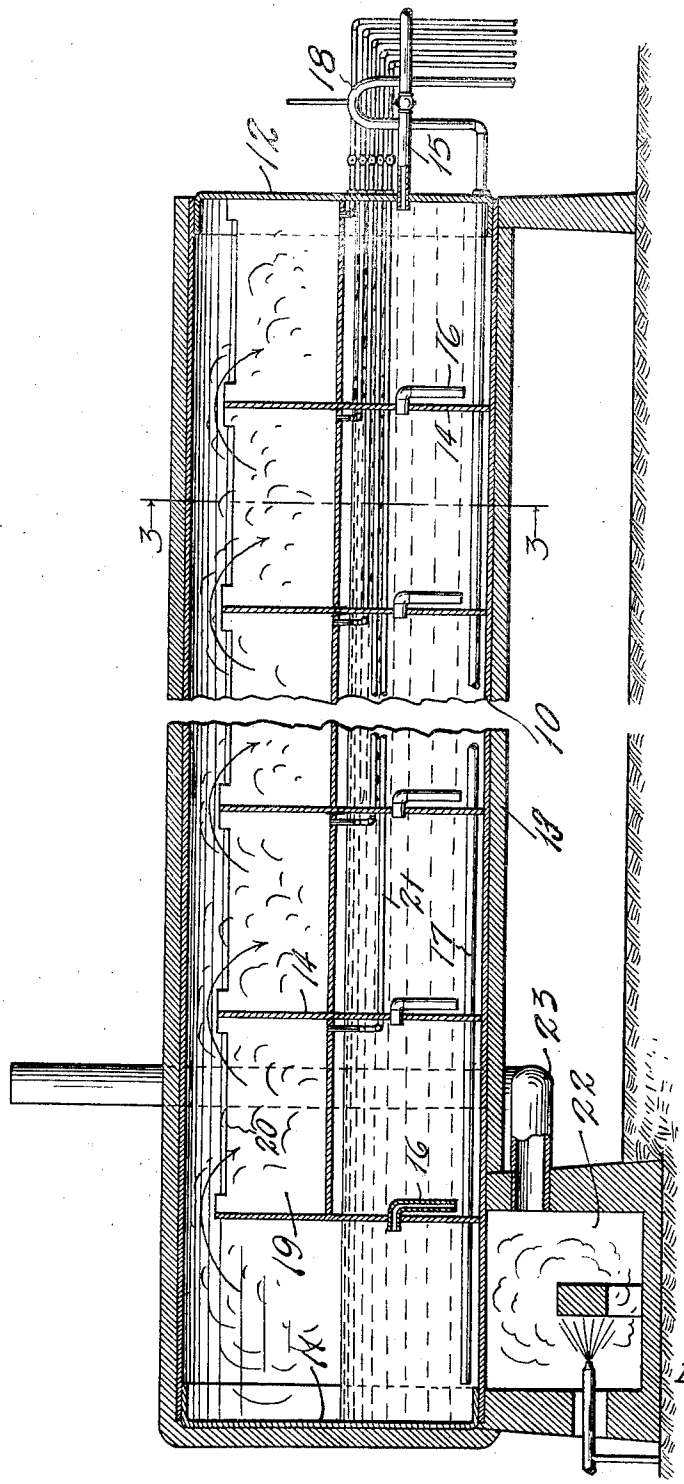


Fig. 1

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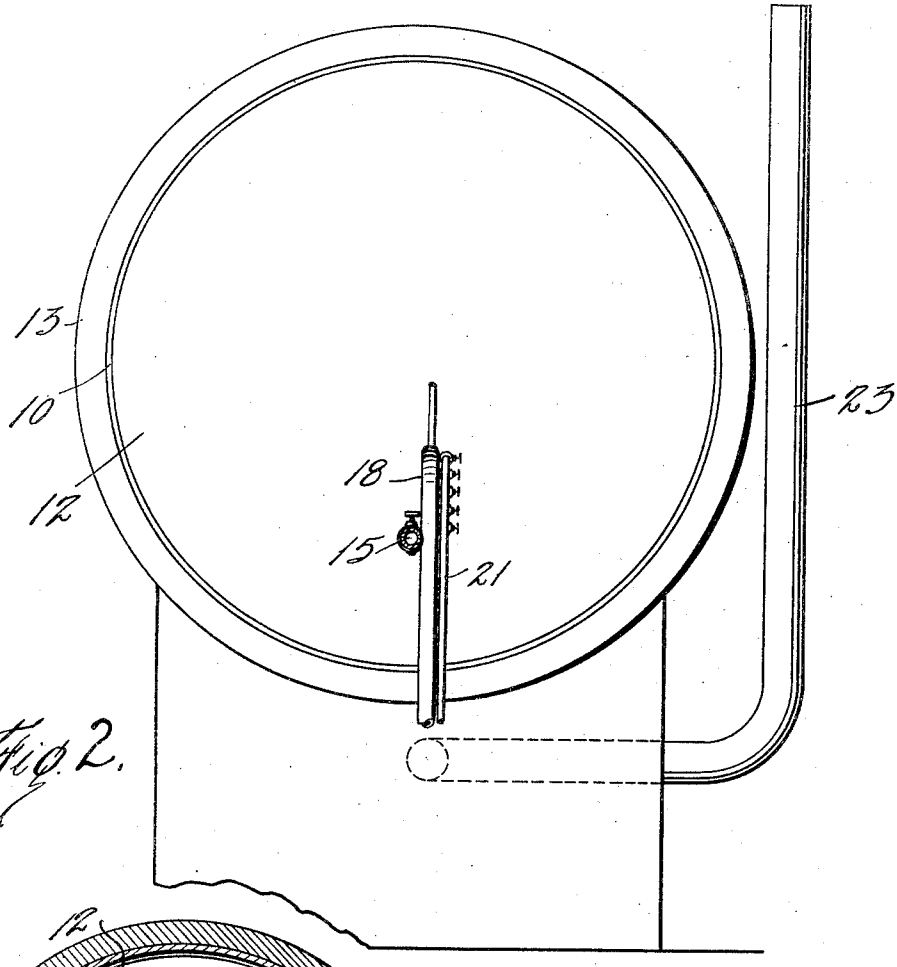


Fig. 2.

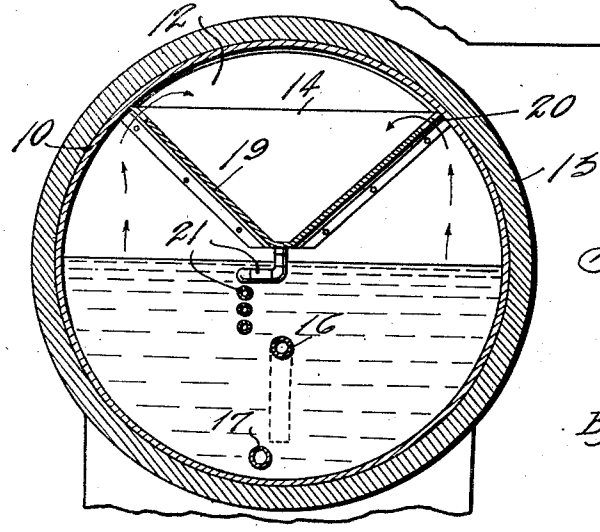


Fig. 3.

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UNITED STATES PATENT OFFICE.

JEWETT G. P. EVANS, OF HANDLEY, TEXAS.

CRUDE-OIL-REFINING PROCESS.

1,366,642. Specification of Letters Patent. Patented Jan. 25, 1921.

Application filed November 11, 1919. Serial No. 337,278.

To all whom it may concern:

Be it known that I, JEWETT G. P. EVANS, a citizen of the United States, residing at Handley, in the county of Tarrant and State of Texas, have invented certain new and useful Improvements in Crude-Oil-Refining Processes, of which the following is a specification.

This invention has to do with refining crude oil.

The result sought is to produce refined oil in an expeditious and economical manner and obviate acid treatment; also to do away with water-circulation or any means external of the still to condense the hot vapors. It is further proposed to produce such refined oil, as gasolene direct from the still and which will test "sweet" when delivered from the still and register all the points of a high grade fuel oil.

In carrying out the invention it is proposed to construct a still so that the latent heat of vaporization is used to heat the oil being refined and wherein the vapors are condensed by being brought into contact with similar vapors, but of a lesser degree of heat, the condensation being effected entirely within the still.

In such a device a liquid admitted at a normal temperature is subjected to the refining process, whereby the refined products are taken out of the still substantially at said normal temperature, and said liquid is used to reduce the temperature of the said products.

Successful results have been had with a still divided by transverse partitions or bulkheads into a plurality of successive sections with a heating unit under the first section and a liquid supply entering the last or most remote section. Means for causing the supplied liquid to flow forwardly from one section to the next is included together with an overflow for maintaining a level in the still. Condensing pans are disposed over each section and from each pan a discharge pipe leads through the supplied or stock liquid, in which it is kept immersed. By contact the heat supplied to the first section will be transmitted to the next section and so on from section to section. Thus the liquid in each successive section rearwardly will be at a lesser degree of heat and as such liquid vaporizes, it will do so at a lesser degree of heat than the liquid which refuses to vaporize and passes to the next section forward. The hot vapor rising from a section and encountering the vapor of the section which has a lower degree of heat, will condense as is evident.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, in which an example of the invention is shown, and wherein:

Figure 1 is a longitudinal sectional view of a still constructed in accordance with this invention,

Fig. 2 is a rear end elevation of the same, and

Fig. 3 is a cross sectional view on the line 3—3 of Fig. 1.

In the drawings the numeral 10 designates an elongated horizontal cylindrical drum or casing preferably formed of metal similar to boiler plate, but the shape and material are subject to change and substitution. The drum has a front end cap 11 and a rear end cap 12 and is covered, except its cap 12, with a jacket 13 of suitable insulating material, whereby the heat is retained in the drum. The drum is divided from front to rear, into a plurality of successive sections or compartments by means of transverse partitions 14 preferably of plate metal, but not necessarily so. These partitions terminate short of the top of the drum so as to maintain a passage thereover. The number of sections may be varied and would depend upon the temperature and liquid refined.

A liquid supply pipe 15 enters the rear cap 12. Connecting pipes 16 including an elbow extend through the partition so that the fluid entering the rearmost section will flow forwardly from each section to its next section, through said pipes until the sections are all filled to a liquid line or limit. An overflow pipe 17 extends from the front section through the partitions and over the bottom of the drum. This pipe 17 after passing through the rear cap 12 is bent upward into an inverted goose-neck 18, which determines the liquid line in the drum.

Just above the liquid line in section, except the front section, a condensing pan or hopper 19 is disposed longitudinally and extends from one partition to next and to which it is fastened. Each hopper exhibits a V-shape in cross-section and has its diverging sides extending upwardly to the walls of the drum. Each hopper has an intermediate portion of each top edge re-

cessed to form with the walls of the drum, slots 20 through which vapors arising from the liquid below, may pass. These hoppers do not extend above the partitions and thus leave an unobstructed passage over the partitions. From the bottom and rear end of each hopper, a condensate pipe 21 leads rearwardly and extends through the partitions and the rear cap 12.

A fire box 22 is disposed under the front or first section and the jacket is omitted from the under side of the drum over the fire box. The box has a flue 23 and a suitable fire of any nature may be maintained in said box. It has been found that it is only necessary to heat the first section, because the heat will be transmitted from the liquid in the first section to next section by the first partition and so on rearwardly, whereby the liquid in each section will be heated, but of course each successive section to a lesser degree.

In operating the still, liquid to be refined, such as crude oil, is supplied to the sections until the drum is filled to the overflow or liquid line. The oil in the first section is heated and vapor arises from the same. As the front cap 11 is heated and insulated and the rear cap is not, the tendency of the vapors is to pass rearward over the first partition. The oil which vaporized in the first section would not vaporize while in the second section as the degree of heat of the latter is lower. However, a certain portion of the oil will vaporize in the second section and these vapors pass upward around the hopper and through the slots 20, where the vapors flowing rearward from the first section are encountered. These vapors of two degree ranges meet and tend to mingle at an intermediate degree of heat, with the result that a portion of the comingled vapors condenses and settles into the hopper from which the condensate passes out through the pipe 21; while the lighter degree vapors pass rearward to the next section where the condensating operation is repeated.

It is obvious that a condensing operation will be had over each hopper and the vapors will condense at a lesser degree over each successive hopper rearwardly until the last hopper is encountered where the temperature will be almost the same as that of the crude oil entering the last section. It will be seen that any liquid which is not vaporized in the first section will flow back through the subsequent sections to the goose-neck 18 by way of pipe 17; however in such passage the residuum will be robbed of its heat by the oil stored in the various sections through which it passes. It will further be seen that the condensate pipes 21 are submerged in the crude oil, so that said condensates are robbed of their heat as they pass through the various sections. The heat absorbed from the pipes 17 and 21 acts to raise the temperature of the oil in its various sections. The condensate or refined products passing out of the pipes 21 will show different grades, having been condensed at different degrees; however these refined products will be clear and free from discoloration and no further treatment will be necessary. In refining parlance, a clean product is said to be "sweet," whereas a discolored or yellow product is called "sour" and subsequent treatment is required to make the product sweet. As my products are sweet when delivered by the pipes 21, no subsequent treatment is necessary.

One of the results had in this still is that the heat imparted to the liquid being refined, to cause it to vaporize, is reclaimed to a great extent from said vapors, after the latter have been condensed and utilized in vaporizing liquids of lesser degree of heat, until the heat is entirely dissipated. This is due to the fact that the heat is confined in the still and thoroughly absorbed. The condensing of the vapors within the still without the influence of an external condenser, is undoubtedly responsible for the clear and sweet refined products.

What I claim is:

1. A process of refining liquids in an inclosed still, which includes segregating in a still, the crude liquid into bodies, applying heat only to the body of crude liquid requiring the maximum degree of heat to vaporize its volatile elements and heating said other bodies by transmission of the heat through contact, vaporizing the volatile elements of each body capable of being vaporized at the degree of heat attained by said body, condensing in the same still by bringing vapors of a higher degree of heat into contact with vapors of a lesser degree of heat, while maintaining the same free from contact with said liquid bodies, and separately collecting and withdrawing the condensed liquids.

2. The herein-described process of refining liquids, comprising subjecting one end of a body of the liquid to heat and transmitting the heat by contact toward the opposite end of the body so that the body decreases in temperature toward such opposite end, passing the vapors from the portion of the body having the higher degree of heat into contact with the vapors of a lower degree of heat from the portion of the body having a lower degree of heat to superheat the lower degree vapors and condense the higher degree vapors, and fractionally collecting and withdrawing the liquid condensed from the higher degree vapor.

3. The herein-described process of refining liquids, comprising holding a plurality of bodies of liquid in an approximately horizontal position and in close relation, sub-

jecting one body to the action of heat and transferring the heat in succession by contact from one body to the other, passing the vapors from each body into contact with the vapors from the succeeding body of lower temperature while maintaining the vapors free from contact with the liquid bodies for superheating the lower temperature vapors and condensing the higher temperature vapors, and separately collecting and withdrawing the condensed vapors while maintaining them free from contact with said liquid bodies.

4. The herein-described process of refining liquids, comprising holding a plurality of bodies of liquid in end-to-end relation, subjecting one body to the action of heat and transferring the heat in succession by contact from one body to the other, passing the vapors from each body upon one side of the succeeding body of lower temperature to contact with the lower temperature vapors of such succeeding body whereby the lower temperature vapors are superheated and the higher temperature vapors condensed, separately collecting the condensed vapors in proximity to said bodies while maintaining the condensed vapors free from contact with the liquid bodies, and withdrawing the collected condensates.

5. The herein-described process of refining liquids, comprising holding a plurality of bodies of liquid in an elongated still, retarding the flow of the liquid bodies in a direction longitudinally of the still, subjecting one body of liquid at one end of the still to the action of heat, and transferring the heat in succession by contact from one body to the other, passing the vapors from each body through a longitudinal passage within the still extending over the several bodies and causing the vapors from each body to contact with the vapors from the succeeding lower temperature body whereby the higher temperature bodies are condensed and the lower temperature vapors superheated, collecting the condensed vapors within the longitudinal passage while maintaining them free from contact with the liquid bodies, and separately withdrawing the condensates and passing the same through the lower temperature bodies to preheat the same.

In testimony whereof I affix my signature.

JEWETT G. P. EVANS.