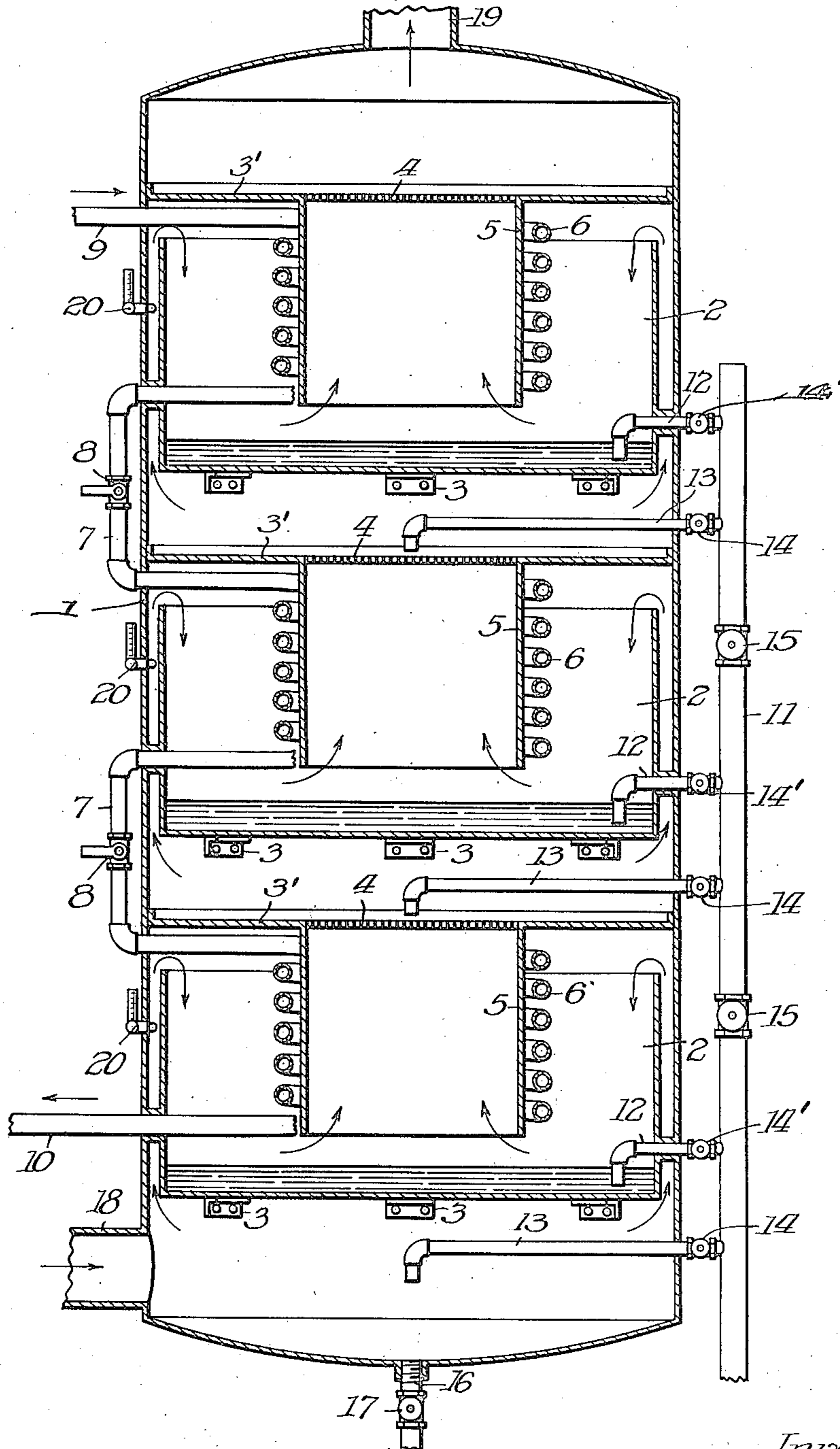


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 APPARATUS FOR DEPHLEGMATION.
 APPLICATION FILED AUG. 22, 1916.

1,222,801.

Patented Apr. 17, 1917.



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Specification of Letters Patent.

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Application filed August 22, 1916. Serial No. 116,254.

To all whom it may concern:

Be it known that I, RUDOLPH R. ROSENBAUM, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Apparatus for Dephlegmation, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to dephlegmators and is concerned with an improved construction whereby a process of fractional condensation may be more effectively carried out. It is the object of my invention to provide such a device whereby a more distinct line than has heretofore been possible may be drawn between materials of a high boiling point and materials of a low boiling point and whereby the methods may be more thoroughly practised to the end of the complete divorce of the materials desired to be separated.

While it will appear to those skilled in the art that the dephlegmator of my invention may be used to carry out processes of fractional condensation in connection with any materials having different boiling points, I have in mind particularly a dephlegmator which is well adapted to the separation of high boiling hydrocarbon from low boiling hydrocarbon. In connection with the structure which I propose, I provide means of control whereby the practice of the method is greatly facilitated.

In the accompanying drawing, which represents a vertical axial, sectional view of the dephlegmator, it will be seen that the main element is in the nature of a drum 1 which is conveniently made of heavy iron in a substantial manner, and, while size may not be important, I might mention a proportion of about six feet in diameter by fifteen feet in height.

Within the drum 1, I mount, one above the other, a series of pans of cylindrical form 2, 2, these pans being of a diameter less than the interior diameter of the drum so as to leave an annular space around each of them, as illustrated. These pans are conveniently mounted upon angle irons 3, 3. Above each of these pans I mount an an-

nular partition 3', each of these partitions having a reticulated central portion 4, surrounded by a downwardly extending tube 5 passing into the pans 2 immediately below it. About each of the tubes 5, I mount a cooling coil 6, supported in any suitable manner, these three cooling coils being connected in series by means of pipes 7, 7, in each of which a hand valve 8 is disposed. The top of the uppermost cooling coil is provided with the entry pipe 9 and the bottom of the lowermost cooling coil is provided with the exit pipe 10. These cooling coils are for the purpose of the circulation of a cooling medium, such as cold water, crude oil, etc.

A stand pipe 11 is mounted vertically alongside the drum 1 and has a lead 12 for each pan 2, each of these leads extending into an opening near the bottom of the respective pans and being provided with a valve 14'. There are also three leads 13, 13, 13, which extend from the stand pipe 11 into the drum to a central position under the respective pans. Each of these pipes 13 is provided with a hand valve 14 and the sets of pipes 12, 13, are separated by hand valves 15, 15 in the stand pipe 11. The bottom of the drum is provided with an exit pipe 16 having the hand valve 17. Near the bottom of the drum a vapor entry pipe 18 is provided and at the top of the drum a vapor exit pipe 19 is provided.

It will now be seen that gases or vapors entering by way of the pipe 18 will have an undulated path first through the first annular passageway, then into the first pan, then up through the first tube, then through the second annular passageway, then down into the second pan, and so on, until they reach the top where they may leave the drum by way of the exit pipe 19, this circuit being traced by the arrows as illustrated.

Let it be assumed now that a mixture of vapors of different boiling points is introduced at the entry pipe 18. Coming in contact with the outside walls of the dephlegmator the vapors of highest boiling point begin to condense and, as the gases proceed to the path outlined this condensation becomes more and more effective. Except for any condensation which may be deposited in the bottom of the drum 1, the portion which

is first condensed is deposited in the first pan 2, as indicated. The portion next condensed is deposited in the middle pan 2, and the portion next condensed is deposited in the top pan 2. That portion which may condense before rising to the first annular chamber will be deposited at the bottom of the drum and may be passed out by way of the pipe 16 and may be led back to a still where it may be returned to vapor form and passed back into the dephlegmator if it is considered to contain portions of material of low boiling point. The deposits in the pans may be led therefrom by siphonic action or by suction by way of the pipes 12, 12, under these conditions the hand valves 15 and the valves 14', 14' being opened and the valves 14 remaining closed. The distilling can, of course, take place as often as may be deemed desirable and the cycle may be repeated, all toward the end of most thorough preparation.

It is a very important feature of my invention that the structure is such that any condensate formed at any of the partitions will drop downwardly in opposition to the upward rise of the vapors, thus causing by friction and agitating contact a thorough and effective action. Accordingly, if I desire to resubmit the condensate to this action, I close the valves 15, 15 in the stand pipe 11 and open the valves 14', 14, thus permitting the condensate from the pan above to pass down to a point just above the center of the partition immediately below, thus feeding the condensate to the rush of rising gases to the tube 5. In the perforations in the partitions the condensate meets the gases in the form of a spray so as to enhance the action which has just been referred to.

In order to watch the action of the dephlegmator and to control it I provide thermometers 20, 20 at the intervals shown in the drawings.

It will be obvious to those skilled in the art that only one chamber may be used or more than three may be used, it being clear, particularly as evidenced by the appended claims that any number is contemplated. It will also be clear that any cooling medium may be used, such as water, oil or other liquid or gas. The cooling coils may be either separate or in series, as described, and it will be noted that I admit the cooling liquid at the top and allow it to exit at the bottom, this flow being the reverse of the direction of flow of the gases through the drum. Thus, the gases in the hottest condition strike the cooling medium in its warmest condition and as the gases rise they strike the coldest point at the top so as to deposit the last vestige of high boiling material.

I claim:

1. In a dephlegmator, a drum having an

inlet at the bottom and an outlet at the top, a pan mounted therein and surrounded by an annular space, a partition over said pan, said partition having a central opening, a tube surrounding said central opening and extending downwardly into said pan, and cooling pipes around said tube. 70

2. In a dephlegmator, a drum having an inlet at the bottom and an outlet at the top, a vertical series of pans mounted therein and each surrounded by an annular space, a partition over each pan, said partitions having central openings, a tube surrounding each opening and extending downwardly into the respective pan, and cooling pipes around each of said tubes. 75 80

3. In a dephlegmator, a drum having an inlet at the bottom and an outlet at the top, a vertical series of pans mounted therein and each surrounded by an annular space, a partition over each pan, said partitions having central reticulated areas, a tube surrounding each said areas and extending downwardly into the respective pan, and cooling pipes around each of said tubes. 85 90

4. In a dephlegmator, a drum having an inlet at the bottom and an outlet at the top, a vertical series of pans mounted therein and each surrounded by an annular space, a partition over each pan, said partitions having central openings, tubes surrounding said openings and extending downwardly into the respective pans, cooling pipes around each said tubes, and a system of piping for conveying away condensates in said pans. 95 100

5. In a dephlegmator, a drum having an inlet at the bottom and an outlet at the top, a vertical series of pans mounted therein and each surrounded by an annular space, a partition over each pan, said partitions having central openings, tubes surrounding said openings and extending downwardly into the respective pans, cooling pipes around each said tubes, and a system of piping for conveying away condensates in said pans, and for conveying the condensates of the upper pans to the partitions over the lower pans. 105 110

6. In a dephlegmator, a drum having an inlet at the bottom and an outlet at the top, a vertical series of pans mounted therein and each surrounded by an annular space, a partition over each pan, said partitions having central openings, tubes surrounding said openings, and extending downwardly into the respective pans, cooling pipes around each said tubes, and a system of piping for conveying away condensates in said pans, valves being provided for controlling said system of piping. 115 120 125

7. In a dephlegmator, a drum having an inlet at the bottom and an outlet at the top, a vertical series of pans mounted therein and each surrounded by an annular space, a partition over each pan, said partitions having cen- 130

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tral openings, tubes surrounding said openings and extending downwardly into the respective pans, cooling pipes around each said tubes, and a system of piping for conveying
5 away condensates in said pans and for conveying the condensates of the upper pans to the partitions over the lower pans, valves

being provided for controlling said system of piping.

In witness whereof, I hereunto subscribe 10 my name this 21st day of August A. D. 1916.

RUDOLPH R. ROSENBAUM.