

May 8, 1928.

F. B. SANDO

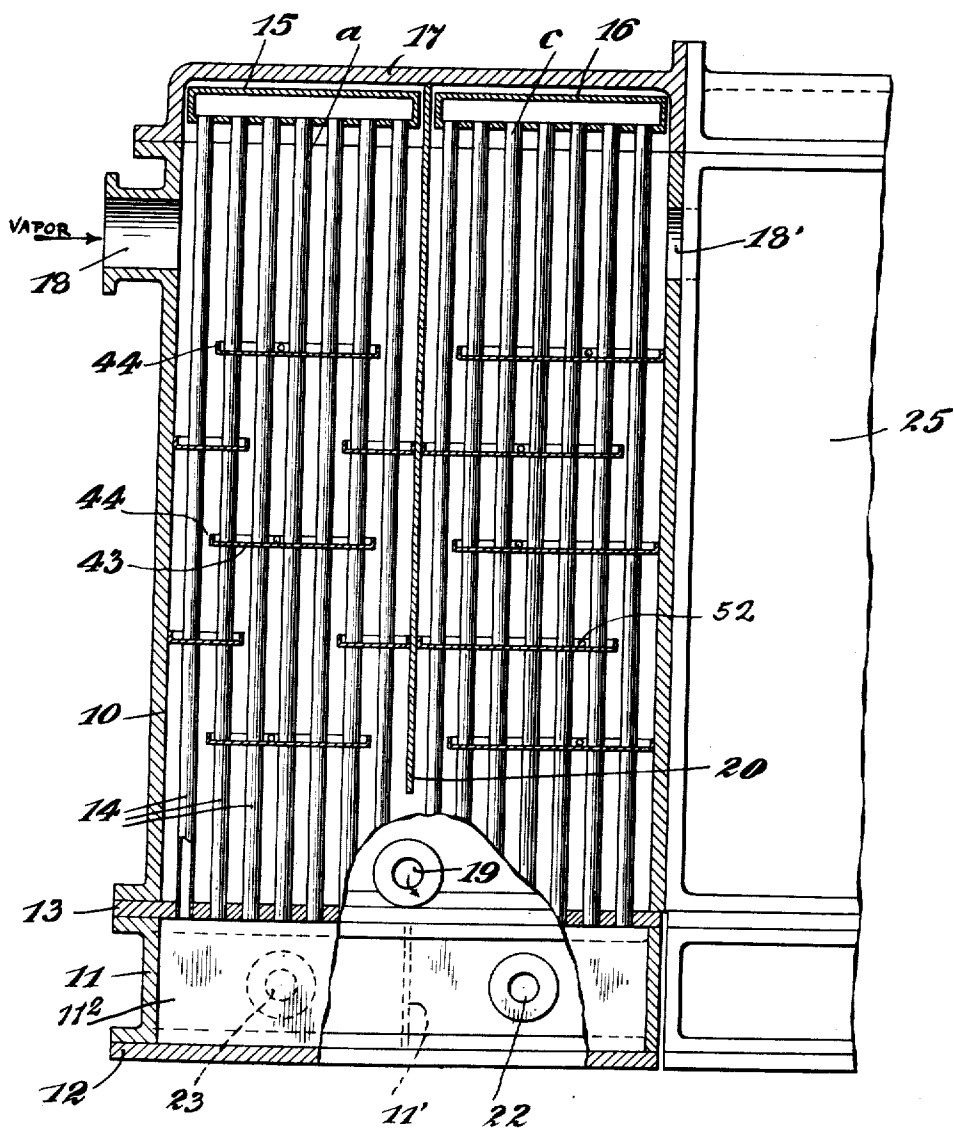
1,669,210

CONDENSER

Filed Sept. 5, 1924

2 Sheets-Sheet 1

Fig. 1.



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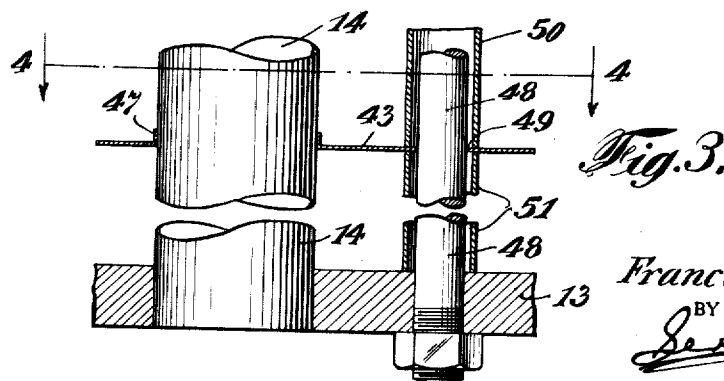
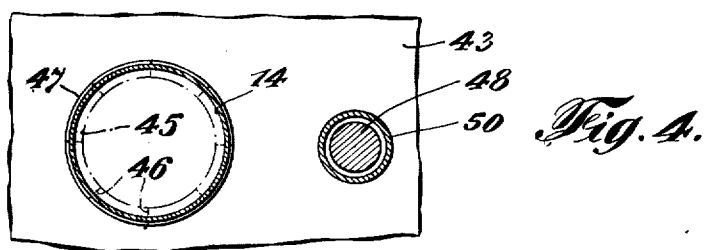
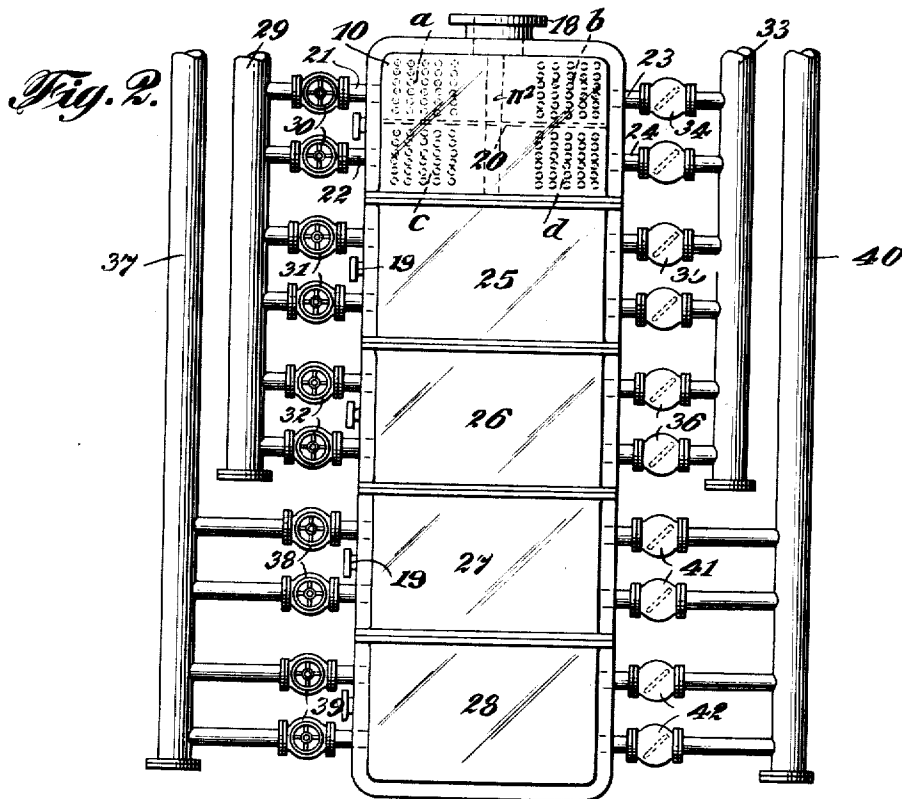
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

FRANCIS B. SANDO, OF EAST ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO FOSTER WHEEL CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

CONDENSER.

Application filed September 5, 1924. Serial No. 735,998.

This invention relates to an improvement in condensers and more particularly to surface condensers adapted to be employed as fractionating or dephlegmating condensers in the refinement of petroleum products, although as will be understood, the invention is not limited to this particular purpose. Heretofore, in the refinement of petroleum and similar products, vessels or similar devices entirely independent of a condenser have been employed for fractionating and dephlegmating purposes. The object of my present invention is the provision of a condenser within which the fractionating or dephlegmating action together with the usual condensing actions are combined in the same apparatus. For this purpose in carrying out the invention the condenser which is a surface condenser is provided with means for causing the condensable vapors to commingle with the condensate in the condenser, and for this purpose a series or plurality of suitably placed fractionating or dephlegmating pans or equivalent devices are employed.

In carrying out the invention I also prefer to provide means for withdrawing the condensate from any or all of the fractionating or dephlegmating pans or similar devices, and to furthermore employ suitable means for effecting a temperature control in the condenser or in any one of a series of condensers when a battery of the same is employed.

The invention will be hereinafter more particularly described in conjunction with the accompanying drawings, in which

Figure 1 is an elevation and partial central vertical section illustrating a condenser made in accordance therewith.

Fig. 2 is a plan illustrating a battery of condensers.

Fig. 3 is a sectional elevation illustrating a manner of placing the fractionating or dephlegmating pans, and

Fig. 4 is a section on line 4—4, Fig. 3.

In carrying out my present invention, the condenser employed is preferably of the tubular type and as will be understood, a cooling medium may be caused to flow through the tubes and the condensable vapors admitted to the shell or body of the condenser so as to surround the tubes, or the circulating or cooling medium may be caused to flow

through the body or shell of the condenser and the condensable vapors introduced into the tubes so as to be condensed therein. In illustrating the invention, the former type of apparatus is shown. It will furthermore be understood, that the condenser employed in carrying out the invention may be constructed to comprise a single pass, a double pass or any multiple of passes for the circulating or cooling medium, and also that the condenser unit embodying the invention may be employed in any desired or necessary numbers comprising a battery of units which constitute a single operating apparatus. As will be apparent and still furthermore understood, the condensers may be arranged so that the tube elements are placed either horizontally or vertically, as occasion may require.

By reference to the drawings and particularly to Figs. 1 to 4 inclusive, it will be seen that in carrying out this invention each condenser unit comprises a body or shell 10. The form of condenser shown in Figs. 1 and 2 is that of the vertical type and beneath the shell 10 there is a box 11 for the circulating or cooling medium and this is mounted on a base plate or cover 12. The ends of the shell and also of the box for the circulating medium are suitably flanged and between the flange at the upper end of the box 11 and the lower end of the shell 10, the usual tube plate 13 is placed. Fixed at corresponding ends in the tube plate 13 are the tubes indicated at 14. At their upper ends these tubes are connected in heads indicated at 15 and 16, so that the condenser unit contains two sets of tubes each of the double pass type. At the upper end of the condenser unit there is a bonnet 17 enclosing the unit at the top thereof.

In a suitable position the condenser shell is provided with a vapor inlet 18 and also with a condensate outlet 19. In this instance the vapor inlet is at the upper end of the shell and the condensate outlet at or adjacent the lower end of the shell. Interiorly the shell is divided into compartments by a partition wall 20 which may be secured in position therein in any desired manner and preferably extends from the bonnet 17 at the upper end thereof to a point adjacent the lower end of the shell at the opposite end thereof. The box 11 for the circulating

medium is provided with inlets 21 and 22 for the circulating medium and with outlets 23 and 24 for the circulating medium. In this type the condenser unit is preferably rectangular and the circulating medium inlets are placed at one side thereof, and the circulating medium outlets at the opposite side thereof. Extending through the box 11 for the circulating medium there is a division plate or partition wall 11'. Also extending through the water box 11 and at right angles to the partition wall 11' is another partition wall 11² which is necessary for properly directing the flow of the circulating medium through the tubes of the apparatus. In the use of this condenser the circulating medium consequently enters one set of tubes by way of the inlet connection 21, passes upwardly through the tubes *a* to the head 15, downwardly through the tubes *b* to the outlet 23. Similarly a portion of the circulating medium passes through the other sets of tubes entering the box 11 by way of the inlet 22, passing upwardly through the tubes *c* to the head 16 and then downwardly through the tubes *d* to the outlet connection 24.

As hereinbefore stated, condenser units may be employed in batteries of any desired number. As illustrated in Fig. 2 in conjunction with the initial condenser unit as hereinbefore described there are shown four additional units associated therewith and designated respectively at 25, 26, 27 and 28. The circulating medium to the initial unit and also the units 25 and 26 may be supplied through a manifold 29. Between the manifold 29 and the inlet connections to the respective units I employ sets of valves indicated for the units respectively at 30, 31 and 32. These valves as will be understood, may be manually operated or automatically operated by means of a suitable thermostatic device or otherwise, to regulate the flow of the circulating medium to and through the several condenser units and in this manner to effect a temperature control therein. Similarly the circulating medium as the same passes from the condenser units may be carried away through a manifold 33. The manifold 33 is connected to the sets of outlets for the circulating medium from the units of the apparatus by way of valves 34, 35 and 36 for the respective units. This type of apparatus is adapted for the utilization of the oil as a circulating medium in the initial and succeeding units 25 and 26. This as will be understood increases the temperature of the oil when thus used as a circulating medium before the same is vaporized, thereby requiring less heat to vaporize the material which is being operated upon in the apparatus. In the final units of the battery, water or other liquid may be employed as the circulating medium and supplied to the

units by a manifold 37. This manifold 37 is connected to the respective inlets for the circulating medium by means of valves 38 and 39. These valves may be operated manually or automatically as hereinbefore stated, to effect a temperature control in each individual unit of the apparatus. The circulating medium as the same leaves the units 27 and 28 may be conveyed away by a manifold 40. This manifold 40 is connected to the circulating medium outlets of these units by valves indicated at 41 and 42 for the respective condenser units. It will be understood of course, that the extent to which the outlet valves are open may be controlled automatically and that the positions of these valves are naturally dependent upon the positions of the valves at the circulating medium inlet side of the apparatus.

Interiorly the body of the condenser is provided with a plurality of fractionating or dephlegmating pans indicated at 43. These pans may be of any desired number or type and are placed in any suitable or necessary positions within the body of the condenser unit. Furthermore, they may also be maintained in position in any desired manner. As shown in Fig. 1 of the drawing, however, each of these pans 43 is provided with an upturned rim 44 in order that each pan may receive and retain the predetermined part of the condensate, which after the pan becomes filled, overflows the rim and drips to the next succeeding pan in order that thereby the uncondensed vapors may be caused to intimately commingle with this condensate as both the condensate and the condensable and non-condensable vapors pass through the apparatus. In this form of apparatus the vapors as hereinbefore stated, are admitted through the inlet connection 18. They then pass downwardly through the outer section of the condenser body around the sets of tubes *a-b* and under the lower end of the partition wall 20, and then upwardly around the tubes *c-d*, the non-condensable vapors and the condensable vapors still remaining uncondensed pass by way of the outlet opening 18' to the next succeeding unit of the apparatus. It will be understood of course, that the condensate from each apparatus may be withdrawn in the customary or any suitable manner by way of the condensate outlet 19.

The fractionating or dephlegmating pans or condensate receptacles as hereinbefore stated, may be formed and maintained in position in a suitable manner. As illustrated in Figs. 3 and 4, however, each of these pans 43 may be made of sheet metal and provided with a plurality of apertures corresponding in number and position with the tubes which are caused to pass through the pan. Each aperture as indicated at 45, as punched in the pan is preferably of a smaller diameter than that of the tube which passes through

the same, and in predetermined positions it is slotted radially as indicated at 46, so that when the tubes are forced through the apertures in the pan a flange 47 is turned upwardly to surround and engage the outer surface of each tube. Also as indicated in these figures, I may employ bolts 48 fixed in the tube plate in suitable positions and extending through apertures 49 provided therefor in the fractionating or dephlegmating pans. Each of these bolts is fitted with spacer sleeves 50 and 51 extending between adjacent pans in order to support and maintain the same positively in position.

Also as shown in Fig. 1, the shell 10 may be provided with a plurality of outlet apertures 52 each making communication with one of the dephlegmating pans in order that when necessary or desirable any pan may be drained, it being understood that any suitable connection may be made with these drains for this purpose. It will also be apparent that the forms of the invention herein shown and described are illustrative merely of apparatus that may be used in carrying out the invention, as other equivalent devices of apparatus may be used to

equal advantage without departing from the nature and spirit of the invention.

I claim as my invention:

1. In a surface condenser, a shell, a plurality of staggered pans within the condenser shell for receiving condensate and causing the same to intimately commingle with the vapors in the shell, a plurality of tubes passing through the said pans, and means for circulating a cooling medium through the said tubes.

2. In a surface condenser, a shell, a plurality of superimposed fractionating or dephlegmating pans staggered within the said shell for receiving and containing quantities of condensate and from each of which the condensate flows to the next succeeding lower pan whereby the condensate is caused to intimately commingle with the vapors in the condenser shell, a plurality of tubes extend through the said pans, and means for circulating a cooling medium through the said tubes.

Signed by me this 26th day of August, 1924.

FRANCIS B. SANDO.

CERTIFICATE OF CORRECTION.

Patent No. 1,669,210.

Granted May 8, 1928, to

FRANCIS B. SANDO.

It is hereby certified that the name of the assignee in the above numbered patent was erroneously written and printed as "Foster Wheel Corporation", whereas said name should have been written and printed as "Foster Wheeler Corporation", as shown by the records of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 19th day of June, A. D. 1928.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.

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