March 20, 1945. A. Y. GUNTER 2,372,079

HEAT EXCHANGER

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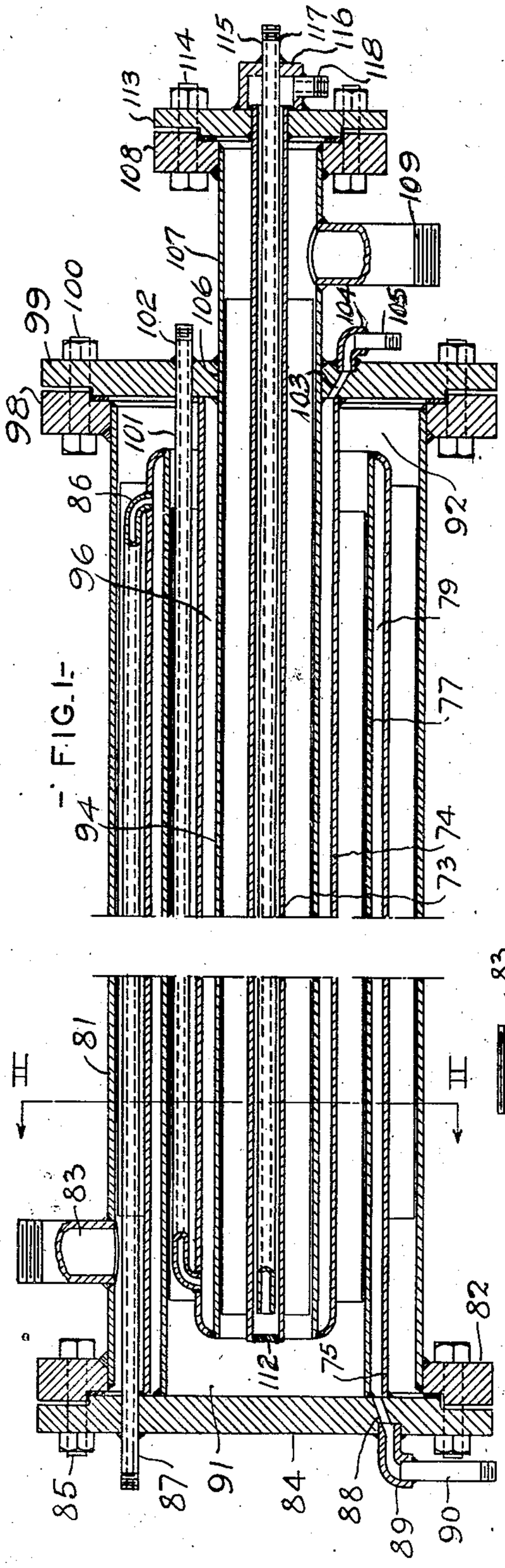
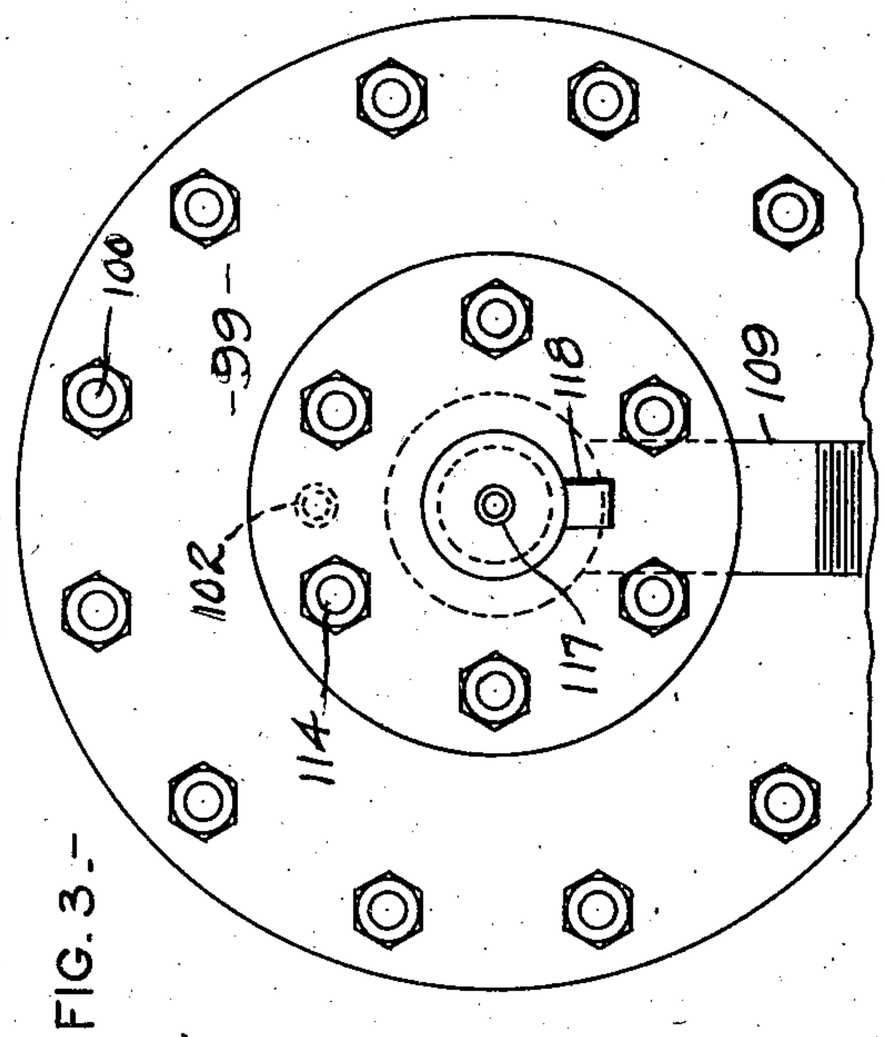
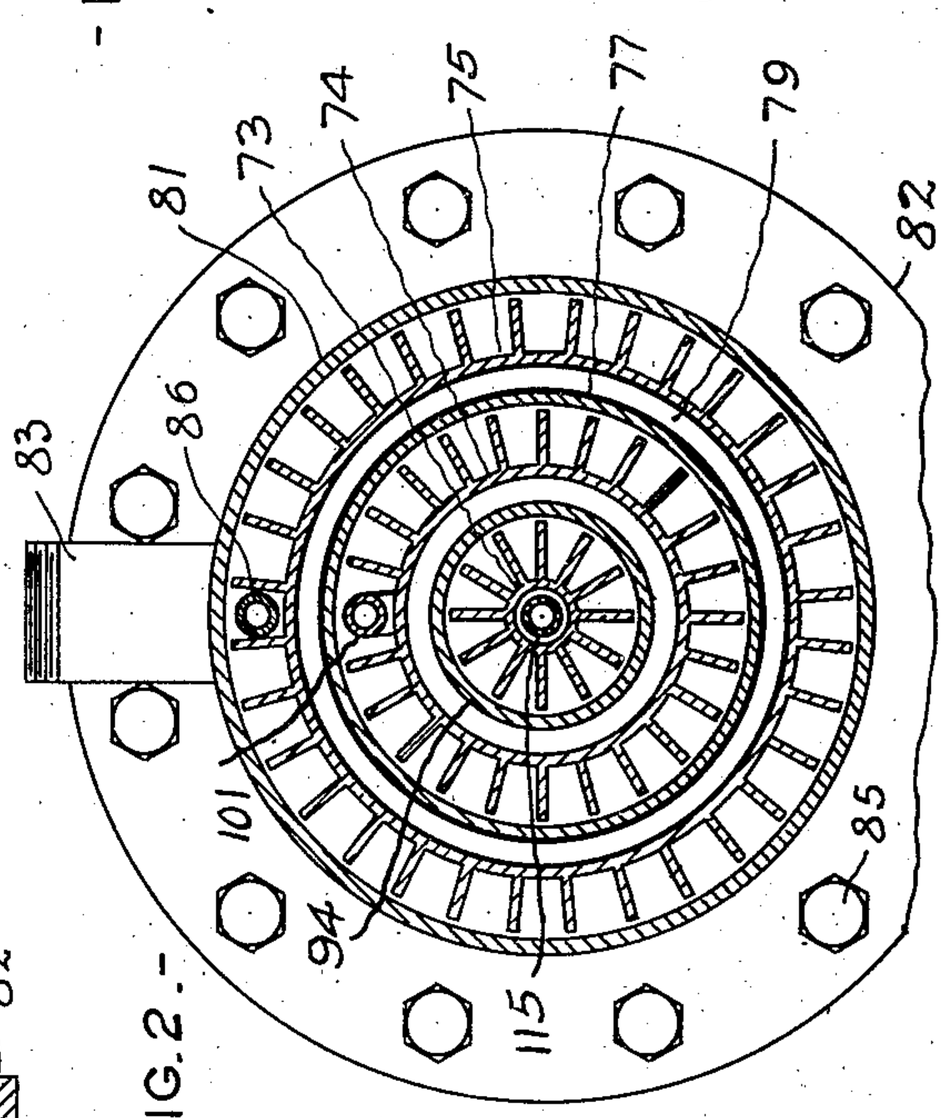


- FIG. 1. -



- FIG. 3. -

- FIG. 4. -



- FIG. 2. -

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HEAT EXCHANGER

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1 Claim. (Cl. 257—246)

This invention relates to heat exchangers.

The object of the present invention is to provide a heat exchanger of the shell type having detachable end covers, tubes within the shell spaced one within the other, and outlet and inlet means, the various parts being so associated as to adapt the exchanger for flow of a treating fluid and for series flow of fluid to be treated, and further for certain of the parts to be removable with one of the covers as a unit and for certain other parts to be removable with the other cover as a unit.

Referring to the drawing forming part of this application, Figure 1 is a foreshortened vertical longitudinal central section of a heat exchanger embodying the present invention, parts being shown in full and parts being broken away; Fig. 2 is an enlarged section, broken away, of the exchanger of Fig. 1 on the line II—II thereof; and Fig. 3 is an enlarged end view, broken away, of the exchanger of Fig. 1, viewed from the right thereof.

Referring generally to the invention, the heat exchanger is not, in all instances, limited as to its position but as it will ordinarily be disposed in a horizontal position it is so shown and will be, for convenience, so described. The elements, such as tubes, and chambers and pipes disposed parallel thereto, will therefore be considered with the outer shell as extending longitudinally in a horizontal direction. The chambers and pipes aforesaid are for the heating or cooling fluid medium.

The exchanger of the present invention may be used to heat or cool a fluid to be treated or it may be used as a vaporizer, the fluid to be treated in this instance being introduced in liquid form and appropriate inlets and outlets being provided. Or the exchanger may be used as a condenser, the fluid to be treated in this instance being introduced in vapor form and appropriate inlets and outlets being provided. Of course the heating or cooling treating fluid will also undergo a change which may be heating, cooling, vaporizing or condensing.

The heat exchanger comprises an inner fin-tube 73, an intermediate fin-tube 74, and an outer fin-tube 75. Between the fin-tubes 74 and 75 is a bare tube 77, spaced from the fin-tube 75 providing therebetween a chamber 79. The shell 81 of the heat exchanger is provided with a bolting flange 82 and an inlet 83 adjacent the flange for oil or other fluid to be treated. A detachable cover plate 84 is secured to the flange by bolts 85. The fin-tube 75 and the bare tube 77 at corresponding ends are secured to the cover plate 84 thereby closing the adjacent end of the chamber 79.

A pipe 86 is disposed exteriorly of the tube 75 between two of the fins thereof. The pipe 86 at one end thereof is connected to the chamber 79 at the end thereof remote from the cover plate 84. The pipe 86 at its other end extends through the cover plate 84 providing an extended portion 87 serving as an inlet for steam or other treating fluid to the chamber 79. The bottom of the chamber 79 at its end adjacent the cover plate 84 is connected to the exterior through an orifice 88 in the cover plate 84, a pipe fitting 89 and a nipple 90 which serves as a drain or outlet for condensate, and steam if any there be, coming from the chamber 79.

The exchanger is provided with a passage 91 within the bare tube 77 at the end of the exchanger adjacent the cover plate 84, and another passage 92 between the fin-tube 74 and the shell 81 at the other end of the exchanger for purposes later to appear.

The cover plate 84 and the parts connected therewith, as aforedescribed, are easily withdrawn, as a unit, from the shell 81 and other parts of the exchanger by merely removing the bolts 85.

Between the fin-tubes 73 and 74 is a bare tube 94 spaced from the fin-tube 74 providing therebetween a chamber 96. The shell 81 at its end remote from the flange 82 is provided with another bolting flange 98. A detachable cover plate 99 is secured to the flange 98 by bolts 100. Fin-tube 74 and bare tube 94 are secured to the cover plate 99 thereby closing the adjacent end of the chamber 96. The opposite end of chamber 96 is closed by sealing the adjacent ends of the fin-tube 74 and the bare tube 94 together, as clearly shown in Fig. 1. And likewise the fin-tube 75 and bare tube 77 at their ends remote from the cover plate 84 are sealed together, thus closing the chamber 79 at its adjacent end.

A pipe 101 is disposed exteriorly of the tube 74 between two of the fins thereof. The pipe 101 at one end thereof is connected to the chamber 96 at the end thereof remote from the cover plate 99. The pipe 101 at its other end extends through the cover plate 99 providing an extended portion 102 serving as an inlet for steam or other treating fluid to the chamber 96. The bottom of the chamber 96 at its end adjacent the cover plate 99 is connected to the exterior through an orifice 103 in the cover plate 99, a pipe fitting 104 and a nipple 105 which serves as

a dr in or outlet for condensate, and steam if any here be, coming from the chamber 96.

Cover plate 99 is provided with an orifice 106 through which the bare tube 94 extends, providing an exterior extended portion 107 having at its outer end a bolting flange 108 and an outlet 109 for the oil or other treated fluid.

The fin-tube 73 is closed at its end adjacent passage 91 by a disc plate 112. The fin-tube 73 at its other end extends through a cover plate 113 which is detachably connected to the flange 108 by bolts 114.

A pipe 115 extends through the interior of the fin-tube 73 in spaced relation therewith, and is open thereto at its end adjacent the disc plate 112, which end may be supported in the fin-tube, if desired, by suitable supporting means (not shown). A fitting 116 is secured to the cover plate 113 and the pipe 115 extends through this fitting providing an extended portion 117 serving as an inlet for the steam or other treating fluid to the interior of the fin-tube 73. A nipple 118 extends from the fitting 116 which serves as an outlet or drain for condensate, or steam if any there be, coming from the fin-tube 73.

The operation of the heat exchanger is as follows: Fluid to be treated enters the shell 81 at the inlet 83, flows between the shell 81 and the fin-tube 75 to the passage 92. From here it flows in the reverse direction between the bare tube 77 and the fin-tube 74 to the passage 91. From here it flows in the reverse direction between the bare tube 94 and the fin-tube 73 to the outlet 109. Thus the fluid to be treated makes three passes in series from the inlet 83 to the outlet 109.

Treating fluid for the first two passes of the fluid to be treated enters the chamber 79 from the pipe 86, this treating fluid leaving chamber 79 through the nipple 90. Treating fluid for further treating the second pass and for treating the third pass of the fluid to be treated enters chamber 96 from the pipe 101, this treating fluid leaving chamber 96 through nipple 105. The third pass is further treated by the treating fluid entering the fin-tube 73 from the pipe 115, this treating fluid leaving fin-tube 73 through nipple 118.

It should be noted that the direction of flow of the fluid to be treated and of the treating fluid, or either of them, may be reversed if desired. Also any appropriate fluid to be treated and treating fluid may be employed as desired. It will be understood that the various outlet and inlet fittings will usually be threaded at their ends for coupling with other parts (not shown but according to usual practice).

Similar to the manner of withdrawal, as stated, of the cover plate 84 and the parts connected therewith, the cover plate 113 and the parts connected therewith, as aforedescribed, are easily withdrawn, as a unit, from bare tube 94 by merely removing the bolts 114; also the cover plate 99 and the parts connected therewith, as aforedescribed, may be similarly withdrawn from the shell 81 by merely removing the bolts 100.

While there has been hereinbefore described an approved embodiment of this invention, it will be understood that many and various changes and modifications in form, arrangement of parts and details of construction thereof may be made without departing from the spirit of the invention, and that all such changes and modifications as fall within the scope of the appended claim are contemplated as a part of this invention.

The invention claimed and desired to be secured by Letters Patent is:

A heat exchanger comprising a shell providing a chamber open to the exterior; a detachable cover at each end of said shell; a pair of tubes spaced one within the other within said shell, secured at one end to one of said covers, said space being closed from said chamber and having inlet and outlet means passing through said one of said covers, the inner of said tubes being open at its opposite end to said chamber; and a second pair of tubes spaced one within the other within said inner tube secured at one end to the other of said covers, said last mentioned space being closed from said chamber and having inlet and outlet means passing through said other cover, the inner of said second pair of tubes being open to the exterior and being open at its opposite end to said inner of said first mentioned pair of tubes, said covers with their respective tubes and inlet and outlet means being each detachable from said shell as a unit.

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