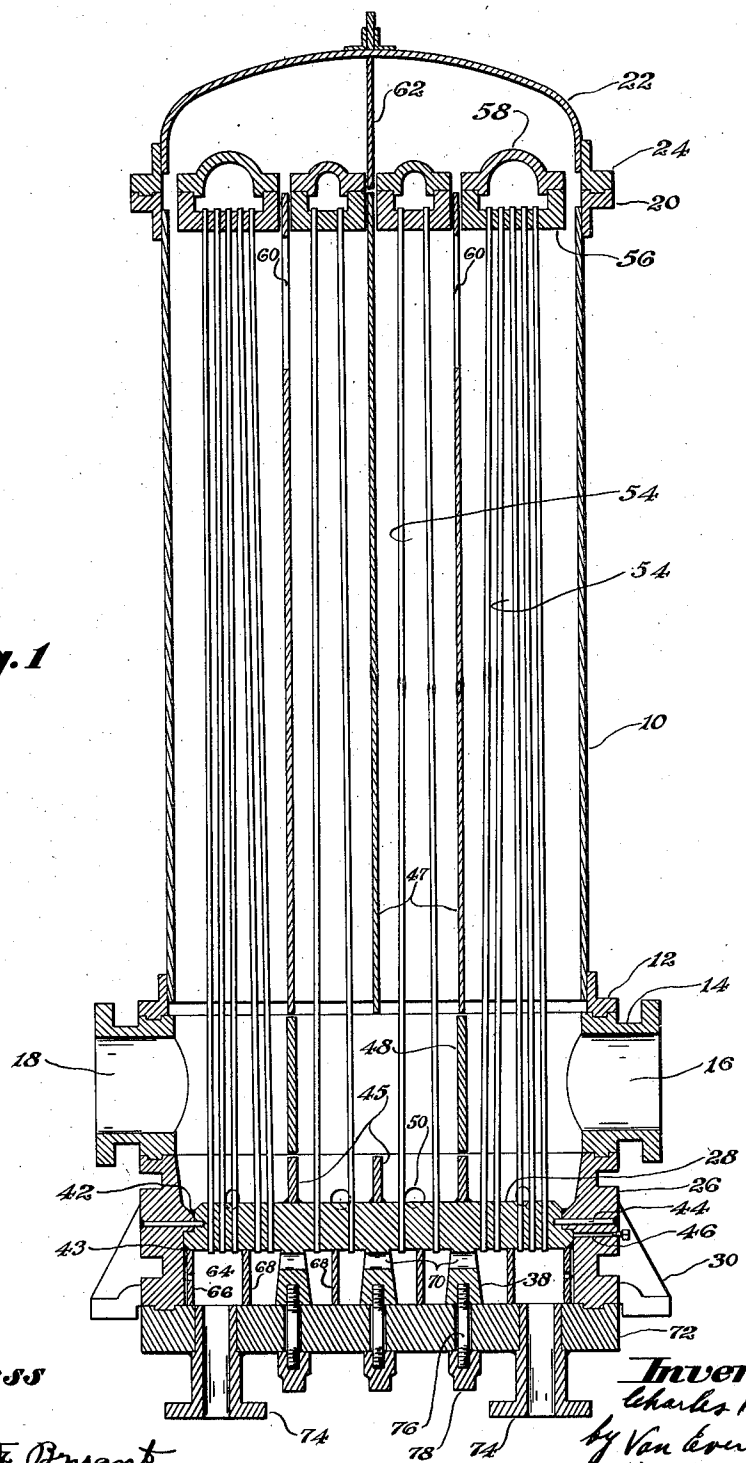
Nov. 17, 1936. C. H. LEACH 2,061,429

HEAT EXCHANGE APPARATUS

Original Filed April 13, 1932 2 Sheets-Sheet 1

Fig. 1



Witness

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Fig. 2

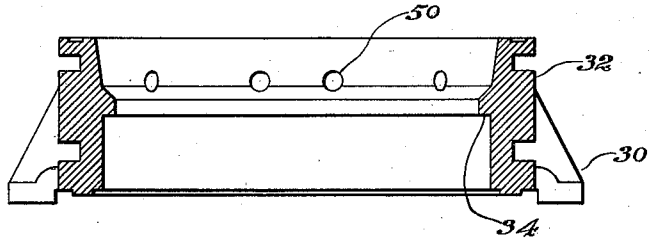


Fig. 3

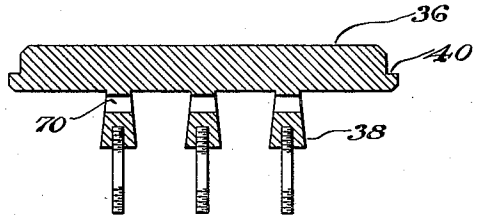


Fig. 4

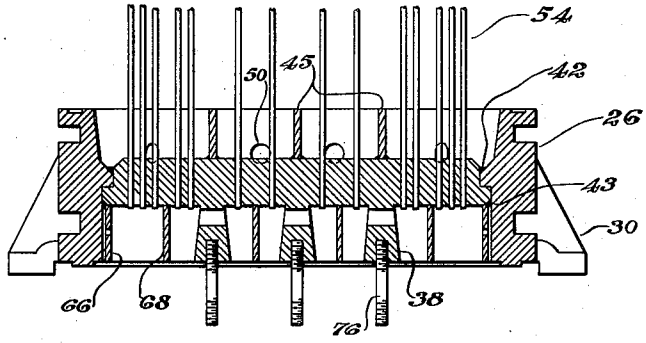
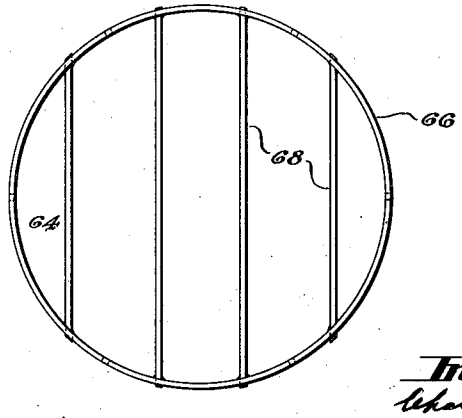


Fig. 5



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UNITED STATES PATENT OFFICE

2,061,429

HEAT EXCHANGE APPARATUS

Charles H. Leach, Roselle, N. J.

Application April 13, 1932, Serial No. 605,011
Renewed October 18, 1935

8 Claims. (Cl. 257—223)

The present invention relates to heat exchange apparatus, and more particularly to heat exchange apparatus employed for the condensation of oil vapors.

It is the object of the invention to provide a simple, practical and long-lived apparatus of this character, capable of successfully withstanding the corrosive effects of condensate and the high pressures which may occur under certain conditions of operation.

With this and other objects in view, the various features of the invention consist in certain novel features of construction, combinations and arrangements of parts hereinafter described and claimed, the advantages of which will be obvious to those skilled in the art from the following description.

In the accompanying drawings illustrating the preferred form of the invention, Fig. 1 is a section in elevation, partially diagrammatic, of the improved condenser; Fig. 2 is a detail illustrating a section of the basin ring forging before assembly with the flat tube plate; Fig. 3 is a detail showing a section of the flat tube plate; Fig. 4 is a detail illustrating a section of the lower end of the condenser with the ring forging and plate assembly, the tube ends connected thereinto; and Fig. 5 is a plan of the removable grating for forming the cooling liquid passages.

The apparatus shown in the illustrated embodiment of the invention comprises generally a shell 10 provided at its lower end with a securing flange 12 mounted upon and detachably connected to a nozzle ring 14, which may be a forging with the nozzles 16 and 18 formed integrally therewith. The upper end of the shell is provided with a securing flange 20, and is surmounted by a cover 22 detachably connected thereto through a flange 24. The condenser as a whole is supported upon a ring 26, having a transverse web portion 28, the ring being provided with supporting brackets 30, as indicated. The ring is preferably made as a steel forging 32, shown in Fig. 2, this forging having an inwardly projected circumferential rib 34. The transverse web 28 is formed by a flat rolled plate, or preferably a forging 36, having projecting transverse partitions 38 formed thereon. The plate is provided with a circumferential shoulder 40, which engages with the rib 34 in the manner shown in Fig. 4, when the two parts are assembled. After assembly, the two parts are permanently connected in assembled relation by welded areas indicated at 42 and 43. The production of the base member in two parts with subsequent assembly, facilitates forging and machining without sacrifice of strength, rigidity or resistance to corrosion. The ring forging and rolled plate, in addition to welding, may be connected by auxiliary connecting means such as the dowel pins 44 disposed thereabout, as indicated. It will be noted therefore that the periphery of the tube sheet intermediate the welded areas is free from attachment with the inner surface of the ring. In addition, I provide a test opening 46 extending inwardly of the ring to the meeting faces of the ring and plate for the purpose of indicating whether the joint is tight after connection. After the welding is completed, this opening may be connected to a test pump which supplies pressure to the meeting faces, any imperfection in the weld resulting in a seepage of fluid under pressure either above or below the rolled plate, this seepage indicating an imperfection, if any, in either weld. Subsequent to assembly and during the use of the apparatus, the test opening may be connected to a suitable vent, any leakage resulting in the venting of fluid. In this case the character of the fluid, whether condensate or crude charge oil, if this is employed for cooling, will indicate the direction in which leakage is taking place, whether from above or below the plate.

The condensate basins are formed above the web by a series of transverse partition plates 45, which are assembled and welded to the base member, and which are co-extensive when the parts are assembled with baffles or partitions 47 extending lengthwise of the condenser from top to bottom. The complete baffle arrangement is formed by the baffles 47, partitions 45 and intermediate partition sections 48, provided in the nozzle ring before assembly. The purpose of the partitions, as will be evident, is to provide a circuitous path for the flow of vapor through the inner tubular region, and to provide a separate and individual condensate basin associated with each vapor pass therebeneath. The basin ring forging is pierced by separate openings 50, designed to drain each of the condensate basins, the openings for this purpose being substantially flush with the top of the flat tube head 36.

The interior of the shell is provided with a series of tube bundles 54, one for each vapor pass. These tube bundles are all connected at their lower ends to the flat head 36, extending therethrough as indicated. At the upper end each tube bundle is connected to a floating head 56, closed by a detachable cover 58 to provide a passage communicating with the interior of the tubes for the reversal of cooling

liquid flow therethrough. The intermediate partitions 47 extend upwardly between the floating heads at their upper ends, all as indicated in Fig. 1. Certain of the partitions also are provided with vapor openings or passages 60 for providing intercommunication between the vapor passes. With this construction, the shell 10 may be disconnected and removed from about the tubes with the connected partitions 47 without disturbing the tubes or the connected heads.

The cover member 22 is provided with a partition 62 for dividing the space above the floating heads and preventing short-circuiting of vapor which may leak by the floating heads from the intertubular space therebelow.

The control of the flow of cooling fluid through the tubes is obtained through a series of cooling fluid passages 64 beneath the head 36. These cooling fluid passages are provided by an inserted ring 66, fitting within the forged ring 26 and having a series of transverse partitions 68 welded therein, as indicated in Fig. 5. The passages so formed direct cooling fluid alternately through successive banks of tubes, as will be evident to those skilled in the art, and provides the necessary multiplicity of passages without expensive machining or coring of the forged ring or connected plate. The integral projection 38 on the plate is provided with openings 70 to complement the partition 68 to control the liquid flow. The bottom of the forged ring and the cooling passages therein are closed by a flat cover member 72, which may be a rolled steel plate having liquid nozzles 74 mounted therein, as indicated. The cover is rigidly retained in assembled relation through securing members 76, threaded into the integral lug 38 and covered by caps 78.

What is claimed is:

1. Heat exchange apparatus comprising a ring, a flat tube plate of substantial thickness welded to the ring, and a test opening extending transversely of the ring to the meeting faces of the ring and tube plate, the test opening serving as an indication of leakage through the joint between the tube plate and ring.

2. Heat exchange apparatus comprising a ring, a flat tube plate of substantial thickness welded to the ring adjacent its upper and lower faces, and a test opening extending transversely of the ring between the two welded regions and designed to indicate leakage through either welded region.

3. In heat exchange apparatus for use in refining petroleum oil, an annular metal supporting member formed with an integral rib extending substantially around its inner surface, and a tube sheet of substantially the same size and shape as the space inside said member positioned inside said member adjacent said rib and formed with a recess to receive said rib and with an abutment portion to engage the side thereof, said tube sheet and member being provided with annular welded connections adjacent the upper and lower surface of the tube sheet and the member being provided with an opening intermediate the two welded connections to reveal leakage in either connection.

4. In heat exchange apparatus for use in refining petroleum oil, a metal ring formed with a projecting portion on its inner surface and a tube sheet positioned inside said ring adjacent the projecting portion and formed with a portion engaging the projecting portion so as to position the tube sheet and aid in holding it in place, said tube sheet having adjacent one surface a continuous sealing connection with said ring, the periphery of the tube sheet intermediate the upper and lower portions being free from attachment with the inner surface of the ring.

5. In heat exchange apparatus for use in refining petroleum oil, a metal ring formed with a projecting portion on its inner surface and a tube sheet positioned inside said ring adjacent the projecting portion and formed with a portion engaging the projecting portion so as to position the tube sheet and aid in holding it in place, said tube sheet having adjacent its upper and lower surfaces continuous sealing connections with said ring, the periphery of the tube sheet intermediate the upper and lower portions being free from attachment with the inner surface of the ring.

6. In heat exchange apparatus for use in refining petroleum oil, a metal ring formed with an annular projecting portion on its inner surface and a tube sheet positioned in said ring adjacent the projecting portion and formed with an annular recess to receive said projecting portion and an abutment wall engaging one side of the projecting portion, said tube sheet having adjacent one surface an annular sealing connection with the inner surface of the ring, the periphery of the tube sheet intermediate the upper and lower portions being free from attachment with the inner surface of the ring.

7. In heat exchange apparatus for use in refining petroleum oil, a metal ring, a tube sheet positioned in said ring and having adjacent one surface an annular sealing connection with the inner surface of the ring, said tube sheet and ring having auxiliary connecting and positioning means at spaced intervals around the periphery of the tube sheet, the remaining portions of the periphery of the tube sheet intermediate the upper and lower surfaces being free from connection with the ring.

8. In heat exchange apparatus for use in refining petroleum oil, a metal ring, and a tube sheet positioned in the ring and having adjacent its upper and lower surfaces annular sealing connections with the inner surface of the ring, the periphery of the tube sheet intermediate the upper and lower portions being free from attachment with the inner surface of the ring.

CHARLES H. LEACH.