Aug. 27, 1935. T. G. SUMERFIELD 2,012,920

FLUID COOLER OR HEAT EXCHANGER

Filed May 18, 1935 3 Sheets-Sheet 1

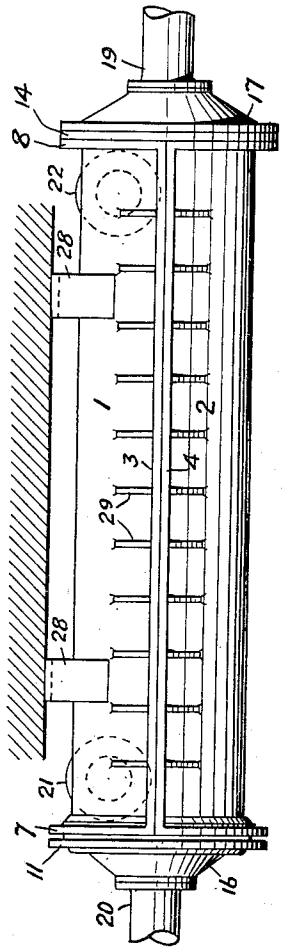



FIG. 2.

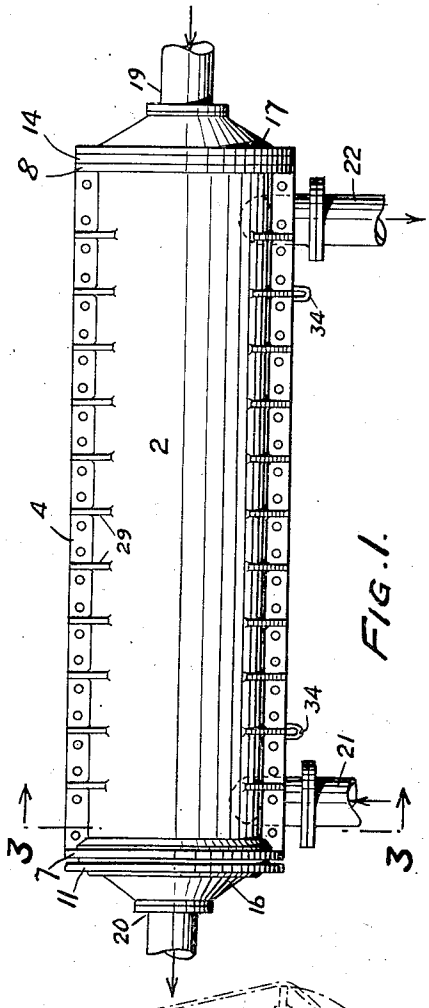



FIG. 1.

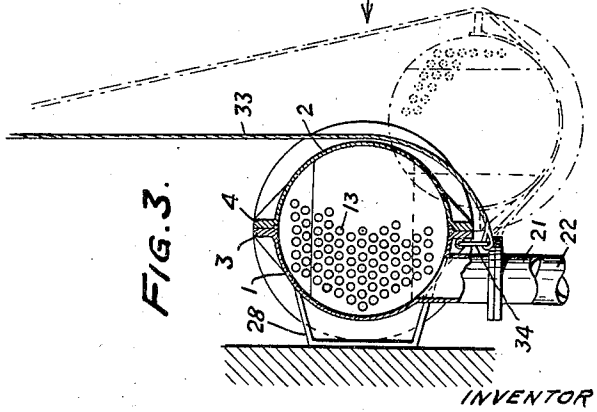



FIG. 3.

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FLUID COOLER OR HEAT EXCHANGER

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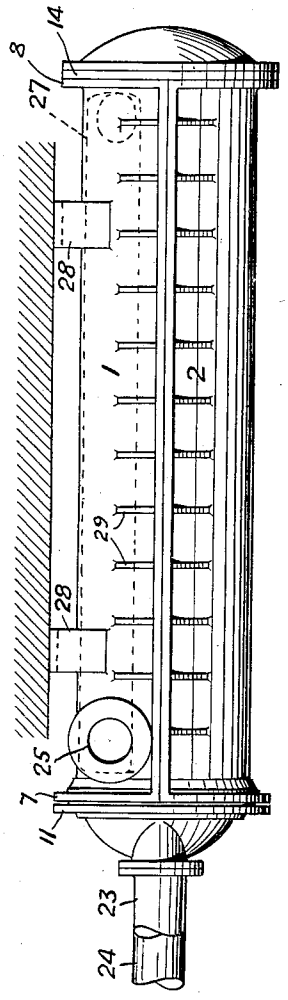



FIG. 5.

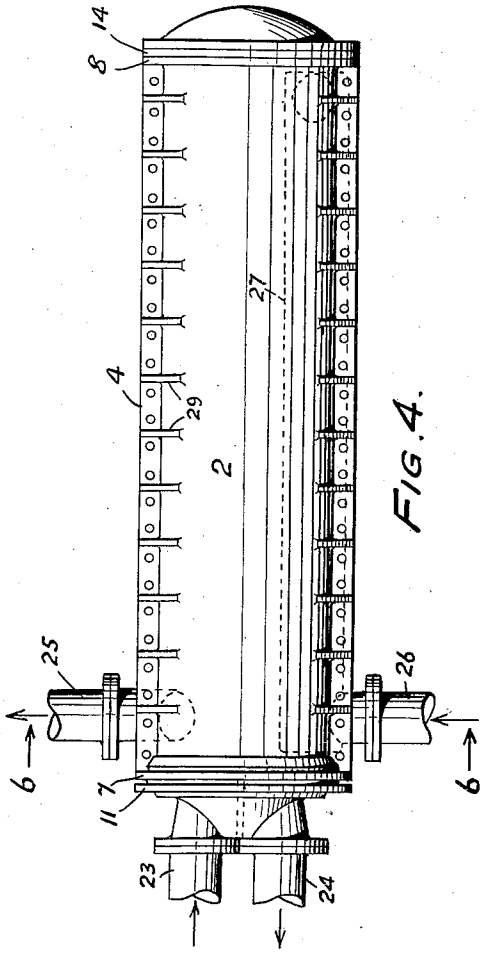



FIG. 4.

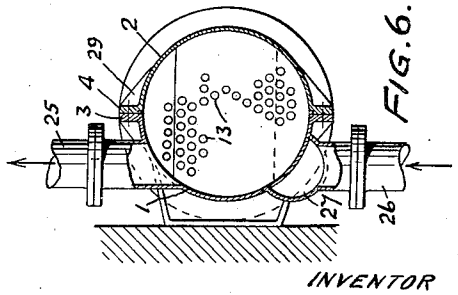



FIG. 6.

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FLUID COOLER OR HEAT EXCHANGER

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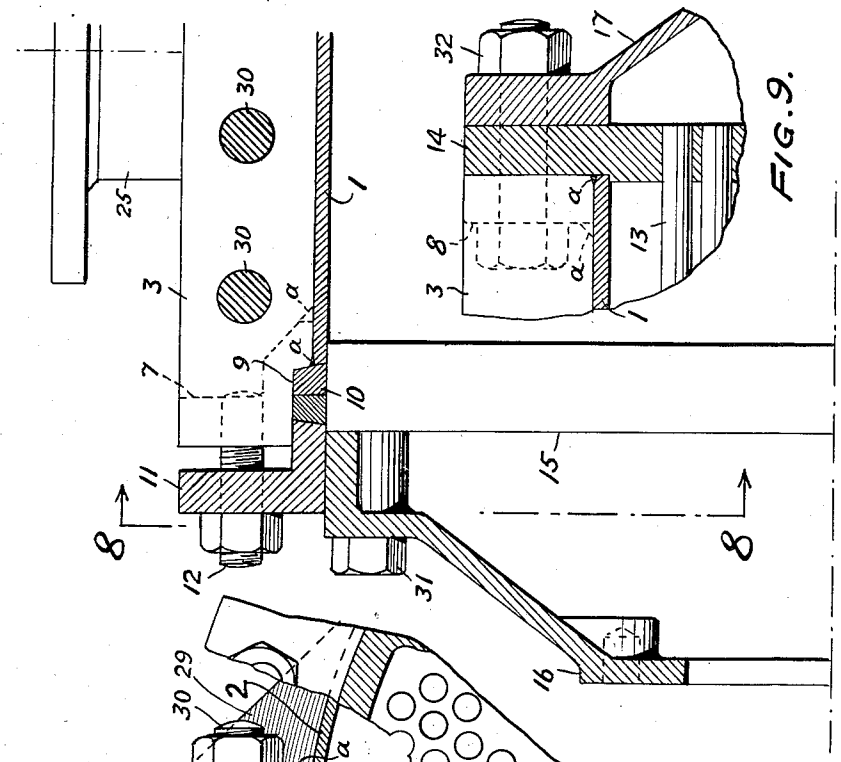


FIG. 9.

FIG. 7.

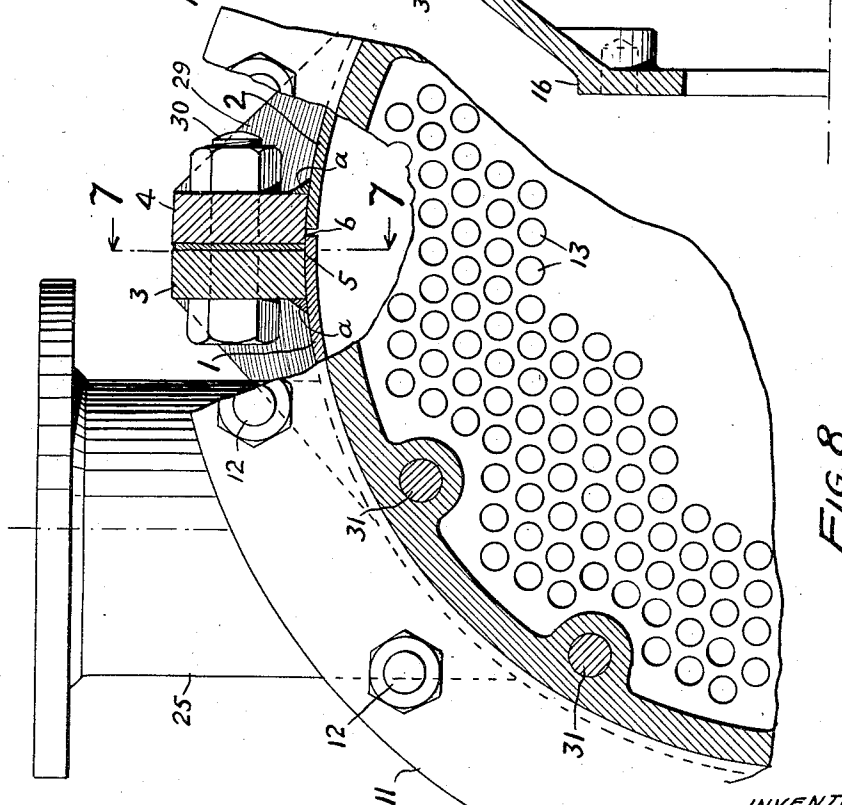


FIG. 8.

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# UNITED STATES PATENT OFFICE

2,012,920

## FLUID COOLER OR HEAT EXCHANGER

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Application May 18, 1935, Serial No. 22,127

7 Claims. (Cl. 257—236)

Objects of the present invention are to facilitate assembly of the half shells of the coolers; to provide for removing the outermost half shell without breaking any pipe connections; to permit of the inspection and test of the tube bundle without removing the tube bundle from the line; to provide for removing the tube bundle either longitudinally or from the side of the cooler; to provide for removing the tube bundle in a small space; and to provide connections for a cooler at one end of the shell.

Other objects of the invention will appear from the following description at the end of which the invention will be claimed.

The invention, generally stated, consists in half cylindrical shell segments having marginal abutting flanges of which the roots are spaced respectively inside and outside of the longitudinal edges of the segments to provide a longitudinal lap; half ring segments secured at the ends of the flanges and to the adjacent end surfaces of the shell segments, and of which two are channelled for the reception of packing, a packing in the channelled ring segments; a packing ring secured to the face of the channelled ring segments; a tube bundle having tube sheets, of which one is fixed to the segments constituting one ring and is grooved for the reception of the ends of the shell segments, and of which the other is movable in and extractable from the shell and is packed by said packing; heads bolted respectively to one of the tube sheets and to one of said segmental rings; and pipe connections confined to one of the shell sections.

The invention also comprises the improvements to be presently described and finally claimed.

In the following description reference will be made to the accompanying drawings forming part hereof and in which,

Figure 1 is an elevational view of a cooler embodying features of the invention and illustrating that the same comprises a shell split longitudinally into half parts.

Figure 2 is a top or plan view of Figure 1.

Figure 3 is a sectional view taken on the line 3—3 of Figure 1 and illustrating in dotted lines the sidewise removal of the tube bundle.

Figure 4 is a view similar to Figure 1 illustrating a two pass cooler embodying features of the invention.

Figure 5 is a top or plan view of the same.

Figure 6 is a sectional view taken on the line 6—6 of Figure 4 and indicating some of the tubes of the tube bundle.

Figure 7 is a view drawn to an enlarged scale showing in cross section, taken on the line 7—7 of Figure 8, the construction at one end of the cooler.

Figure 8 is a sectional view taken on the line 8—8 of Figure 7, and

Figure 9 is a view similar to Figure 8 illustrating the construction at the other end of the cooler.

Referring to the drawings, and more particularly to Figures 7, 8 and 9, 1 and 2 are half cylindrical shell segments and they are provided with marginal abutting flanges 3 and 4 of which the roots 5 and 6 are spaced respectively outside and inside of the longitudinal edges of the segments 1 and 2 to provide a longitudinal lap. The lap is useful in assembling and disassembling the parts. There are half ring segments 7 and 8 secured at the end of the flanges 3 and 4 and to the adjacent end surface of the shell segments. At *a* there is indicating welding for this purpose. Both of the segments of the ring 7 are channelled as at 9 for the reception of packing 10. It may be remarked that the ends of the ribs are also cut away for the accommodation of the packing. 10 indicates packing in the channelled ring segments. 11 is a packing ring secured to the face of the channelled ring segment 7 as by means of bolts 12. The tube bundle includes tubes indicated at 13 and it is provided with tube sheets of which one 14 is fixed to the segments constituting one ring 8 and is grooved for the reception of the ends of the shell segments (Fig. 9), end of which the other 15 (Fig. 7) is movable in and extractable from the shell and is packed by the packing 10. 16 and 17 are heads of which one 17 is bolted through the tube sheet 14 to the segments of the ring 8 and of which the other is bolted to the tube sheet 15.

Referring to Figures 1 and 2, 19 and 20 are water connections through the respective heads and tubes 21 and 22 are oil connections to the space around the tubes which is usually fitted with suitable baffles which are well understood by those skilled in the art and which are omitted from the drawings for the sake of clearness.

Referring to Figures 4, 5 and 6, the water connections 23 and 24 are at one end of the cooler as are also the oil connections 25 and 26. The water connections lead through the tubes and the oil connections lead through a channel 27, provided on the outside of the shell; and around the tubes. In the construction shown in Figure 4 the water makes two passes. 28 indicates supports or brackets for one of the shell segments. 29 indicates gussets or braces interposed between the shell segments and the flanges and connected

with each. The flanges are detachably connected by bolts 30.

The oil connections 21 and 22 (Figs. 1 and 2) and 25 and 26 (Figs. 4 and 5) are confined to the shell segment which is fixed, for example, to the supports 28, leaving the other shell section free for removal. The water connections 23 and 24 (Fig. 4) are fixed to one head leaving the other head free for removal when the tube bundle is detached through one end of the shell. In speaking of oil and water it is well to state that the invention is not confined to those fluids.

In assembling the parts of the shell, the lap joint at 5 and 6 affords means positioning them and in order to further position them use may be made of dowel pins inserted through the holes in the flanges that are provided for the bolts 30.

In order to have access to the tube bundle all of the flange bolts 30 are removed and the bolts 12 which connect the complete ring 11 to one of the half rings 7 are removed, as are also half the bolts 32, then one segment of the shell can be taken off leaving the other segment held by its supports, and in doing this none of the pipe connections need be broken. If the tube bundle is to be removed, for example as shown in Figure 3, it is necessary to remove the bolts 31 and 32 as well as the bolts heretofore mentioned. When this is done the removable shell section can be rolled over into the bight of a cable 33 secured to a ring 34 provided in gussets 29 at the ends of the device. This operation is indicated in dotted lines in Figure 3. In this case none of the pipe connections are disturbed. It is possible to remove the bolts 31 and 32 and to withdraw the tube bundle from the righthand end of the device as shown in the drawings, and in the case of Figs. 4 and 5 this can be done without breaking any of the pipe connections. An examination of Figure 3 indicates that the tube bundle can be removed even when the cooler is arranged in a cramped space.

In some instances I have referred to the device as a fluid cooler, but inasmuch as it may be used for heating fluids, the intention to cover it for either purpose; therefore, it is a heat exchanger.

It will be obvious to those skilled in the art to which the invention relates that modifications may be made in details of construction and arrangement, in matters of mere form, without departing from the spirit of the invention which is not limited in respect to such matters or otherwise than as the prior art and the appended claims may require.

I claim:

1. In an oil or other fluid cooler or heat exchanger of the tubular removable tube bundle type, the combination of half cylindrical shell segments having marginal abutting flanges of which the roots are spaced respectively inside and outside of the longitudinal edges of the segments to provide a longitudinal lap, half ring segments secured at the ends of the flanges and to the adjacent end surfaces of the shell segments and of which two are channelled for the reception of packing, packing in said channelled ring segments, a packing ring secured to the face of the channelled ring segments, a tube bundle having tube sheets of which one is fixed to the segments constituting one ring and is grooved for the reception of the ends of the shell segments, and of which the other is movable in the shell and is packed by said packing, heads respectively bolted to one of the tube sheets and to one pair of half rings, and pipe fittings confined to one of the shell sections.

2. In an oil or other fluid cooler or heat exchanger of the tubular removable tube bundle type, the combination of a longitudinally split cooler shell provided at one end with the half segments of a ring, a tube bundle having a floating tube sheet, and a packing external of the floating tube sheet and inside of said half ring segments.

3. In an oil or other fluid cooler or heat exchanger of the tubular removable tube bundle type, the combination of a longitudinally split cooler shell having outward flanges at its edges and provided at each end with half ring segments secured to said flanges, said flanges providing lap joints, a tube bundle having tube sheets of which one is detachably secured to the segments of one ring and of which the other is movable in respect to the segments of the other ring, and a stuffing box external of the movable tube sheet and carried by the adjacent ring sections.

4. In apparatus of the type specified the combination of a longitudinally split cylindrical shell having flanged edges detachably connected together and of which one shell segment is fixedly supported and is provided with pipe connections and of which the other shell segment is removable and devoid of pipe connections, and a tube bundle mounted in the shell.

5. In apparatus of the type specified the combination of a longitudinally split cylindrical shell having flanged edges detachably connected together and of which one shell segment is fixedly supported and is provided with pipe connections and of which the other shell segment is removable and devoid of pipe connections, a tube bundle mounted in the shell, and eyes at the end parts of the removable shell segment for attachment to cables into the bights of which the shell section can be rolled to afford access to the tube bundle without breaking the pipe connections.

6. In apparatus of the type specified the combination of a longitudinally split cylindrical shell having flanged edges detachably connected together and of which one shell segment is fixedly supported and is provided with pipe connections and of which the other shell segment is removable and devoid of pipe connections, a tube bundle mounted in the shell, and gussets arranged between the flanges and shell segments and of which those at the ends of the removable shell segments are provided with rings.

7. In apparatus of the type specified the combination of semi-cylindrical shell sections each having marginal flanges, segmental end rings secure at the ends of the flanges and to the adjacent surfaces of the shell sections and of which one is a packing ring, gussets secured to the flanges and to the surface of the shell sections, a tube bundle having tube sheets of which one is fixed to one of said end rings, and of which the other is movable and extractable from the shell and is packed by said packing ring, and heads of which one is bolted to one of said rings and of which the other is bolted to the free tube sheet.

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