Nov. 26, 1940. S. E. DERBY 2,223,238

HEAT EXCHANGER

Filed Nov. 12, 1937

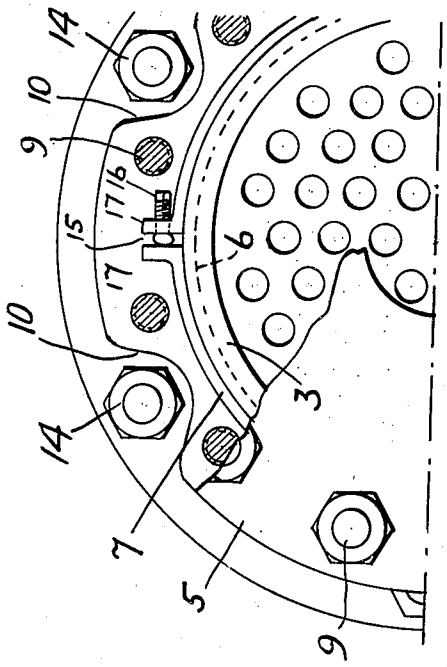


FIG. 2.

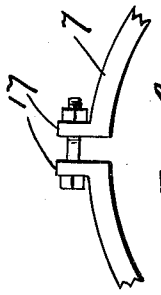


FIG. 4.

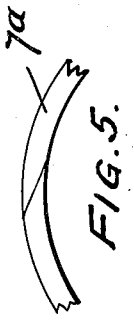


FIG. 5.

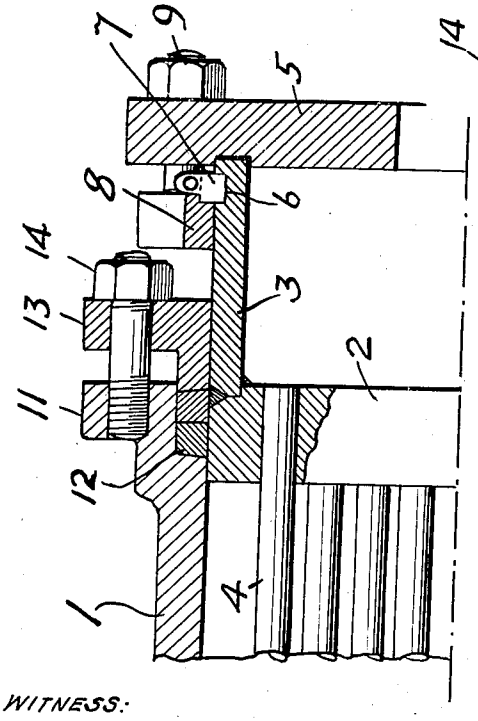


FIG. 1.

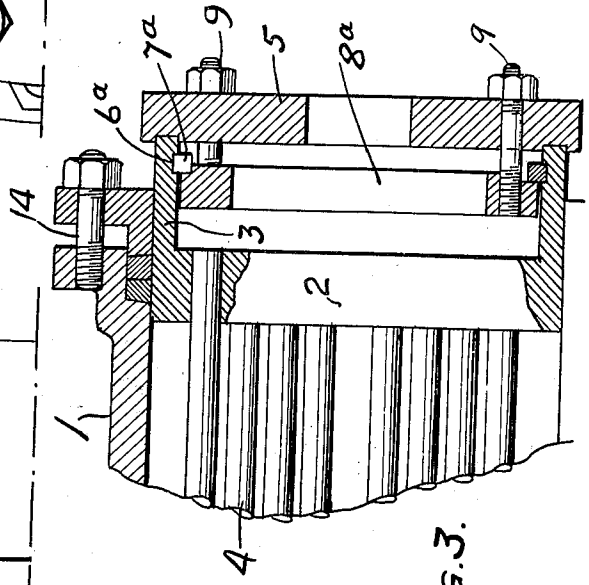


FIG. 3.

WITNESS:

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HEAT EXCHANGER

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1 Claim. (Cl. 257—236)

The object of the present invention is to provide for the accommodation of a maximum number of tubes in a tube sheet, or in other words, to secure the header to place in such a way that its fastenings do not occupy space otherwise available for tubes, so that tubes may be arranged as close to the periphery of the tube sheet as the latter will permit.

Another object of the invention is to provide a construction in which the space between the tube sheet and the header cover is comparatively small.

Another object of the invention is to provide for the convenient detachment and attachment of the header without detaching the parts so that they might become lost and in order to withdraw the bundle of tubes and the tube sheet through the shell.

Another object is to provide for replacing or repairing the packing of the tube sheet and the shell in a convenient manner and without removal of the header.

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

Generally stated the invention consists of a tube sheet of which substantially the entire area is available for tubes and which is provided with a marginal flange or neck adapted to pass through and to project beyond the end of the shell of the heat exchanger, a header cover for the open end of the flange or neck, and means for detachably securing the header cover at the projecting end of the flange or neck which comprise a groove in the curved wall of the neck, a split ring insertable and removable in respect to the groove, a clamping ring shiftable in respect to the neck or flange to cooperate with the split ring as an abutment or stop and to clear the split ring, and screw studs engaging the clamping ring and header cover.

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

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

Figure 1 is a longitudinal sectional view partly in elevation of such parts of a heat exchanger as are necessary in order to show the invention in application thereto.

Fig. 2 is an end view of Fig. 1 with parts broken away.

Fig. 3 is a view similar to Fig. 1 illustrating a modification; and

Figs. 4 and 5 are views illustrating details of construction.

Of course the invention is applicable to single or multi-pass heat or temperature exchangers and referring to the drawing 1 indicates the cylindrical shell of such an apparatus. 2 indicates a tube sheet and it is provided with a marginal flange or neck 3 adapted to pass through and to project beyond the end of the shell 1. In the drawing it is shown in the latter position and it is capable of being drawn toward the left in the drawing through the shell 1 along with the bundle of tubes 4. 5 is a header cover adapted for application to the open end of the flange or neck 3 and it is too large to be drawn through the shell 1 and therefore it is detachably connected. The means for detachably securing the header cover 5 to the end of the flange or neck 3 comprise, referring to Figs. 1 and 2, a groove 6 in the outer surface of the curved wall of the neck 3 and a split ring 7 insertable and removable in respect to the groove. These means also comprise a clamping ring 8 slidable in respect to the neck or flange together with screw studs 9 which secure the header cover 5 to the clamping ring 8. This clamping ring 8 is scalloped as at 10 for a purpose to be presently described. The end of the shell 1 is flanged as at 11 and is provided with a groove 12 for the reception of packing. 13 is a gland ring mounted to slide on the neck or flange 3 and secured to the flange 11 by bolts and nuts 14. The ring 6 is of springy material and is split at 15. There is shown a headed screw 16 interposed between ears 17 provided at the adjacent ends of the split ring 7, and this screw 16 serves as a means for expanding the split ring.

In use the header cover 5 may be removed by slacking off the screw studs 9, shifting the clamping ring 8 toward the left in the drawing on the neck 3 and then springing the split ring 7 out of the groove 6 so that the head or header cover 5, the clamping ring 8 and the split ring 7 can be removed over the right hand end of the neck or flange 3. In order to remove the split ring 7 from the groove use may be made of the screw 16. It may be remarked that the parts last referred to are removed as a unitary structure of which the parts are held together against detachment. The head on the screw 16 shown in Fig. 2 prevents that screw from becoming detached and possibly lost. Whenever it is desired to renew or repair the packing in the groove 12 the stud bolts 14 are slacked off and this operation is facilitated by the scallops 10 in the clamping ring 8 which

during the operation may remain in the position shown in the drawing. The fact that the scallops 10 accommodate the screw bolts 14 permits the space between the tube sheet and the header cover to be comparatively small.

The construction and mode of operation of the modification shown in Fig. 3 are as above described except that the clamping ring 8a and the split ring 7a and its groove 6a are arranged inside of the flange 3. In this case the ring 7a may be split as indicated in Fig. 5 in order to adapt it for contraction to get it out of the groove 6a. Obviously the ring 8a need not be scalloped.

In some cases the ring 7 may be made in segments having at their ends lugs 17, Fig. 4, by means of which they are connected and drawn together and pushed apart to permit of the insertion and removal of the ring in respect to the groove in the flange or neck 3.

In the foregoing description reference is made to an exchanger having a cylindrical shell and, therefore, circular in cross section, but the invention is applicable to condenser shells which are rectangular in cross section, so that the word "ring" is intended to include not only a band in circular form but also a band rectangular in form and the words "tubular" and "annular" and "curved" are used to include structures which are angular and straight in form.

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 and in matters of mere form without departing from the spirit of the invention which is not limited to such matters or otherwise than the prior art and the appended claim may require.

I claim:

The combination in a heat exchanger of a shell, a tube sheet of which substantially the entire area is available for tubes and which is provided with a marginal laterally extending collar adapted to pass through and to project beyond the end of the shell, a header cover for the open end of the collar, and means which comprise a clamp band shiftable along the collar and removable slidably in respect to the collar, a circle of screw studs permanently engaging the clamping band and header and adapted to shift the band axially along the collar, the marginal portion of the header cover and the opposing face of the band and the circle of screw studs constituting a cage structure, a groove in a curved wall of the collar located between the end thereof and the clamping band, a complete ring of springy material insertable and removable as a unit in the groove and retained by the cage structure and constituting at all times when in use an assembly with the clamping band and the header cover and the circle of screw studs, and the ring, the clamping band and the groove being arranged internally of the collar.

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