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CONDENSER AND LIKE HEAT EXCHANGE APPARATUS

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Fig. 1.

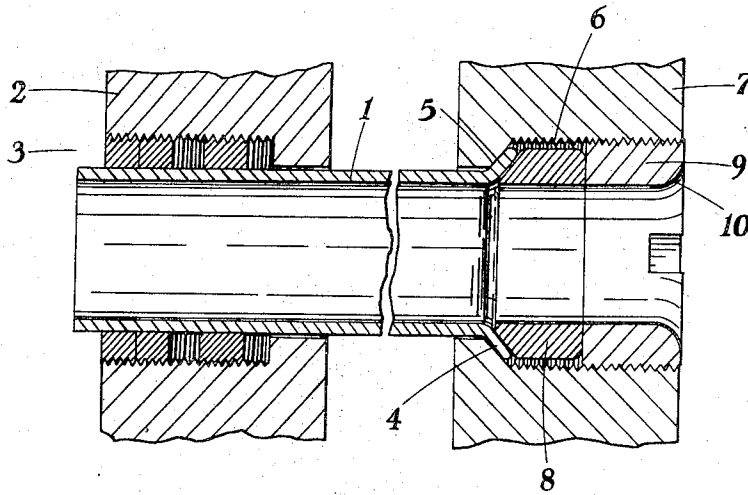
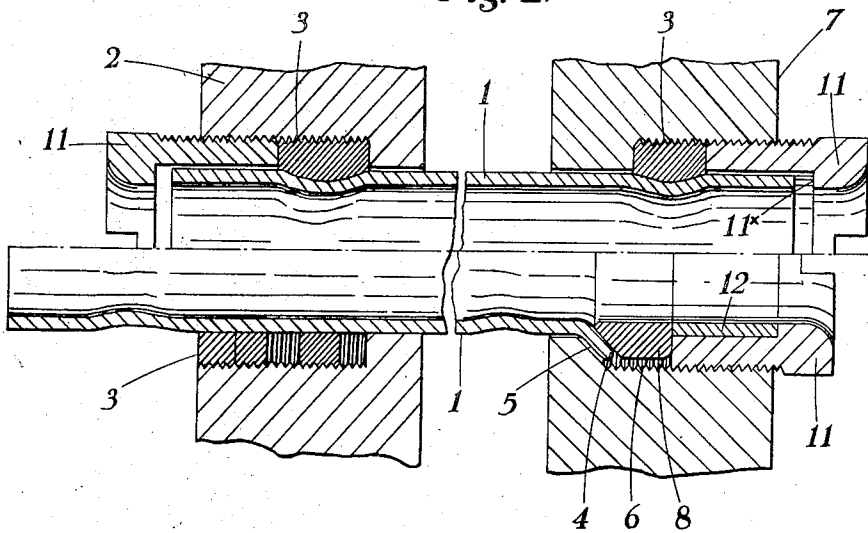


Fig. 2.



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CONDENSER AND LIKE HEAT EXCHANGE APPARATUS

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1 Claim. (Cl. 285—46)

This invention relates to improvements in surface condensers and other heat exchange apparatus, and more particularly to the fitting of the tubes in the tube sheets of condensers.

One common method of securing the ends of the tubes in the tube sheets of condensers is to expand the tube ends lying within the holes in the sheet and to leave a short projecting portion to serve in forming a beaded end. A disadvantage of this method is that if any tube requires to be removed it has to be driven out and the driving process may damage the tube to such an extent that it cannot be used again, and moreover there is considerable time expended in fitting a new tube.

Another common method of securing these tubes has been by means of an ordinary stuffing box and gland or "ferrule", the ferrule having an external thread adapted to engage a corresponding thread in the stuffing box, this stuffing box being formed by part of the tube sheet. With this method of fitting the tubes, although not having the disadvantage of the first mentioned method, there is the disadvantage that the tubes are liable to creep or "spin".

It is an object of the present invention to provide a method of fitting such tubes which will not have the aforementioned disadvantages.

In accordance with the present invention, which resembles the stuffing box and gland method of fitting, only a short end of the tube is allowed to project into the box and this projecting end is then flared or expanded against a conical seating in the box and held tightly thereon by a ring or fitting with a beveled or cone shaped inner end which fits against and conforms to the shape of the expanded tube end. Said ring or fitting may be secured by a ferrule having an external thread adapted to engage with a similar thread on the inside wall of the stuffing box.

In order that the invention may be clearly understood and readily carried into effect the same will now be described more fully with reference to the accompanying drawing in which:—

Figure 1 illustrates in longitudinal section a condenser tube having its ends fitted in the tube sheets of a condenser in accordance with the invention.

Figure 2 is a longitudinal section showing in its upper half a damaged condenser tube fitted in

the old way and in its lower half the same tube re-set and fitted in the new way according to this invention.

Referring first to Figure 1, it is seen that the condenser tube 1 is fitted at its rear end into the rear tube sheet 2 by packing 3, whilst its front end is flared as at 4 to seat against a conical seating 5 at the base of the recess or stuffing box 6 in the front tube sheet 7. Bearing upon the face of the flared end 4 of the tube is an annular fitting 8 having its forward or inner end coned to fit against the flared end 4 and its outer end square. Said fitting is forced against the flared end 4 of the tube by a ferrule 9 screw-threaded externally to engage screw-threads on the surface of the stuffing box 6.

The outer end of the ferrule 9 is flared on its internal edge as at 10 to facilitate the smooth inflow of cooling water.

The fitting 8 may be made in various lengths so that a ring can be selected to suit the depth of stuffing box and the length of ferrule to ensure a flush position of the front edge of the ferrule relatively to the face of the front tube sheet.

Figure 1 represents a new tube and a new tube sheet in which the present invention has been embodied, but the invention may also be applied to existing condensers and to the re-use of damaged tubes in such condensers as will now be explained with reference to Figure 2.

In Figure 2 the upper half of the drawing shows a damaged condenser tube 1 fitted in the old way into the rear tube sheet 2 and also into the front tube sheet 7 by ferrules 11 and packing 3. In the lower half of this figure the same tube is seen re-used in accordance with the present invention. To bring about this change the old ferrules 11 were removed and the tube was withdrawn and the front stuffing box was slightly deepened; the base or shoulder portion of the front stuffing box was then shaped conically at 5 by a suitable seating tool. The front end of the damaged tube was then flared or outwardly coned at 4 by a suitable bellowing tool and then seated on the conical shoulder portion 5 of the stuffing box as shown. An annular fitting 8 with correspondingly coned end was then inserted in the front stuffing box and finally a screw threaded ferrule. If the original ferrule 11 is used having an internal stepped portion as at 11^x a filling ring 12 may also be in-

cluded in the assembly. Obviously, however, a ferrule such as 9 in Figure 1 may be used. The rear end of the tube is held in the rear stuffing box merely by the packing 3.

5 What I claim is:—

In a surface condenser or similar tubular heat exchange apparatus, a tube end assembly in a tube sheet, comprising a tube sheet having a screw-threaded recess and a conically shaped shoulder portion therein to receive a flared tube

end, a loose ring having an externally coned leading end to fit against said flared tube end, and an annular screw-threaded ferrule in and engaging the said screw-threaded recess in the tube sheet to force the said ring against said flared tube end in self-centering relation thereto, forming a substantially liquid tight and air tight joint. 80

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