Nov. 16, 1926. 1,606,739

E. A. AVERILL

HEAT TRANSFERRING DEVICE

Filed August 30, 1922

Fig. 1

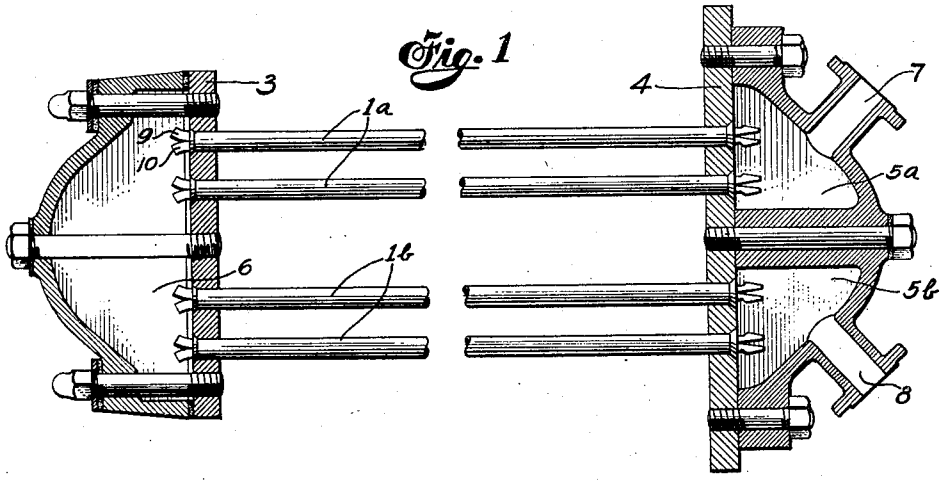
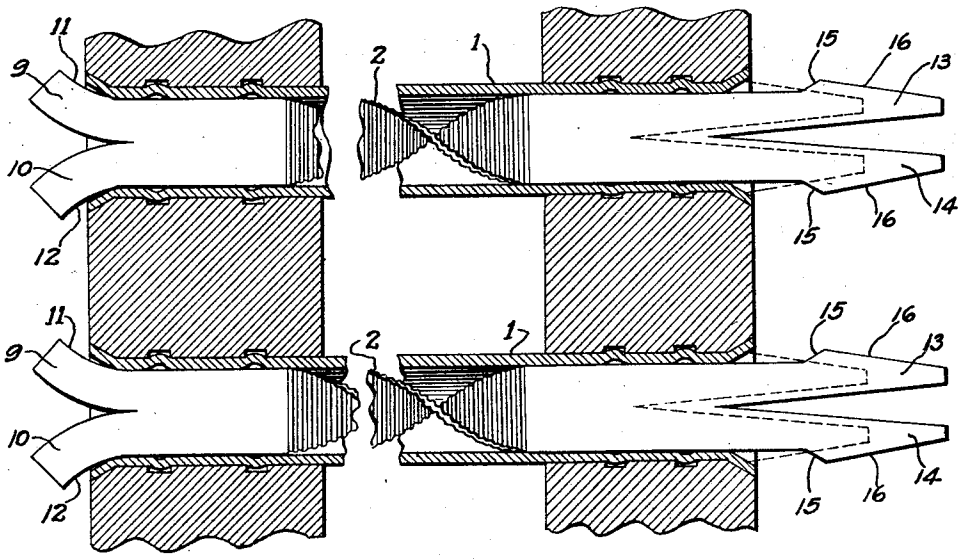


Fig. 2



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UNITED STATES PATENT OFFICE.

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HEAT-TRANSFERRING DEVICE.

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My invention relates to devices in which a fluid, usually a liquid such as water, flows through tubes and absorbs heat from or delivers it up to another fluid in contact with the outside of the tubes. A very beneficial effect is produced in these structures by the presence in the tube of a twisted flat, or preferably, corrugated band extending from end to end of the tube. The current of water, however, or whatever liquid flows through the tubes, tends to carry the band with it through the tube, and provisions must be made to prevent this. Such provisions have been proposed and used heretofore and my invention relates to an improvement on them. The invention is illustrated in the sheet of drawing filed herewith, in which Fig. 1 shows, in longitudinal section, a feedwater heater with my invention applied, and Fig. 2 is an enlarged sectional detail view of the portions of Fig. 1 necessary to show my invention more clearly. Parts of the heater, not required to an understanding of my invention, have been omitted in the drawing.

The tubes 1^a and 1^b within which the twisted strips or bands 2 are located, connect the two tube sheets 3 and 4 of the heater, opening at the right into the two chambers 5^a and 5^b respectively, and both opening at the left into the common chamber 6.

7 and 8 are connections for admitting and carrying away the water to be heated. The tubes, it will be understood, are surrounded by steam, hot gases, or other heated medium. As the invention does not relate to this phase in any way it will be unnecessary to illustrate it.

The means usually employed up to this time for preventing the water from carrying the twisted strips into the tubes are shown at the left, both in Fig. 1 and in Fig. 2. These means consist in splitting the strip for a short distance from the end, and spreading the two resulting portions 9 and 10, so their outer edges, 11 and 12, will engage the tube ends. This forms effective anchoring means, and is entirely satisfactory as long as the strips are always all to be inserted and removed from the same end of the apparatus. Usually, however, this will not be the case. The tubes in a heater do not usually all convey water in the same direction, and the anchoring means for part of them will have to be at one end of the apparatus and for the remainder at the opposite end. The strips, it should be stated, are made as light as possible for reasons of economy as well as to cut down the free tube area as little as possible. For this reason anchoring the strips at the end toward which the flow occurs does not answer. These ends could be anchored readily enough but the only result would be that the current would carry the opposite ends into the tubes and crumple up the strips.

The objection to the present practice of anchoring strips at each end is that to remove the strips, e. g., when the tubes are to be cleaned, it is always necessary to remove both heads or covers. My invention makes it possible to insert and to remove the strips all from one end.

To effect this I use anchoring means such as shown at the right ends of the strips in both figures. The strips are split for a distance from their ends and the split portions 13 and 14 are spread as clearly shown. The outer edges are given a shape such that one portion 15, which comes into contact with the end of the tube when the strip is moved into the tubes, forms a rather sharp angle with the axis of the tube; while the other portion, 16, slants gradually toward the axis. This will be perfectly clear from the figure.

A strip with an anchor such as described can be inserted from the opposite end of the tube without difficulty, the angle which the edges 16 make with the walls of the tube being so flat that the end will move along readily through the tube. When the anchoring portion reaches the end of the tube the elasticity of the material used causes the two portions 13 and 14 to spread apart as in the figures. In the figures I show the other end of the strips provided with the usual anchoring means more fully described above, and this is my preferred practice. With the edges 15 disposed about as shown I have found that if these edges are once in contact with the pipe end as indicated in dotted lines, the anchorage afforded is so secure that the strip will be torn before a pull on the opposite end will cause the portions 13 and 14 to squeeze together and enter the tube. If, however, the strip is allowed to protrude a little beyond the pipe end, as in the figure, and is then given a sudden pull from the

other end, the parts 13 and 14 will, when the edges 15 hit the tube end, be forced together and the anchoring portion will enter the tube after which it can readily be drawn out. It is for this purpose that, as shown in the figures, I make the distance between the edges 11, 12 and 15, 15 appreciably greater than the tube length.

It will be clear that in the heater shown by way of illustration in Fig. 1 all of the strips can be inserted and removed from the left. When the heater is in operation, the strips lying in those tubes communicating with the chamber at the right from which the fluid enters the tubes will be carried inward by the current until their edges 15—15 engage the tube end, as indicated in dotted lines in Fig. 2.

It will be obvious that various modifications of the inventive idea may occur in practice. For instance in some cases the strips may be provided with my improved anchoring means at one end only, the other end being left plain, or again my improved means may be employed at both ends. Likewise, some variation in the detail of the form of the anchoring means I show by way of illustration may be made while yet retaining the inventive idea. The exact angle at which the edges 15, 15 must extend toward the axis will vary with conditions. Factors influencing it, e. g., are the gauge of the material of which the strip is made, the stiffness of the material, the shape of the end of the tube. The essential point is that in any given case a sudden pull shall cause the two split portions to yield so the end may enter the tube, while a steady pull must not do so.

What I claim is:—

1. In a device of the class described the combination of a tube, a twisted metallic strip extending through the tube, and means at one end of the strip to engage the tube end, said means comprising resilient portions extending beyond the limits of the projected tube area, the angle of the portions coming into engagement with the tube end being such that a steady pull will not cause the portions to yield and enter the tube but a sudden pull will.

2. In a device of the class described the combination of a tube, a twisted strip extending through the tube, said strip being split for a little distance from each end and the split portions separated so their edges are adapted to engage the tube ends, the distance between the engaging edges of one end and those of the other being greater than the tube length, and the angle of the engaging edges of one end being such that if initially they are in engagement with the tube end a steady pull on the strip will not cause the end to yield and enter the tube, but if the edges are brought against the tube by a sudden pull, the end will enter the tube whereupon the strip can be withdrawn from the tube.

3. In a device of the class described, the combination of a tube, a twisted strip extending through the tube, anchoring means at each end of and integral with the strip to prevent the ends from entering the tube under steady pull, the two means being separated by a distance greater than the tube length, and the means at one end permitting the end to yield and enter the tube when the strip is given a sudden pull bringing the means sharply into engagement with the tube end whereupon the strip can be withdrawn from the tube.

4. In a device of the class described, the combination of a tube, and a twisted metallic strip extending into the tube from one end, the strip being split for a distance from its outer end and the split portions being spread so their outer edges are adapted to engage the tube end, the slope of the engaging edges being such that a steady pull beginning with the edges engaging the tube end will not cause the split portions to yield and enter the tube, but a quick pull beginning with edges out of engagement and bringing them sharply against the tube end will do so whereupon the strip can be withdrawn from the tube.

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