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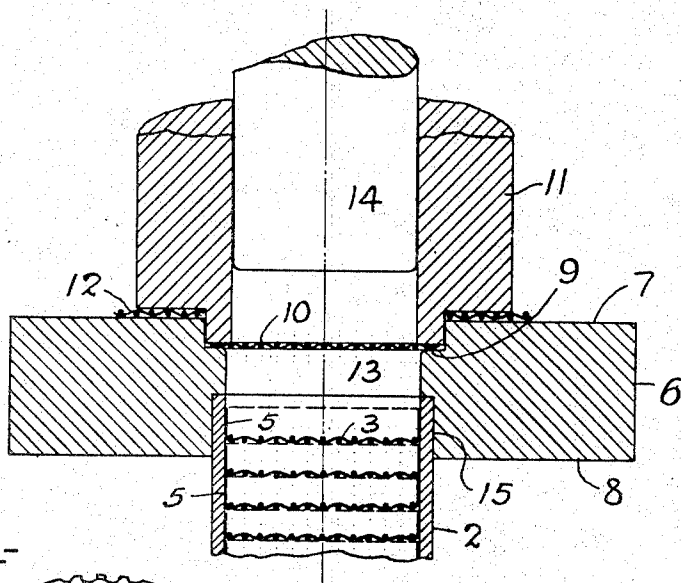
A. Y. GUNTER

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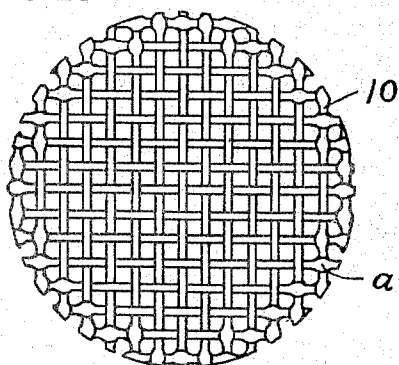
FIN-TUBE

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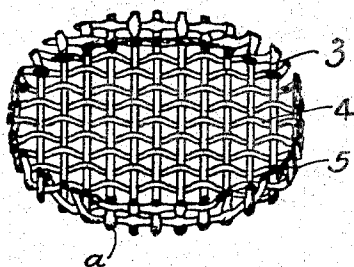
- FIG. 1.-



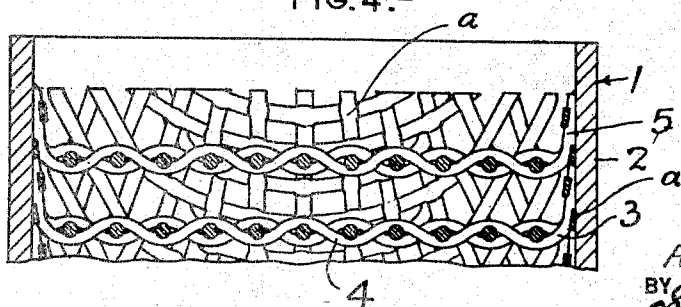
- FIG. 2.-



- FIG. 3.-



- FIG. 4.-



INVENTOR
Addison Y. Gunter
BY *E. C. Yost*
ATTORNEY

UNITED STATES PATENT OFFICE

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FIN TUBE

Addison Y. Gunter, Larchmont, N. Y., assignor to
American Locomotive Company, New York,
N. Y., a corporation of New York

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1 Claim. (Cl. 138—38)

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This invention relates to fin-tubes, and more particularly to a fin-tube having novel internal cup-shape wire screen fins, the bottoms of the cups providing spaced cross fins.

It is known to employ flat discs of wire screen entirely filling the interior of a tube and engaging each other for support to increase the heat-conducting surface of the tube, no attachment to the tube being provided. Because of the number of discs employed and the consequent reduction in the flow area of the tube, the tube had to be made larger in order to provide for the necessary flow rate therethrough. Moreover, due to the fact that the discs are not attached to the tube, heat transfer from these fin-like discs is not efficient.

The present invention is directed toward providing a fin-tube having internal cup-shape wire screen fins, the bottoms of the cups providing spaced cross fins through which ample flow can take place without the necessity of enlarging the tube. Accordingly, an object of the present invention is to provide a fin-tube having internal cup-shape wire screen fins, each having a flange, the flanges insuring spacing of the transverse bottoms of the cups and providing for bonding of the cups to the inner face of the tubular member of the tube.

Other and further objects of this invention will appear from the following description, the accompanying drawing and the appended claim.

Referring to the drawing forming a part of this application, Figure 1 is a portion of an apparatus for use in performing some of the steps in the manufacture of the fin-tube of the present invention, a portion of a fin-tube partially completed and a sheet of wire screen with one screen blank punched therefrom being shown, parts being shown in vertical central section and parts being shown in full; Fig. 2 is an enlarged plan view of the screen blank shown in Fig. 1; Fig. 3 is an enlarged inclined view of one of the screen cups shown in the tube of Fig. 1; and Fig. 4 is an enlarged vertical central sectional view of a portion of a completed fin-tube.

The present invention concerns the fin-tube, indicated generally by the reference numeral 1, shown in Fig. 4. Tube 1 includes a tubular member 2, and wire screen cups 3 secured transversely in the tube, as by soldering. Cups 3 provide internal cross fins for the tube for increasing its effective heat exchange surface and provide for increased turbulence which promotes increased heat transfer, the wires of the cup forming, in effect, pin fins in the tubular member.

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Each wire screen cup includes a transverse flat bottom portion 4 and an integral circular perpendicular flange 5. The wires of the flange are preferably, but not necessarily, flattened circumferentially of the flange at their ends and at points where wires cross each other, as is indicated in the drawing by the letter *a*, to prevent flange wires being broken when the flanges are formed. The cups are disposed similarly in the tubular member in engagement with each other over the finned length of the tube, each flange 5 at its outer edge engaging the adjacent cup. Thus flanges 5 serve to correctly space the transverse portions 4. They also serve to provide adequate surface for insuring a secure bond between the cups and the tubular member. That is to say, if the flanges 5 were not provided, then the ends of the wires of portions 4 would have to be bonded to the tubular member wall and it would be difficult to insure perfect bonding of each wire to the wall. The flattened portions of flanges 5 also aid materially in obtaining a secure bond between the tubular member and the cups. The wires of the flanges provide added fin surface which extends over the entire inner surface of the tubular member when the cups are disposed as shown.

Referring to Fig. 1, the apparatus shown therein includes a forming block 6 having an upper face 7 and a lower face 8. A shouldered recess forming a die 9 is formed in the face 7 and is of the proper diameter to produce a screen blank 10, best shown in Fig. 2. A shear punch 11 contacts with die 9 to punch the blank 10 out of a sheet of wire screen 12, as is clearly shown in Fig. 1. Punch 11 not only cuts the blank 10 out of the sheet 12 but further, when desired, may be employed to press its margin firmly against the horizontal face of the die 9, thereby flattening the wires engaged between the die and the punch which provide the flange of the fin cup, as shown in the drawing.

Block 6 also includes an orifice providing a die 13 adjacent die 9 and of smaller diameter, the diameter being proper to produce the cups 3. Punch 11 is bored and a forming bar 14 operates in this bore to engage the blank 10 disposed in die 9 and force it into die 13 in an obvious manner to form the flanges of the cups 3, the pressure of the punch 11 being first released and the diameter of the bar 14 being sufficiently less than the diameter of the die 13 to permit formation of the flange.

A shouldered recess forming a jig 15 is formed in face 8 of block 6 below die 13, and is of a

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diameter larger than the die 13 and proper to receive the tubular member 2. Tubular member 2 has an inside diameter equal to the diameter of die 13 and aligned therewith. Bar 14 has a stroke sufficient to enter tubular member 2, pushing the cup it has formed into the tubular member 2 to a desired position.

The bar 14, die 9, die 13, and jig 15 are disposed in line with each other. The apparatus has been but briefly described as it forms no part of the present invention.

After the tubular member has been filled with the desired number of cups, the cups are bonded to the wall of the tubular member. It has been found that a suitable bond may be formed by pretinning the inner wall of the tubular member and of the wire screen, and then heating the tubular member with the cups therein in a furnace to a bonding temperature. Pretinning the wire screen also bonds all the wires together at their points of crossing.

While there has been hereinbefore described an approved embodiment of this invention, it will be understood that many and various changes and modifications in form, arrangement of parts and details of construction thereof may be made without departing from the spirit of the invention, and that all such changes and modifications as fall within the scope of the appended claim are contemplated as a part of this invention.

The invention claimed and desired to be secured by Letters Patent is:

A fin-tube comprising a tubular member; and a plurality of wire screen cups in said tubular member, each of said cups having a wire screen bottom extending transversely of said tubular

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member and a circumferentially continuous wire screen side flange integral with and at right angles to said bottom, said cups being arranged in succession with the flanges of successive cups being each in engagement at its free edge with the bottom of the cup adjacent thereto, each of said flanges being bonded throughout to said tubular member whereby said cup flanges collectively provide a substantially continuous wire screen sleeve bonded to the inner face of said tubular member, the wires of said wire screen sleeve extending the heat exchange surface of the inner face of said tubular member and the wires of said wire screen bottoms further extending said heat exchange surface of said inner face of said tubular member.

ADDISON Y. GUNTER.

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