

Sept. 16, 1930.

R. N. TRANE

1,775,706

RADIATOR

Filed June 19, 1926

3 Sheets-Sheet 2

Fig. 3.

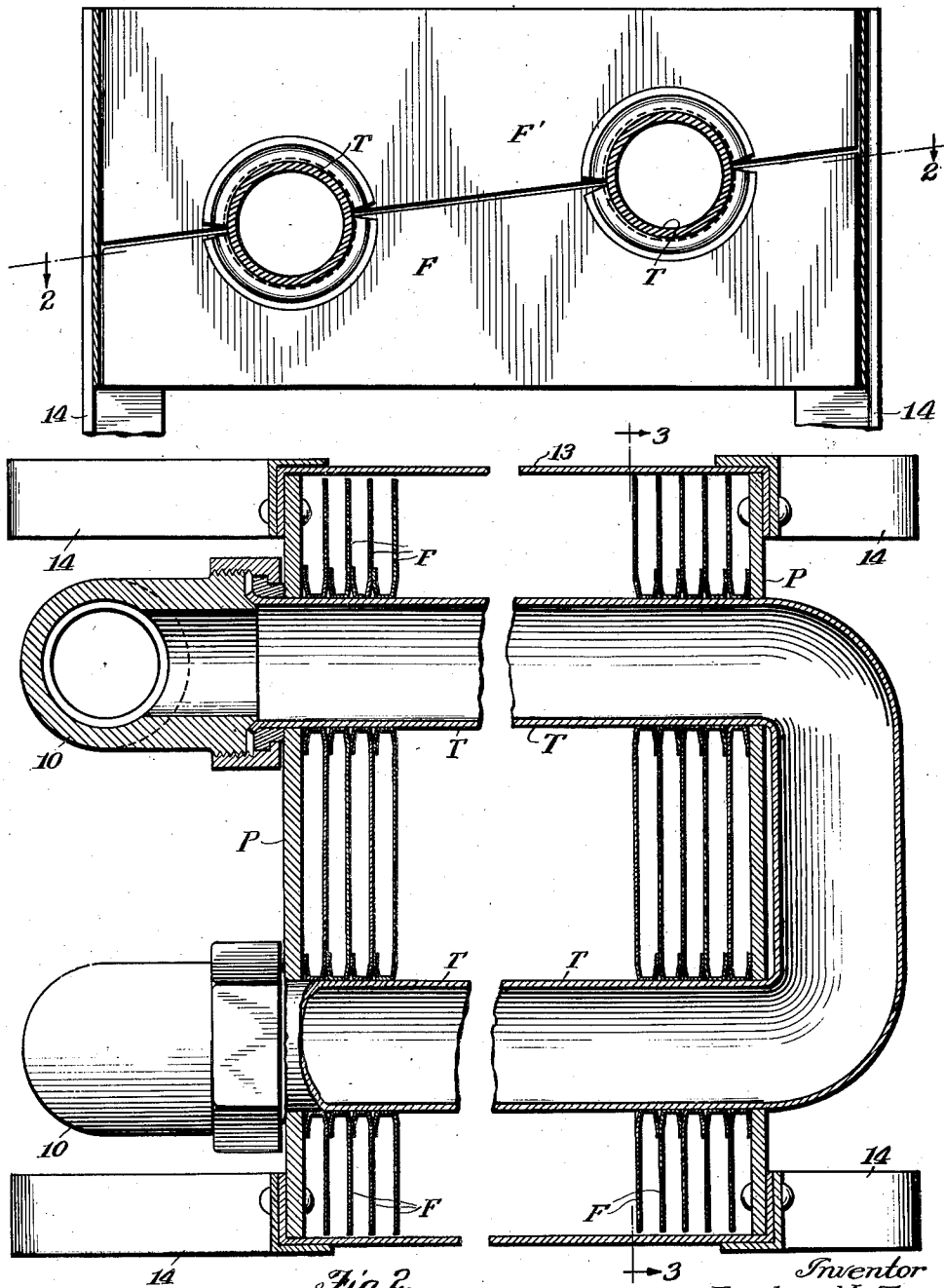


Fig. 2.

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Fig. 4.

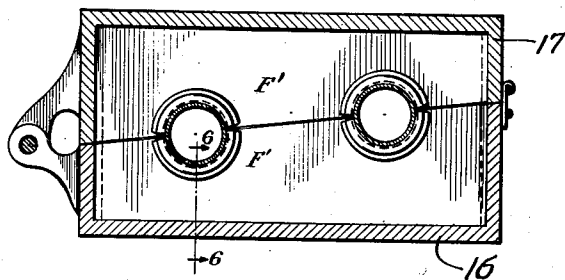
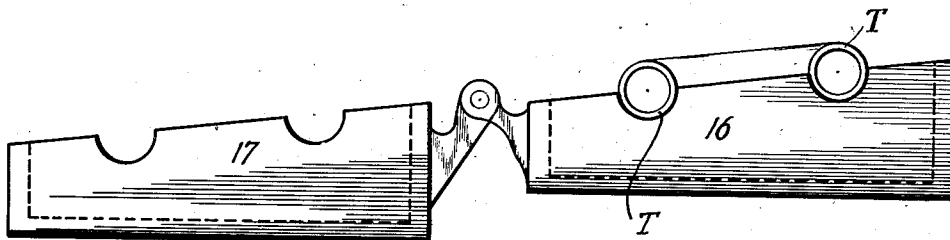


Fig. 5.

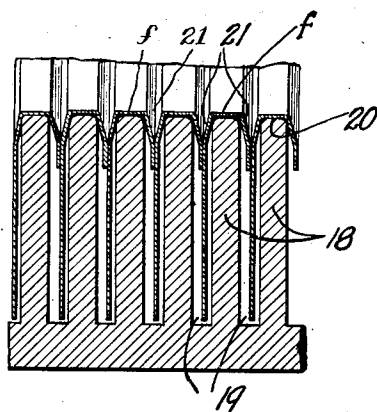


Fig. 6.

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UNITED STATES PATENT OFFICE

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RADIATOR

Application filed June 19, 1926. Serial No. 117,031.

My invention relates to heating radiators, and more especially, that type of radiator which employs a plurality of fins mounted on a heat tube. My present invention may be considered as an improvement on that set forth in my co-pending application Serial No. 104,196, filed April 23, 1926.

The chief objects of my invention are to simplify the construction and manufacture of the radiator and to improve the means for effecting a good heat conducting contact between the heat radiating fins and the heat tubes upon which they are mounted.

In order to lighten a radiator of the above type and thereby reduce the cost of its construction, the fins are preferably made from very thin sheet copper,—some .007 to .012 inches thick. The fins are flanged about the openings through which the heat tube passes, the heat conducting contact being made between the flanges and the tube over a sufficient peripheral area to permit the passage of enough heat to supply the fuel radiating capacity of the fins. The particular means for securing this contact which I set forth in this application is to split the fin along a line passing through the tube opening, leaving two halves, each of which has an arcuate flange about the margin of the tube opening. These halved fins are brought together with the heat tube between them, and are secured to the tube by any suitable means—preferably by soldering.

This method of construction has several outstanding advantages. One is that it is not essential that the flanges have any considerable strength, for they are not required to withstand any strain as they would, for instance, if the tube were expanded into contact with the flanges. This eliminates the necessity of either a reinforcing ferrule about the flange or a stronger flange made possible by the use of heavier, and more expensive, sheet copper for the fins (with which the flanges are integral). Another advantage is that the flanges, or if desired, rebent flanges, are semi-circular instead of completely annular with the result that less strain is imposed upon the metal in stamping out the flanges, for the ends of the flanges may draw

away somewhat from the alignment with the edges of the fins so that the structure of the metal is not deformed by imposing an undue strain upon it. A further advantage is that the fins may be assembled more quickly, for the set of fins forming the upper and lower halves of the radiator may be positioned in a pair of racks which can conveniently be hinged to bring the sets into registry with the heat tube between them.

Another object of the invention is the designing of flanged fins which may be satisfactorily assembled with the aid of a rack such as just described, without the necessity of sliding or compressing the partitions of the rack.

A further object is a method of soldering the fins to the heat tube without impairing the permanency, good heat conducting contact or cheapness of manufacture.

The foregoing, and further objects, features and advantages of my invention are set forth in the following description of specific embodiments thereof, and are illustrated in the accompanying drawings wherein:

Figure 1 is a perspective view of a radiator unit of my invention encased in a cabinet for increasing the air draft through the radiator.

Figure 2 is a plan section through the radiator unit taken substantially along the center lines of the heat tubes on the line 2—2 of Figure 3, but broken away centrally to foreshorten it longitudinally.

Figure 3 is a transverse vertical section taken on the line 3—3 of Figure 2.

Figure 4 is a vertical transverse section through the two halves of an assembling rack which has been folded together with the assembled radiator therein.

Figure 5 is an elevation of the unfolded rack.

Figure 6 is a detailed horizontal section through a fragment of one of the racks, showing the fins assembled therein; and;

Figure 7 is a perspective view of a fragment of a radiator unit arranged to be stood on its side, that is, with the air flow parallel with the plane of its heat tubes.

My radiator unit U comprises, in general, a heat tube T, which I have here shown as

bent into a U-shape, the ends of which connect through couplings 10 to inlet and outlet steam pipes 11 and 12. Obviously, however, the radiator unit may be used with a hot water or vapor heating system. A plurality of fins F and F^1 are mounted upon the heat tube T to radiate the heat therefrom. The fins are split along a plane passing through the two legs of the U-shaped heat tube forming upper and lower fins F and F^1 , an upper fin F^1 and a lower fin F together forming what is virtually a rectangular fin.

In the commercial form of the radiator unit shown, I use heat tubes of copper with about .020 inch shell and an inch or so in diameter. The two half fins F^1 and F together, then, will form a rectangle about six inches wide and three inches high. A multiplicity of these fins are mounted upon the radiator in spaced relation—about three-sixteenths of an inch apart—in sufficient number to give the radiator the desired length, which, for example, might be comparable to the lengths of ordinary cast iron radiators. The first and last pairs of fins abut end plates P . One plate lies along the bight of the elbow of the U-shaped heat tube T while the other plate P lies adjacent the free ends of the tube where they are joined to the coupling members 10. The end plates P are connected by side plates 13, which extend along the lateral edges of the fins F . The end plates and side plates together form a frame which protects the fins from bending and which gives the radiator unit as a whole a sufficient rigidity to withstand shipment and to maintain its shape when installed. The side plates 13 also serve to space the end plates a fixed distance apart so that this strain does not have to be borne wholly by the heat tube, nor can the flanges of the fins be subjected to compression longitudinally to the radiator.

The upper edges of the plates P carry outwardly bent horizontal portions P^1 which at one end cover the elbow of the heat tube, and at the other end the heat pipes and coupling members 10. The end plates are provided with legs 14 formed from angle irons which are offset longitudinally of the radiator unit to lie directly beneath the outermost corners of the horizontal flanges P^1 of the end plates.

A cabinet C , comprising four walls suitably joined and having an inner perimeter snugly fitting over the outer periphery of the radiator unit as defined by the outer corners of the flanges P^1 of the end plates, may be set over the radiator to form a "chimney" therefor which augments the air draft through the radiator and thereby speeds up its heating action. The cabinet discharges the heated air more or less horizontally into the room through a screened opening 15.

While a radiator using a flange construction such as I have just described may be assembled in any of a number of suitable ways,

I prefer to use a special fixture or rack in the form of a six sided box cut in half to provide two box shaped racks 16 and 17 which are long enough to contain all the fins of the radiator set side by side. As shown in Figure 6, each rack or half of the box of Figures 4 and 5 is provided with a multiplicity of spaced partitions 18 forming pockets 19 therebetween into which the fins may be dropped to assemble them in spaced relation preparatory to securing them to the heat tube.

Each fin has an arcuate flange f —preferably a return-bent flange giving the tube something of a channel or J cross section—about the margin of the semi-circular opening for the heat tube. The web of the channel shaped flange f is conformed arcuately to fit tightly against the periphery of the heat tube and make a fairly perfect contact therewith. The upper edges of the partitions 18 of the lower rack 16 are milled or bored out to provide semi-circular notches into which the two legs of the heat tube may set. The radius of these arcuate notches 20 is the radius of the outer periphery of the webs of the rebent flanges f of the fins, so that when a fin is dropped in one of the pockets 19 of the rack, its flanges f will overlies one of the adjacent partitions and set snugly within the two semi-circular notches 20 of the partition.

As shown in Figures 3 and 4, the two legs of the U-shaped heat tube do not lie in a horizontal plane, but one leg is slightly lower than the other to provide drainage for the condensed steam. For this reason, the fins are not divided along a horizontal line, but along a slightly oblique line passing through the axes of the two legs of the heat tube. The fins F and the rack boxes 16 and 17 (except for their hinge supports and locking clasps) are interchangeable for either the upper or lower halves of the radiator unit.

Accordingly, the fins F , f are formed by the same cutting and stamping machine and are in all respects identical. As shown in Figure 3, when the return-bent flanges f are stamped in the fins F or F^1 , since they are not completely annular but merely arcuate, the ends of the arcuate flanges f tend to draw back somewhat from the plane along which the fins are divided, because the ends of the flanges are free to yield under the strain imposed by bending the flanges. This relieving of the strain on the metal obviously helps to prevent an undue cracking or breaking of the sheet metal from which the same is formed, although very thin sheet stock be used.

As previously explained, in the assembling of my radiator the upper and lower fins F^1 and F are dropped in the pockets 19 of the respective rack 16 and 17 with the slots 20 of the partitions catching the webs of the rebent flanges. I prefer to use a copper heat tube which has been tinned or coated with

solder, and also to tin or solder the arcuate webs of the flanges f of the assembled fins, which may readily be done by a soldering iron having a diameter approximately that of the tube. The tube is then set on one of the racks with its parallel legs lying in the respective semi-circular grooves in the assembled fins. The top rack 17 is then swung over the lower rack 16 to the position of Figure 4. The entire rack box may then be placed in an oven and brought to a heat which will melt the solder or tin, or a blow torch or other heating element may be directed through the heat tube. If desired, pressure in addition to the weight of the upper rack 17 may be applied to press the flanges of the fins against the heat tube.

The arcuate faces of slots 20 of the partitions 18 hold the tube contacting portions of the flanges f squarely against the heat tube, so that the strength of the flanges themselves does not become a factor in holding them into firm contact with the tube while they are being soldered to the tube. After the soldering operation, the racks are again separated, the fins on the upper half of the radiator unit pulling out of the pockets 19 of the upper rack 16. The assembled tube and fins are then lifted out of the lower rack 17. The end plates P are inserted in pockets at the ends of the racks so that they are assembled on the tube at the same time that the fins are assembled. Otherwise it would be impossible to get an unsplit plate between the fins and the elbow of the U-shaped tube.

In order that the operation of dropping the fins into the racks and the cost of the racks be kept down, it is not desirable to use racks wherein the partitions 18 are slidable so that they can be compressed together to hold the fins. To overcome the necessity of this, I prefer to make my partitions 18 narrow enough to leave pockets 19 of sufficient width for the easy insertion of the fins and leave the partitions fixed distances apart. In order to insure that each fin, although easily dropped into its pocket, will align itself perfectly in the groove 20 of the partition, I prefer to bend the flanges f with slightly beveled portions 21 at either side of the web, so that they will co-act with the upper edges of the partitions 18 to bring them to their proper positions when downward pressure is exerted on them. This downward pressure is exerted in part when the flanges are coated with solder and in part when the heat tube is inserted and the upper and lower sets of fins compressed together. If any fin were not properly positioned, this downward thrust would, through the action of the beveled portions 21, tend to direct it to its proper position. In addition the return-bent portion of each flange f has a certain amount of spring tension which it exerts against the neighboring fin, with the result that the fins tend to

straighten themselves within the pockets 19 and to space themselves correctly.

While I have described a soldering process wherein both the tube and the tube contacting portions of the fin flanges are previously coated with tin or solder, I contemplate that it is not necessary that both elements be covered with tin, but that only one need be coated. I also contemplate that electrical welding or other means may be employed for fixing the fins on the heat tube.

In those installations where it is desired to turn the radiator unit on edge and send the air current through the long dimension of the radiator unit, that is in a direction parallel with the plane of the spaced legs of the tube, I prefer to use a slightly different construction for securing the fins to the tubes. This construction is illustrated in Figure 7. Here the fins are made in halves F' , F'' with one return-bent flanges f' . In this instance, however, the fins F' have lateral flanges 22 along their abutting edges. These flanges are fastened together either by spot-welding or soldering by the method previously described. The advantage, in this arrangement of the radiator unit, of fastening the abutting edges of the half fins by means of the flanges 22 is that the radiator unit would probably be used in a forced draft heating installation where the air would pass over the fins so rapidly that in order to raise it to the required temper a longer travel through the radiator would be necessitated. In this case, the side plates 13' of the radiator unit would extend opposite the long edges of the fins. With a forced draft thus directed through the radiator unit, there would be more tendency to set up vibrations in the fins, and the vibration would tend not only to create some noise but would tend in time to impair the permanency of the soldering. To avoid both of these difficulties, I prefer to use the central flanges 22 which of themselves strengthen the fins, and also to solder or otherwise fix the abutting flanges together so that a more secure and vibration proof uniting of the fins to each other and to the heat tube is accomplished.

While I have described these specific embodiments of my invention, I contemplate that many changes may be made therein without departing from the scope or spirit of my invention.

I claim:

1. As an article of manufacture, a radiator fin formed from thin sheet metal and having a semicircular cut away portion in one edge and a rebent flange about the margin thereof formed from the sheet metal with a J cross section, the web of the flange thus formed being arcuately conformed for contacting the periphery of a heat tube.

2. A radiating fin for mounting on the heat tube of a radiator, comprising a thin sheet of metal having an arcuate notch in one edge

and an integral rebent flange about the margin of the notch, the flange being substantially J-shaped with its web arcuately conformed to mate the periphery of a heat tube, the legs of the J immediately adjacent the web being slightly tapered for the purpose specified.

3. A radiator fin comprising a thin metal sheet with a semicircular cut-away portion in one edge and a flange surrounding said cut-away portion, said flange having a J-shaped cross section, the sides of which are slightly tapered.

4. A radiator comprising in combination a heat tube and a plurality of radiating fins, each fin comprising a thin metal sheet with a semicircular cut-away portion in one edge and a marginal flange along said cut-away portion, said flange having a channel cross section, the web of the channel forming a semicircle and the legs of the channel adjacent the web being slightly tapered outwardly for engaging and yieldingly spacing adjacent fins.

5. A radiator comprising in combination a heat tube and a plurality of radiating fins, each fin comprising a thin metal sheet with a semicircular cut-away portion in one edge and a marginal flange along said cut-away portion, a rebent flange on the edge of said marginal flange, the fin, the marginal flange and the rebent flange forming a channel arcuately conformed to fit the periphery of the heat tube, the portions of the channel adjacent said marginal flange being slightly tapered outwardly for yieldingly spacing adjacent fins.

In witness whereof, I hereunto subscribe my name this 16th day of June, 1926.

REUBEN N. TRANE.