April 12, 1932. F. M. YOUNG 1,853,487

RADIATOR CONSTRUCTION

Filed Jan. 31, 1931 3 Sheets-Sheet 1

Fig. 1.

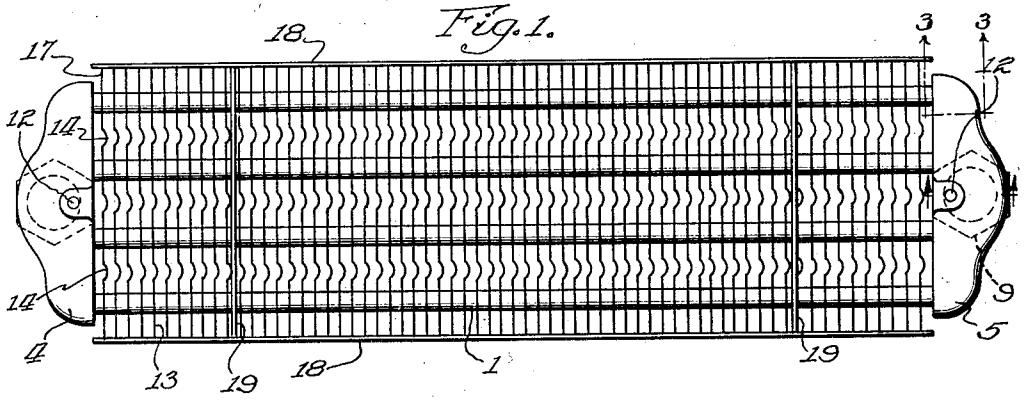


Fig. 2.

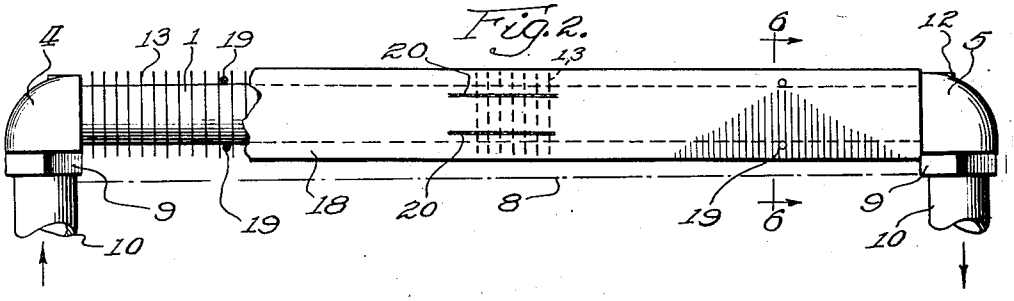


Fig. 3.

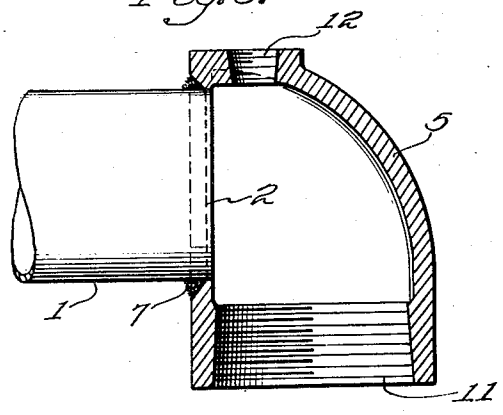
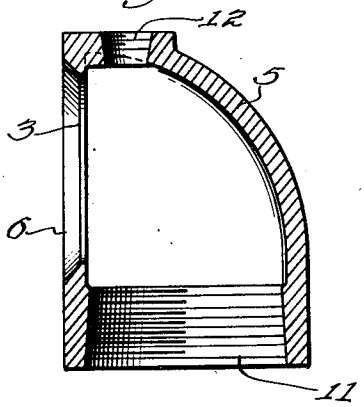


Fig. 4.



Witness
Arthur M. Franke.

Inventor
Fred M. Young.
Cummings, Cummings
& Woodworth
Attys.

April 12, 1932. F. M. YOUNG 1,853,487

RADIATOR CONSTRUCTION

Filed Jan. 31, 1931 3 Sheets-Sheet 2

Fig. 5.

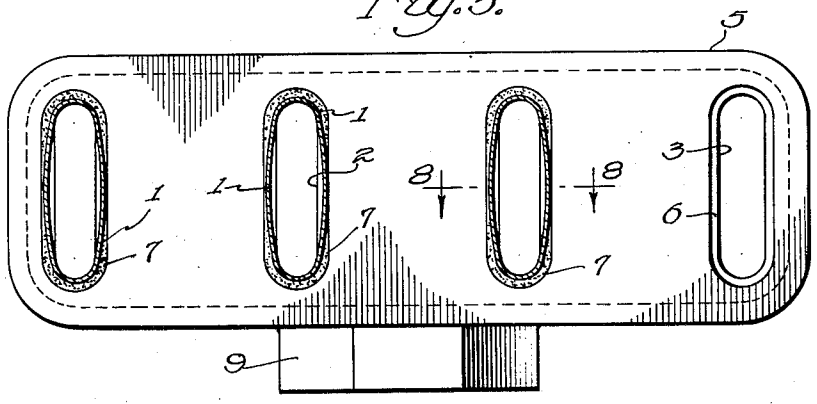


Fig. 6.

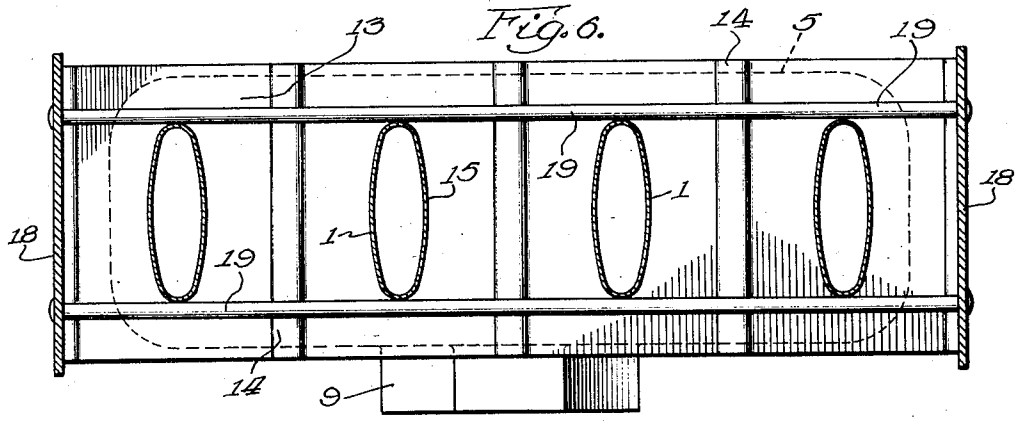


Fig. 7.

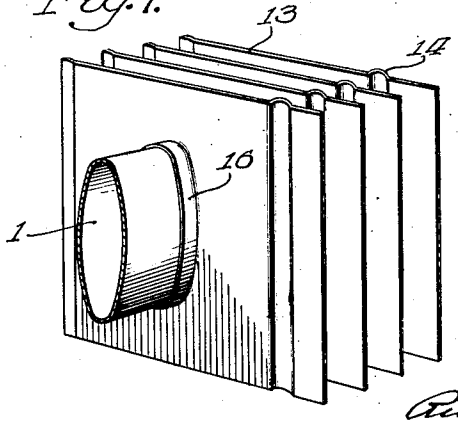
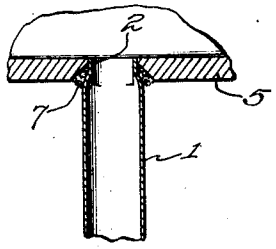


Fig. 8.



Witness
Arthur M. Franke

Inventor
Fred M. Young.
Cummings, Cummings
Woodworth Attys.

April 12, 1932. F. M. YOUNG 1,853,487

RADIATOR CONSTRUCTION

Filed Jan. 31, 1931 3 Sheets-Sheet 3

Fig. 9.

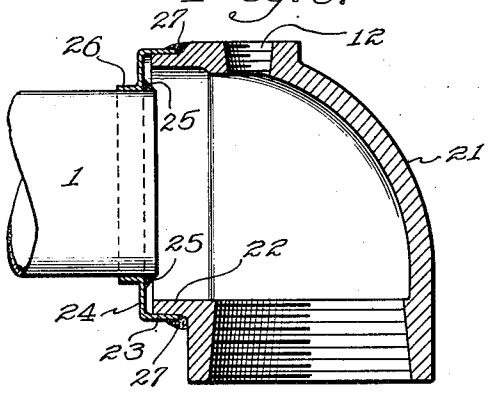


Fig. 10.

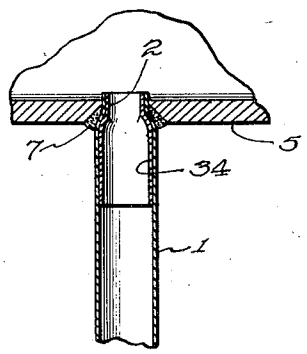


Fig. 11.

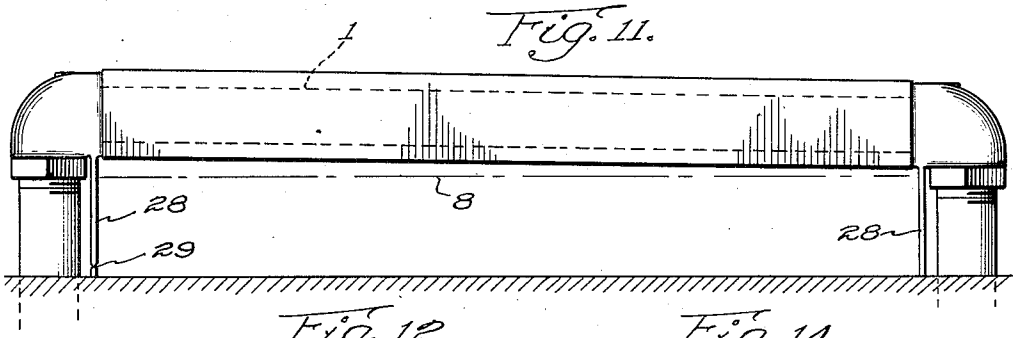


Fig. 12.

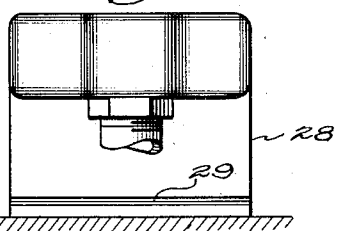


Fig. 14.

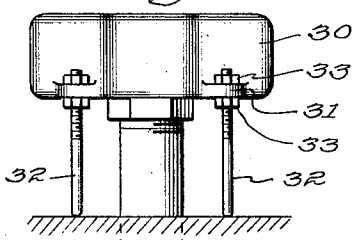
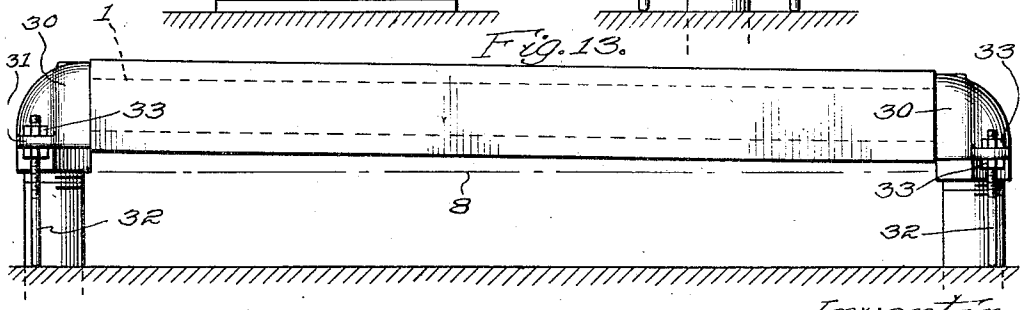


Fig. 13.



Witness
Arthur M. Franke.

Inventor
Fred M. Young,
by Rummler Rummler & Woodworth
Attys.

Patented Apr. 12, 1932 1,853,487

UNITED STATES PATENT OFFICE

FRED M. YOUNG, OF RACINE, WISCONSIN

RADIATOR CONSTRUCTION

Application filed January 31, 1931. Serial No. 512,520.

This invention relates to constructional features of radiators or heat transfer elements for various uses such as interior heating in steam, vapor, or hot water systems, or for the removal of heat from the cooling systems of internal combustion motors.

An object of the invention is to provide an improved tube and header combination which enables the use of tubes of elliptical form in cross-section while the header apertures for receiving the tubes may be flat-sided ellipses, enabling a more ready and convenient machining of the header elements than would be possible if the tube openings in the header elements conformed to the general form of the tube. A further object of the invention is to provide a fin and side plate construction for this type of radiator which adds to its rigidity and strength while permitting free expansion and contraction of the radiator core under temperature changes. A still further object of the invention is to provide improvements in construction of the type of radiator to which this invention relates which will insure proper drainage of condensate, and uniform action throughout the radiator and the absence of air pockets therein.

The objects of the invention are accomplished by a construction as shown in the drawings, in which:

Figure 1 is a plan view of the improved radiator.

Fig. 2 is a side view of the radiator with one of the side plates thereof partly broken away.

Fig. 3 is an enlarged sectional detail of one of the headers taken on the line 3—3 of Fig. 1.

Fig. 4 is a sectional view similar to Fig. 3, but with the core tube omitted therefrom.

Fig. 5 is an enlarged inner face view of one of the headers showing some of the core tubes in section.

Fig. 6 is an enlarged sectional view taken on the line 6—6 of Fig. 2.

Fig. 7 is a fragmentary perspective view partly in section showing one of the core tubes and some of the radiating fins thereon.

Fig. 8 is a sectional detail taken on the line 8—8 of Fig. 5.

Fig. 9 is a sectional detail of a modified form of header construction.

Fig. 10 is a sectional detail of the tube and header joint showing the tube reinforced locally.

Fig. 11 is a side elevation of the heater with modified headers.

Fig. 12 is an end view of the same.

Figures 13 and 14 are corresponding views of a further modification.

One of the principal characteristics of this radiator is the particular form of radiator core tubing in connection with the form of apertures in the headers for receiving the tubing. The tubing is elliptical in cross-section, providing space between the adjacent parallel tubes of a Venturi-like form permitting the passage of air therebetween with but small resistance, while the apertures in the headers which receive the tubes are of flattened elliptical form, and the ends of the tubes are likewise flattened to fit these apertures. With this arrangement an elliptical form of tube may be employed without entailing difficult machining in the tube receiving apertures of the headers.

Another feature of the construction is that the tubes are inclined from header to header so that when the radiator is supported in a partly horizontal position, free drainage may take place from one header through the tubes to another.

Another constructional feature, which will be described more in detail further on, is the ribbed radiating fins which are mounted upon the tubes and carry fin protecting side plates which are drawn against or otherwise secured to the edges of the fins and add strength and rigidity to the light core structure.

Referring to the drawings, the core of the radiator includes a plurality of horizontally spaced, parallel copper tubes 1, each of which in cross-section is of elliptical form, leaving air channels between the tubes, suitably formed for the passage of air, with substantially no other resistance than the frictional resistance against the sides of the tubes.

The ends 2 of the tubes are reshaped into flat-sided ellipses to fit within the apertures 3 of the radiator headers 4 and 5. The apertures 3 are chamfered at the edges 6 to provide a pocket surrounding the tube for receiving the soldering or welding compound 7, Fig. 3. The tubes or core of the radiator, as may be seen from Fig. 2, are inclined downwardly from the inlet header 4 to the outlet header 5. The dot and dash line 8 in this view indicates a horizontal plane.

Each of the headers is provided with a hexagonal portion 9 for the application of a wrench to relieve the header of strain when the conduits 10 are applied to the threaded openings therein. The smaller threaded openings 12 at the top of the headers are for the reception of air venting valves or plugs.

The core of the radiator includes radiating fins 13 which may be formed from sheet copper. These fins are beaded or ribbed as indicated at 14 to add to their strength, and are provided with apertures 15 of elliptical form to receive the tubes. In forming these apertures an elliptical collar 16 is bent downwardly from the face to provide good contact with the tubes to which the fins are soldered at this point.

The outer edges 17 of the fins engage side plates 18 which are held in contact with the fins preferably by the transverse rods 19, which at their ends are tack soldered, riveted or welded to the side plates 18. The rods 19 preferably pass above and below in contact with the top and bottom of the tubes 1. The side plates 18 also have slits at the spaced points 20 thereon, through which solder is run to attach the plates to the edges of the fins, thus adding further rigidity to the radiator.

The beads or ribs 14 stiffen the fins and permit them to readily absorb pressure strains due to expansion and contraction of the tubes so as to avoid irregular buckling and consequent noise at times of temperature change.

To compensate for the change of a sectional shape and possible weakening of the walls of the tubes by overheating during the operation of brazing them into the header plate, the tubes are preferably made thicker at their ends than at their intermediate portions as illustrated in Fig. 8.

The elliptical tube section provides the arch strength for resisting collapse when a partial vacuum forms within the tube without sacrificing the advantages of the elongated cross-section in reducing resistance to the flow of air between the tubes.

In the modified construction shown in Fig. 9, the header casting 21 is rimmed or flanged at 22 to receive a bent-up marginal flange, or rim 23 of a cup-shaped header plate 24. The tubes 1 are brazed at 25 to an integral collarlike flange 26 on the header plates and the marginal rims are brazed at 27.

The header casting of Figs. 11 and 12 is provided with an integral apron or foot 28 which may rest on the floor to regulate the height of the heater. The feet 28 at opposite ends of the heater may be of different height to provide appropriate inclination for drainage of the tubes and to this end the aprons may be scored as at 29 to facilitate the removal of the bottom portion to reduce the height thereof.

In the form shown in Figs. 13 and 14, the castings 30 are provided with lugs 31 bored to receive supporting pins 32 which serve as feet and are adjusted by nuts 33 threaded thereon.

In Fig. 10, the tube 1 is thickened and reinforced by inserting a lining 34 adjacent its ends to prevent overheating of the tube during brazing. After the lining is in place the tube may be swedged at its ends as hereinbefore described to fit the header apertures. It is desirable to have the heat transfer tubes as thin as is consistent with the pressures to which they are to be subjected but in brazing thin material to heavier material there is risk of overheating the thin material, which risk this reinforcing to a large extent obviates.

I claim:

1. A radiator comprising cast end header elements, a core affording communication between the said header elements, and having parallel tubes, each of which is elliptical in cross-section throughout its length, but at its ends having its sides flattened to flat-sided form, and said header elements having flat-sided apertures fitting the ends of said tubes.

2. A radiator comprising end header elements, a core affording communication between the said header elements, and comprising parallel tubes, each of which is elliptical in cross-section throughout its length, but at its ends having its sides flattened to flat-sided form, and said header elements having flat-sided apertures into which the ends of said tubes fit, chamfers formed in the headers at the edges of said apertures, said chamfers being filled with metal for securing the tube to the header elements.

3. A radiator comprising end header elements, a core affording communication between said elements, and comprising parallel tubes, transverse radiating fins through which said tubes pass, and side plates extending along the outer edges of said fins, said side plates being provided with spaced slits therein and soldered to the edges of said fins at said slits.

4. A radiator core comprising tubes of elongated cross section, transverse fin plates perforated to fit said tubes and beaded in directions parallel to the long axes of said tube perforations, side plates engaging the ends of

said fin plates, bond members rigidly connecting said side plates to each other, said side plates being perforated adjacent the ends of said bond members, and solder connecting said bond members and side plates at said perforations.

5. A radiator core comprising tubes of elongated cross section, transverse fin plates perforated to fit said tubes and beaded between adjacent tubes, such beads extending in directions parallel to the long axes of said tube perforations, side plates engaging the ends of said fin plates, bond members rigidly connecting said side plates to each other, said side plates being perforated adjacent the ends of said bond members, and solder connecting said bond members and side plates at said perforations.

6. A radiator tube having an elliptical cross-sectional form throughout the main portion of its length and having a flat sided cross-sectional form at its ends, and an internal reinforcing sleeve disposed at each end of said tube, said sleeves extending into the elliptical sectioned portion of said tube and being formed with said tube to assure complete contact between the entire surface of said sleeves and said tube.

7. A heater comprising a pair of headers, a plurality of tubes connecting said headers, and feet on said headers for supporting said heater from a horizontal surface, said feet having horizontal grooves located to reduce the cross-sectional area of said feet at a predetermined distance from their ends to facilitate breaking off a portion of and shortening certain of said feet and supporting said tubes in an inclined position.

Signed at Chicago this 23rd day of January, 1931.

FRED M. YOUNG.