

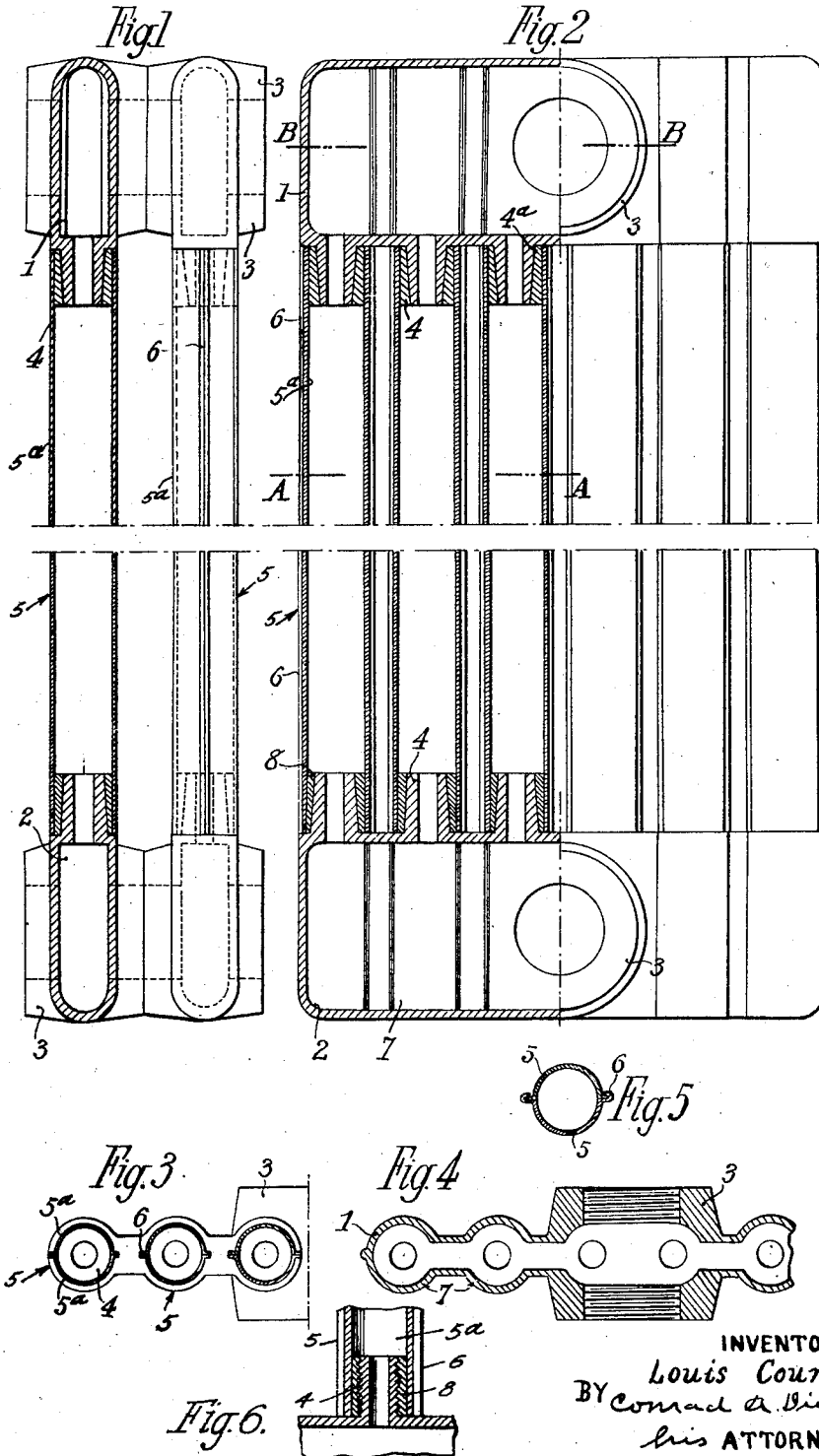
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RADIATOR

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RADIATOR

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The present invention relates to improvements in steam or hot water radiators wherein the upper and lower collecting chambers consist of cast iron or other metal and are connected together by tubes of wrought iron, steel or other metal. My said improvements have for their object to obtain a high calorific efficiency for such radiators, while employing apparatus of small size and an inexpensive construction, the efficiency being obtained by affording a ready circulation of air between the collecting chambers such as cannot be had with the known radiators of this type in a small-sized apparatus.

For this purpose, the tubes are fitted upon bosses which are cast in one with the headers instead of being inserted into apertures in the walls of the headers; in this manner I may give to the headers a width which is about equal to the outer diameter of the tubes, so that it will be feasible to provide between two consecutive collecting chambers a sufficient space for the free circulation of air while maintaining the general size of the radiator within restricted limits.

The tubes may have any suitable construction, and may be made without welding, or may be welded or attached by bending in any suitable manner.

According to an approved construction of the apparatus, I may employ tubes consisting of two concave members or shells having a semicircular or like cross-section, and comprising longitudinal flanges which serve to unite the said shells by soldering or bending, thus forming two ribs upon each tube; the radiating surface is increased by these ribs, and it may be further increased by the use of headers which have a corrugated instead of a flat surface.

The appended drawings show by way of example a constructional form of apparatus according to the invention, as concerns a radiator having six tubes for each element.

Fig. 1 is a partial elevation of a portion of a radiator comprising two elements whereof one is shown in vertical section and the other in elevation.

Fig. 2 shows one-half of a side elevation

and one-half of a vertical section of an element.

Figs. 3 and 4 are partial horizontal sections of an element, on the lines A—A and B—B of Fig. 2, respectively.

Fig. 5 is a cross-section of a tube whose edges are folded to secure the same together.

Figure 6 is a detail sectional view of a modified form of connection between the tubes and a header.

The said elements comprise an upper hollow cast metal header 1, and a similar lower header 2 which are provided with the coupling parts or bosses 3 adapted to be connected together by rings or nipples (not shown) or by like means, for example by soldered or welded joints.

Each header is provided with a plurality of apertured bosses 4 for the tight reception of tubes 5 of iron, steel or other metal, each tube consisting of two half-tubes or shells 5^a of semicircular section (Fig. 3) provided with the longitudinal flanges 6. The two shells 5^a are placed together and are united by the autogenous welding, optionally electric, of the said flanges.

The two shells 5^a may consist of stamped metal plate, and this construction of said tubes 5 is not only inexpensive, but also serves to increase their radiating surface due to the fact that the flanges 6 form ribs which further increase the rigidity of the tubes.

The bosses 4 are fitted by pressure or by like means into the ends of the tubes 5 which latter are preferably first heated. To assure a more substantial construction, I may provide the end of each boss 4 where it joins the header with a slightly constricted part forming an annular recess to receive the corresponding end of the tube when cooled, as shown at 4^a in Fig. 2, whereby to unite the upper ends of the tubes to the header 1 in fluid-tight relation (Figs. 1 and 2). For like purposes, I may form on each boss a notch into which the corresponding end of each tube may be engaged by striking the outside of the tube, or by like means.

The radiating surface can be further increased by providing one or more of the wall portions or surfaces of the headers with cor-

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rugations 7 corresponding for instance to the bosses 4. The said corrugations may be provided in any suitable number, and may be of any shape.

Fluidtight connections between the tubes 5 and the bosses 4 are assured by suitable means, either by the direct contact between the tube and the boss which latter may be partly cylindrical and partly tapered or entirely cylindrical or may carry projections in relief whereby the joint with the tube is made tight,—or by the interposition of a suitable packing substance,—or by soldering or welding, or by like means.

I preferably employ for the fitting of the tubes upon the collecting chambers, an arrangement which will hold the said tubes for the whole or a part of their length in the position which they are to occupy, so as to avoid bending them under the pressure.

Obviously, the said tubes 5 may be united to the coupling parts in any other manner, and in particular, the ends of the tubes may be provided with internally-threaded annular reinforcing members 8 whereby the ends of said tubes may be screwed upon the bosses 4 which should be correspondingly threaded for the purpose.

Furthermore, the ends of the tube may be strengthened by means of a ring adapted to support the stresses due to the assembling operation. In Figs. 1 and 2, the lower end of each tube is shown, by way of example, as strengthened by a ring 8 which is secured in a fluidtight manner to the inner wall of the tube by soldering or welding, and which is fitted in a fluidtight manner upon the boss 4, preferably by the shrinking process.

Fig. 5 shows a modification wherein the tube consists of two shells 5 made of pressed metal plate and having a semicircular cross-section, with the side flanges 6; said shells are assembled by folding or overturning the flanges of one shell upon those of the other.

The cross-section of the tubes may be circular or may have other shapes; the ends of the tubes which are mounted on the bosses 4 of the headers may have a circular cross-section like the bosses, and irrespectively of the cross-section of the rest of the tube; or otherwise, these ends, as also the bosses, may have the same shape as the tube should the latter not have a circular cross-section.

Should the said tubes be made in one piece, they may be provided with external ribs or corrugations of any shape for increasing the radiating surface.

Any suitable number of tubes per radiator element may be employed.

The method of mounting the said tubes on the headers will permit (Fig. 1) of giving the said headers a width about equal to the diameter of the tubes 5, thus allowing between any two successive collecting chambers a space for air circulation which is about the

same as the space between the tubes as provided in the known cast iron radiators, this being important as concerns the thermic efficiency of the apparatus.

By reason of the difficulty in manufacturing long tubes by the casting process, the height which can be given to the known radiators wholly constructed of cast metal is limited, but by reason of my said improvements I can readily construct apparatus of a great height which has a high thermic efficiency.

In addition to the above-mentioned advantages, my said radiators having headers of cast iron or other metal and tubes of wrought iron, steel or other metal will have the further advantage in that they are lighter and occupy less space than the radiators consisting entirely of cast metal; as compared with certain types of radiator in which the headers consist of metal plate. Further, my construction possesses an additional advantage in that it is not subject to rusting at the upper part by the action of moist air which sometimes collects therein.

Obviously, the said invention relates to the construction of radiators of all types, irrespectively of the number and the arrangement of the tubes, the disposition of the collecting chambers, and the like, for instance relative to the arrangement in separate groups, in flat form, in cylindrical form, or like construction.

I may utilize, among others, tubes which are obtained by the electrolytic process.

Having thus described my apparatus, what I claim as new therein, and my own invention, is:

1. A radiator comprising a hollow header, a series of tubular bosses extending therefrom, relatively thin tubes associated with said tubular bosses, and tubular reinforcing means secured to the ends of said tubes, fitted upon said tubular bosses, substantially as specified.

2. A radiator comprising a hollow header, a series of tubular bosses extending therefrom, relatively thin tubes associated with said tubular bosses, and tubular reinforcing members secured within said tubes and engaging said tubular bosses, substantially as specified.

3. A radiator comprising a hollow header, a series of tapering tubular bosses extending therefrom, relatively thin tubes associated with said tapering bosses, and tubular reinforcing members secured within the ends of said tubes, said reinforcing members each having the aperture therein conforming to the tapering wall portion of its respective boss, substantially as specified.

4. A radiator comprising upper and lower hollow headers, a series of tubular bosses extending therefrom, relatively thin tubes associated with said tubular bosses, and tu-

bular reinforcing members secured to the ends of said tubes and adapted to frictionally engage with the bosses on said headers, substantially as specified.

5 5. A radiator comprising upper and lower hollow headers, a series of tubular bosses extending therefrom, relatively thin tubes associated with said bosses, each of said tubes comprising two substantially semi-cylindrical
10 parts united along their longitudinal edges, and annular reinforcing members secured within the ends of said tubes and fitted upon said bosses, substantially as specified.

15 6. A radiator comprising upper and lower hollow headers, a series of tubular bosses extending therefrom, relatively thin tubes associated with said bosses, each of said tubes comprising two substantially semi-cylindrical
20 parts, flanges along the longitudinal edges of said semi-cylindrical parts, said semi-cylindrical parts having their contacting flanges folded together to form longitudinal ribs at opposite sides of said tubes, and annular reinforcing members secured inside
25 of the ends thereof, and engaging the tubular bosses on said headers in fluid-tight relation, substantially as specified.

7. A radiator comprising relatively flat hollow upper and lower headers, a series of
30 tubular bosses, of smaller diameter than the transverse width of said headers, extending therefrom, relatively thin tubes having their opposite ends engaging said tubular bosses in fluid-tight relation; said tubes having an
35 external diameter coinciding substantially with the transverse width of said headers, substantially as specified.

In testimony whereof I have hereunto affixed my signature.

40 LOUIS COURTOT.

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