

C. E. SAFFORD.
SHEET METAL RADIATOR.

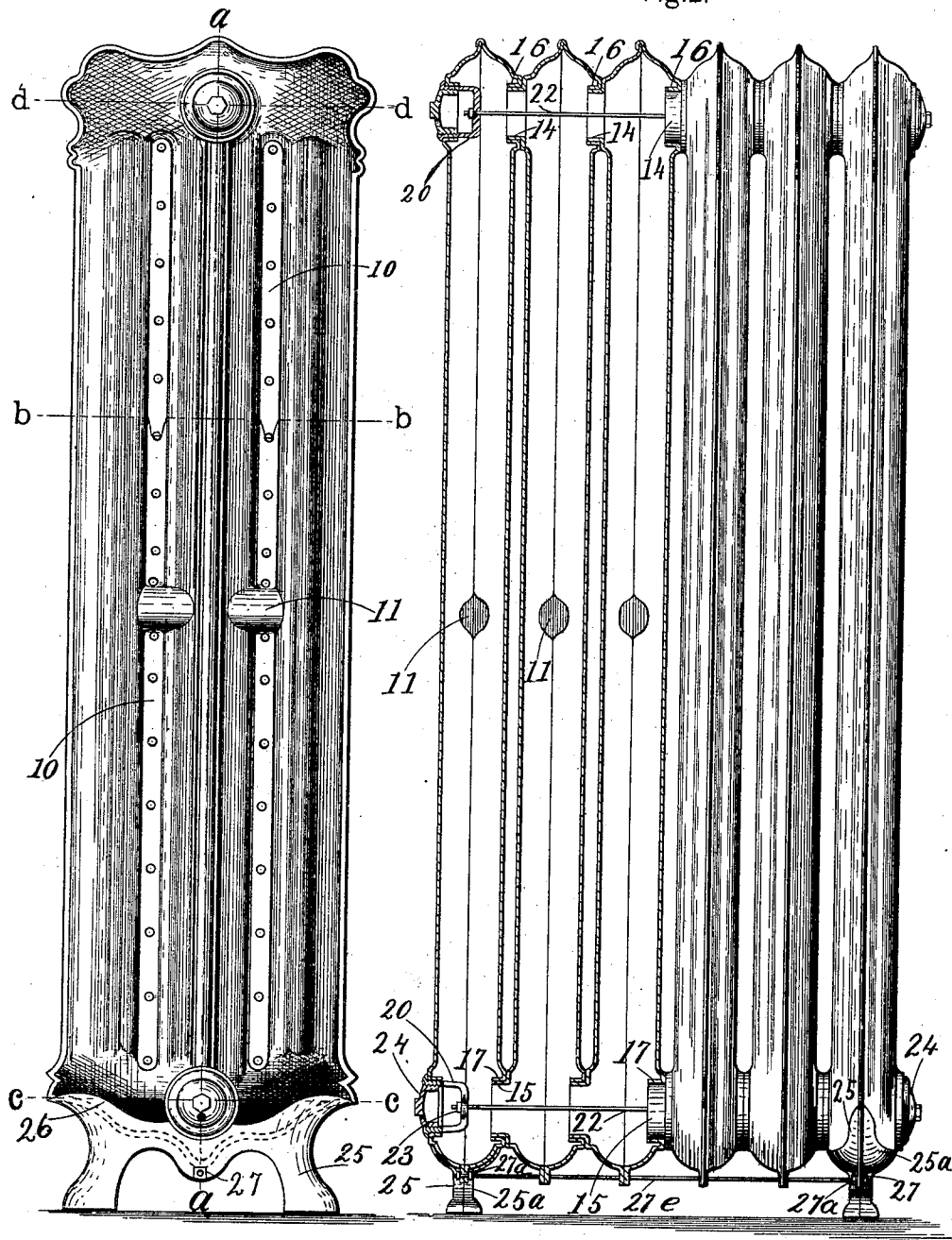
(Application filed Feb. 23, 1898.)

(No Model.)

3 Sheets—Sheet 1.

Fig.1.

Fig.2.



Witnesses,

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(No Model.)

3 Sheets—Sheet 2.

Fig.3.

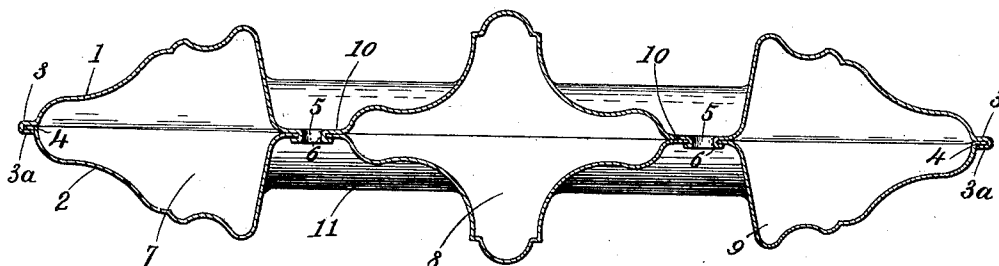


Fig.4.

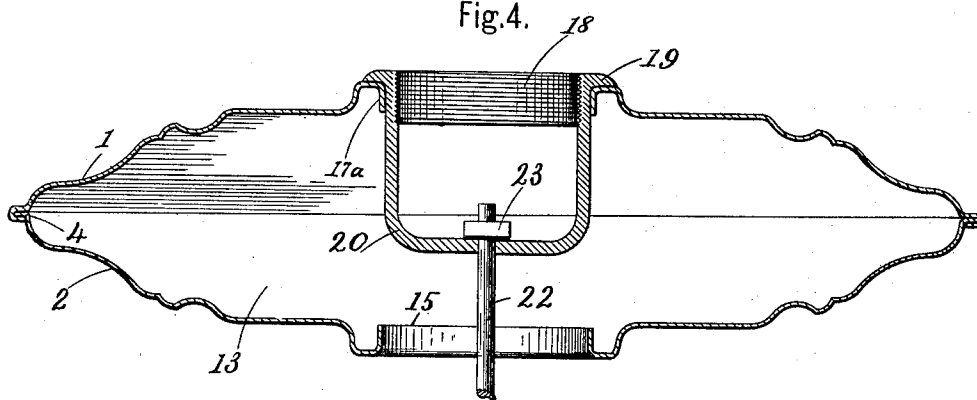


Fig.5,

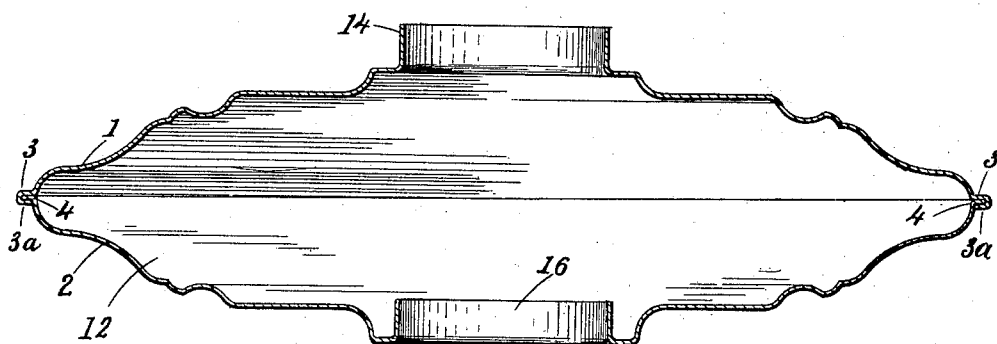


Fig.6.

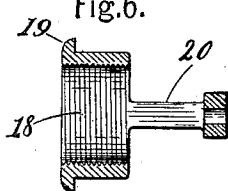
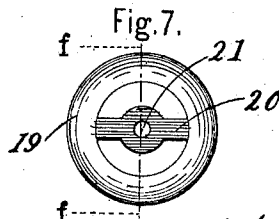


Fig.7.



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(Application filed Feb. 23, 1898.)

(No Model.)

3 Sheets—Sheet 3.

Fig.8.

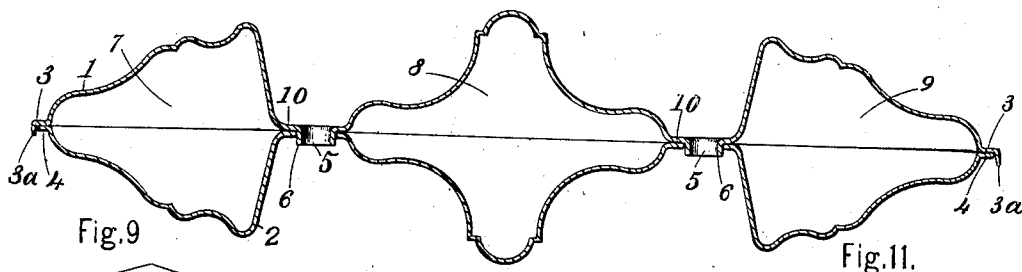


Fig.10.

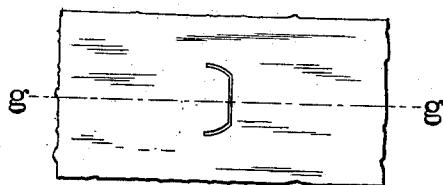


Fig.12.

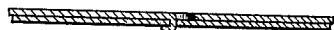


Fig.13.



Fig.14.

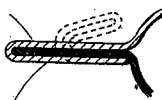
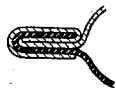


Fig.15.



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UNITED STATES PATENT OFFICE.

CLARENCE E. SAFFORD, OF BUFFALO, NEW YORK.

SHEET-METAL RADIATOR.

SPECIFICATION forming part of Letters Patent No. 692,365, dated February 4, 1902.

Application filed February 23, 1898. Serial No. 671,276. (No model.)

To all whom it may concern:

Be it known that I, CLARENCE E. SAFFORD, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Sheet-Metal Radiators, of which the following is a specification.

My invention relates to an improved steam and hot-water radiator each section of which is composed of two or more portions formed or stamped into shape from sheet metal and united by steam or water tight couplings or joints which are formed homogeneous or integral with the portions of the sections; and the principal object is to produce an extremely light weight radiator and also greatly cheapen the cost of construction thereof without detracting from the practicability or utility of the same.

A further object of the invention is to shape the metallic sheets into irregular contours, so as to provide when assembled a series of ducts or channels for the circulation of the heating agent which terminate in common chambers, in the side walls of which are located the coupling or jointing means, said side walls being distensible under pressure to force the couplings into closer union.

It also relates to certain details of construction, all of which will be fully and clearly hereinafter described and claimed, reference being had to the accompanying drawings, in which—

Figure 1 represents a front elevation of one of the end or leg sections. Fig. 2 represents a side elevation showing a series of sections secured together, a vertical central section being shown through a portion of the series on or about line *a a*, Fig. 1. Fig. 3 represents a horizontal section on or about line *b b*, Fig. 1. Fig. 4 represents a horizontal section on or about line *c c*, Fig. 1, cutting through the bottom of a leg-section and showing one of the fastening devices for securing a series of sections together. Fig. 5 is a horizontal section on or about line *d d*, Fig. 1, cutting through the top of one of the intermediate sections, showing the telescoping connecting portions. Fig. 6 represents a central section on or about line *ff*, Fig. 7, through one of the devices for securing the sections to each

other. Fig. 7 represents a front elevation of one of the side devices for securing a series of the sections together. Fig. 8 represents a horizontal section through the two halves comprising a section, showing the two portions in position and in condition for turning the edges of one part over the edges of the other part, and thereby rigidly securing them together. Fig. 9 represents one-half of a section as it is pressed up from a blank and before the edges have been trimmed. Fig. 10 represents a modification of the fastening device for securing the central portions of two half-sections together. Fig. 11 represents a suitable form of sheet-metal blank for forming a half-section. Fig. 12 represents a section on or about line *g g*, Fig. 10. Fig. 13 represents another modification of the device for securing the central portions of two halves of a section together. Fig. 14 represents an enlarged cross-section through the edge seam of a radiator-section, showing also by dotted lines how it may be turned over to form a double seam. Fig. 15 represents a cross-section through a double seam formed by bending the single seam shown in Fig. 14 upon itself.

In referring to the annexed drawings in detail like numerals represent like parts.

The preferred embodiment of my invention comprises a plurality of sections, each section being formed in two portions of sheet-steel or other suitable metal in substantially the shapes shown in the drawings. These two portions I will designate, respectively, as the "male" and "female" portions and denote the same by the numerals 1 and 2, the numeral 1 denoting the male and the numeral 2 the female. The male and female portions are substantially the same, with the exception that the male portion is provided with a wide overlapping edge or flange 3 and 3^a, adapted to be turned over to tightly clasp the narrower edge or flange 4 of the female portion. (See Figs. 3, 4, and 5.) The male portion is also provided with one or more series of short tubular portions 5, which pass through perforations or eyelets 6 in the female portions, substantially as shown in Fig. 8, in which the two portions of a section are put together preparatory to having the edges of the tubu-

lar portions 5 and the flange 3^a turned over, substantially as shown in Fig. 3, so as to hold all the parts rigidly to each other.

When the two portions of the sections are 5 together, as shown in Fig. 3, they form between themselves the substantially vertical tubes or chambers 7, 8, and 9 for the reception of the heating agent—steam or hot water—the tubes being separated from each other by 10 the webs 10, formed by the close contact of the male and female portions at those points. The tubular portions 5 and the perforations 6, into which they are inserted, are located in these web portions, as will be perceived by referring to Figs. 1, 3, 8, and 9.

The object of the web portions is to secure strength and rigidity of the parts when put together, so that a lighter weight of metal will give the necessary strength to resist any 20 ordinary pressure that the tubes may be subjected to.

The male and female portions are formed so that when secured together a substantially transverse tube 11 connects the vertical tubes 25 with each other, the said tube extending from one of the side vertical tubes 7 and 9 through the center vertical tube 8 and into the opposite side tube, substantially as shown in Figs. 1, 3, and 9. While the main purpose of this 30 transverse tube is to afford means of communication between the vertical tubes for the circulation of the heating agent, it also serves to strengthen the structure. I have shown but one of these transverse tubes in my preferred construction as illustrated; but more may be employed without departing from the nature of my invention. It will be observed by reference to Figs. 1 and 9 that the web 40 portions terminate a sufficient distance from the top and bottom of the sections to define terminal diaphragms which are highly sensitive to the pressure of the heating agent, these diaphragms forming between themselves upper and lower hollow spaces or chambers 12 45 and 13, in which the tubes 7, 8, and 9 merge. The general form of these spaces or chambers is shown in Figs. 4 and 5.

To connect the sections with each other, I provide jointing or coupling means, the male 50 portions in my preferred adaptation having upper and lower outwardly-extending tubular portions 14 and 15 and the female portions corresponding upper and lower openings having inwardly-projecting flanges or tubular 55 portions 16 and 17. These couplings are formed integral or homogeneous with the portions of the sections, each portion, with its coupling, being stamped at one operation, thereby greatly simplifying and cheapening 60 the construction. The said tubular portions are preferably tapered slightly, and the outwardly-projecting portions of the male portion of one section are adapted to be inserted or telescoped in the corresponding projecting 65 portions of the female portion of the section. In this manner the several sections of the radiator are secured to each other, the outwardly-

extending tubular portions of one section being inserted into the inwardly-projecting portions of the adjacent section. 70

All of the sections are duplicates of each other with the exception of one of the end or leg sections, the male portion of this section being provided with an inwardly-projecting 75 portion instead of the usual outwardly-projecting portion.

A hollow screw-threaded portion 18, preferably formed of malleable iron, having an outer flange 19 and an inner yoke or bridge 20, substantially as shown in Figs. 6 and 7, 80 is adapted to be inserted and snugly fitted in each of the inwardly-projecting tubular portions of the leg-sections, substantially as shown in Fig. 4, and each yoke or bridge 20 is provided with a central opening 21, through 85 which a rod 22 is passed. Two of these rods are employed, one being passed through the upper series of telescopic tubular portions and the other through the lower series, and their ends are screw-threaded and provided 90 with nuts 23, thus providing means for drawing the sections closely and rigidly together. The object of these portions 18 is to provide means for attachment for valves connecting 95 the heating agent and also secure the sections together without interfering with the free passage of the said agent into the radiator. When not attached to pipes, the openings in these portions are closed by the screw-plugs 24, either one or more of which may be re- 100 moved and a bushing inserted or screwed in to receive a valve or pipe.

While the legs of the radiator may be formed integral with the end sections, it is believed that it would be better to form them separately of cast or malleable iron and attach them thereto by bolts or other suitable means. 105

In the construction shown in Figs. 1 and 2 the legs or leg-sections are formed in two halves 25 and 25^a, with curved and concave 110 tops 26, into which the lower ends of the leg-sections are seated and secured by means of a rod 27^e, having nuts 27 and 27^a, one on each side, as shown in Fig. 2. The rod 27^e may, if desired, extend and pass through the lower 115 parts of all the intermediate sections and to and through the opposite leg-section, substantially as shown in Fig. 2, thus providing means whereby the same bolt secures the legs to their respective end sections and also 120 additionally fastens the sections together. It is obvious, however, that the two halves of each leg might be secured to its section by means of a short bolt, or various other means could be employed without departing from 125 the scope of my invention.

Modified means for securing the male and female portions together are shown in Figs. 10, 12, and 13, which could, if desired, be used in place of the device shown in Fig. 8. 130

In Figs. 14 and 15 modified means for securing the male and female portions of the sections together at their edges are shown, the edge of one portion being lapped over or

bent upon the edge of the other portion, and the lapped edges are again bent upon themselves, thereby forming reinforcements on both sides of the contacting margins of the portions.

While the form shown in Figs. 3, 4, 5, and 8 is probably sufficient for small radiator systems in buildings of two or three stories, it is more advisable to use the construction shown in Figs. 14 and 15, as it makes a firmer connection and a stronger construction.

In constructing my improved radiator the male and female portions of the sections are stamped into shape from suitable blanks, substantially similar to that shown in Fig. 11, by means of dies or analogous devices. The male and female portions of each section are secured together, and the sections are immersed in a cleaning liquid and then dipped into a bath of molten lead or other suitable material, the openings in the sections allowing the same to freely flow and circulate through their interiors, thus coating the interior of the section with a preparation capable of protecting the sheet-steel or other metal of which the section is composed from the corrosive influence of the heating agent and also closing all joints, both externally and internally, to prevent leakage. The sections are drained and cooled and then assembled, the outwardly-extending tubular portions of the male portions of the sections being inserted in the inwardly-projecting tubular portions of the female portions of the respective adjacent sections. When a sufficient number of sections to form the required size of radiator have been assembled in this manner, the portions 18 are inserted in the openings in the end sections and the rods 22 passed through the openings 4 in the yokes 20 of the said portions, and the nuts 23 are tightened, thus drawing the sections closely together. The legs or leg portions are secured to the end section, as before described.

The heating agent—steam or hot water—may be introduced either into the upper or lower portion of the radiator, as described, by removing the plug 24 and inserting the end of a connecting pipe or valve.

Heretofore radiators composed of a plurality of sections secured together by pressure had to be assembled at the manufacturing plant, and an expensive machine or press driven by power was required to force the sections together closely enough to form steam or water tight connections.

With my improved radiator the sections can be shipped separately, with the necessary fittings, from the plant to the steam-fitter and can be easily and readily assembled by hand in the apartment or room in which it is desired to place the radiator, as great pressure, and consequently a power-press, is not required to force the sections together in water or steam tight connection, owing to the substantially flexible and expansible character of the metal of which the sections are com-

posed. This great advantage is secured through the fastening means employed, the improved form of jointed connection, and mainly by the flexibility of the metal, which is such that the pressure of the heating agent tends to bulge or distend the sections against each other and the fastening means, and thus force the telescoping portions more closely upon and within each other.

In assembling my improved radiator the sections are connected together by telescoping the tubular connection of one within the tubular connection of the other and passing a fastening or tie rod or bar through the tubular connections, the ends of which are secured to the exterior or end sections by screw-bolts, as before described, the screwing of which upon the bar tends to force the sections together and their diaphragmatic side walls inwardly toward each other. Now upon the admittance of the heating agent the pressure of the same upon the interior of these diaphragmatic portions bulges or distends them, and as the fastening-rods, with their screw-bolts, maintain the end sections rigidly in the same relative position the distention of the walls caused by the pressure exerted must necessarily force the telescoping connections more closely upon and within each other to tighten the joint.

It may prove advisable to insert the portions 18 in the openings in the leg or end sections before coating the sections, as the molten metal will then fill and seal the joints.

I claim as my invention—

1. A radiator comprising a plurality of sections having coupling devices, one of the sections having a diaphragmatic portion provided with a coupling device, said diaphragmatic portion being adapted to be moved by pressure within the radiator to force the coupling device into tight connection with a cooperating coupling device of an adjacent section.

2. A radiator having a plurality of sections, one section at least of which has a diaphragmatic portion and a coupling, said diaphragmatic portion being adapted to be moved by pressure within the section to force the coupling into tight connection with an adjacent section.

3. A radiator-section having a plurality of contacting parts; said parts having their outer margins bent to clamp and support both sides of the parts.

4. A radiator-section having a plurality of sheet-metal parts having contacting margins joining to each other by oppositely-bent folds and having at least two superimposed thicknesses of metal on each side of the line of separation between said contacting margins.

5. A radiator-section having a plurality of joined parts and having a connection between parts consisting of their two margins lying together and bending to clamp and support both sides of the parts.

6. A radiator-section formed of two portions

of sheet metal having two marginal parts of unequal length and having the edge of the longer part bent upon the outer edge of the other part and the superimposed lapping edges bent back again upon themselves in the opposite direction, thereby forming reinforcements on both sides of the parts.

7. A radiator comprising a plurality of sections formed of flexible sheet metal, and united by homogeneous coupling means tightened by internal fluid-pressure.

8. A radiator formed of flexible sheet metal and comprising a plurality of sections united by coupling members which are tightened by the bulging of the sections through internal pressure, and tie-rods for securing the sections together.

9. A radiator comprising a plurality of sections formed of flexible sheet metal and united by homogeneous coupling members tightened by the pressure of the heating agent, as set forth.

10. A sheet-metal radiator composed of two or more sections each having male and female nipple portions formed integral therewith and extending from the sides thereof, the male nipples of one section being adapted to be inserted in the corresponding female nipple portions of the adjacent section, and to be more firmly forced therein by the bulging of the sections caused by the pressure of the heating agent.

11. A radiator comprising a series of sections each having diaphragmatic portions provided with coupling devices, said diaphragmatic portions being adapted to be moved by the fluid-pressure of the radiator,

to force the coupling devices into tight connection.

12. A radiator composed of two or more sections of flexible metal connected together by joints which are tightened by the bulging of the sections through the pressure of the heating agent, and connecting means for rigidly maintaining the end sections in substantially the same relative position with respect to each other.

13. A radiator formed of flexible sheet metal composed of two or more sections formed in two portions, a male and a female portion, tubular nipple portions integral with and extending outwardly from the sides of all the male portions with the exception of the end male portion, tubular nipple portions formed integral with and extending inwardly from the sides of the female portions and the end male portion, the said outwardly-extending portions being adapted to telescope in the inwardly-extending portions to secure the sections together, and tubular devices seated in the inwardly-extending tubular portions of the male portion and the inwardly-projecting portions of the female portion of the section at the opposite end and each provided with an inner yoke, and rods or bars passing through the yokes, telescoping nipples and the sections for drawing and securing the sections together, whereby the bulging of the sections tends to force the tubular devices into closer contact to tighten the joint.

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