W. R. KINNEAR.

METHOD OF FORMING CONNECTIONS BETWEEN OPPOSED WALLS OF SHEET METAL RADIATORS.

APPLICATION FILED DEC. 27, 1906.

1,015,738. Patented Jan. 23, 1912.

Fig. 1.

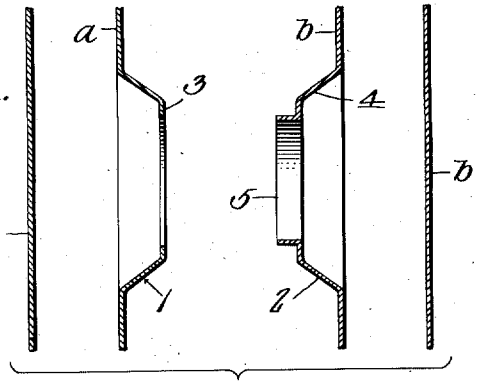


Fig. 2.

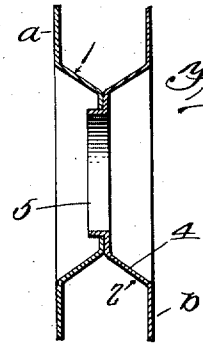


Fig. 3.

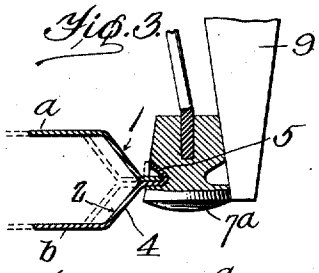


Fig. 4.

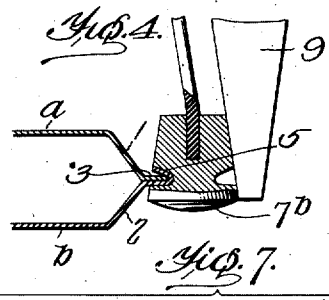


Fig. 5.

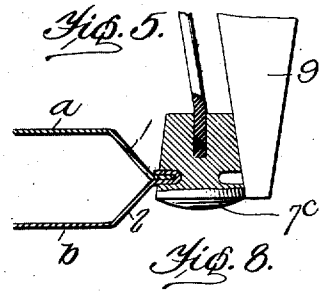


Fig. 7.

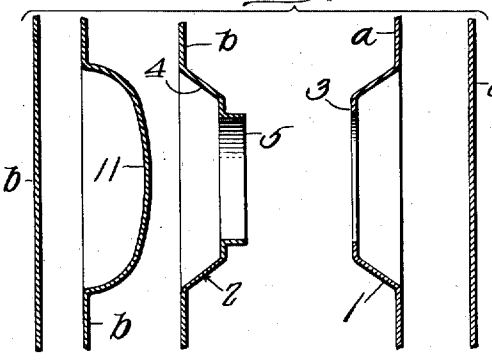


Fig. 8.

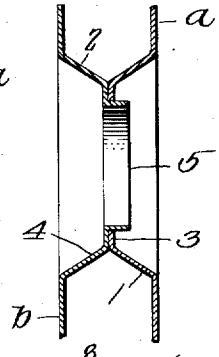


Fig. 9.

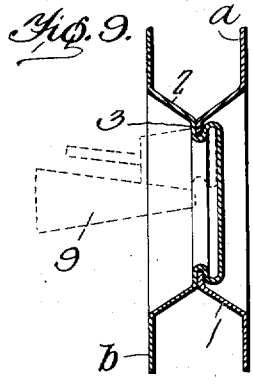


Fig. 6.

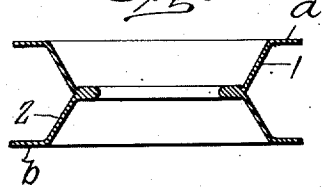


Fig. 10.

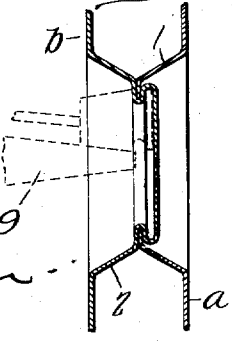


Fig. 11.

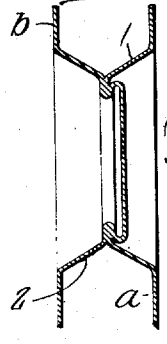
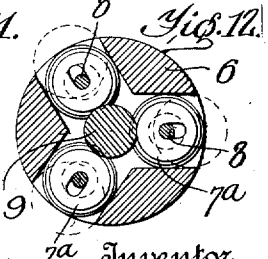


Fig. 12.



Witnesses

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METHOD OF FORMING CONNECTIONS BETWEEN OPPOSED WALLS OF SHEET-METAL RADIATORS.

1,015,738. Specification of Letters Patent. Patented Jan. 23, 1912.

Original application filed September 29, 1903, Serial No. 175,071. Divided and this application filed December 27, 1906. Serial No. 349,705.

To all whom it may concern:

Be it known that I, WILLIAM R. KINNEAR, a citizen of the United States, and resident of West Pittsburg, in the county of Lawrence and State of Pennsylvania, have invented certain new and useful Improvements in Methods of Forming Connections Between Opposed Walls of Sheet-Metal Radiators, of which the following is a specification.

This invention relates to methods of forming connections between opposed walls of sheet metal radiators and this application is a division of an application for sheet metal radiators filed by me September 29, 1903, Serial No. 175,071.

In connecting opposed walls of sheet metal radiators, I have experienced great difficulty in making the joint water and steam tight. After repeated experiments, I ascertained that one way to overcome this difficulty is to flow the metal of the parts forming the seam. It is, therefore, an object of my invention to provide a method of flowing the metal of the connection.

Other and further objects of my invention will appear in the following description and will be more particularly pointed out in the appended claims.

In the drawings: Figure 1 is a view showing the steps in forming the members of one embodiment of the connection, before said members are associated; Fig. 2 is a view showing the members fitted together; Figs. 3, 4, and 5 show the successive steps in the process; Fig. 6 is a sectional view of the completed connection; Fig. 7 is a view showing the steps in forming the members of another embodiment of the connection; Fig. 8 shows the two members of this connection fitted together; Figs. 9 and 10 show the next two steps in the operation; Fig. 11 shows the completed connection; and Fig. 12 is a sectional view of one of the spinning tools.

Two opposed walls *a* and *b* are stamped or pressed to form tapering bosses 1 and 2 respectively. During the stamping or pressing of the boss 1, it is preferably perforated to provide an inwardly turned annular flange 3 or tongue. And during the formation of boss 2, it is preferably perforated and formed with an inwardly turned portion 4 and a portion 5 projecting laterally from the inwardly turned portion 4. The two members thus formed are then fitted together, so that the laterally projecting portion 5 fits with the annular inturned flange 3. A spinning tool, such as is shown in Fig. 12 is then fitted with the annular opening and rotated. This spinning tool comprises a head 6 having a series of grooved and tapered rollers 7^a journaled therein in such a manner that they may move perpendicularly to their axes 8. A tapered mandrel is introduced so as to force the rollers outwardly. The grooves of the rollers 7^a are wide and serve to flare the laterally projecting portion 5 to the position shown in Fig. 4. A tool with rollers 7^b, having narrower grooves, is then introduced within the connection and the laterally projecting portion is then bent outwardly as shown in Fig. 5 to form an annular groove 10 for the inwardly extending flange 3. Then a tool with still narrower grooved rollers 7^c is introduced. As during the rotation of all the tools, the rollers are forced outwardly by the mandrel 9, the metal of the seam is expanded radially so as to condense it in this direction. The two first tools serve to spin the portion 5 in proper position to form the groove 10, while the third tool, which is operated under great pressure, serves to spin the metal, expand the seam radially to condense the metal radially and sustain the sides of the seam during the expansion, thus causing the metal to flow, so that there is formed an integral connection as shown in Fig. 6.

In radiators employed for some systems of heating, it is desirable not to have a circulating opening between the upper ends of adjacent units; yet it is very essential that the radiator units be rigidly locked together at such points. To accomplish this purpose, I employ a connection made in accordance with the embodiment of my method illustrated in Figs. 7 to 11. This blind connection may also be employed to connect any other pair of opposed walls in a radiator. In this embodiment, one wall *a* is pressed or struck up to form an open tapering boss 1 having an inwardly extending annular flange 3 as in the first embodiment. The other wall *b* is not perforated during the process but is closed. And, so as to stretch the metal to its greatest extent, I find it desirable to first strike or form a rounded

boss 11, as shown in Fig. 7, and then, by the use of other suitable dies, the boss is pressed to form a tapering boss 12 having a reduced cylindrical extension 13 which is fitted within the open boss as shown in Fig. 8. A spinning tool similar to that heretofore described, with widely grooved rollers, is introduced within the closed boss 12 and rotated (see Fig. 8). This expands the reduced cylindrical extension so as to form an annular groove 14, in which the annular flange 3 extends. A second spinning tool with narrower grooved rollers is introduced in the place of the first tool, see Fig. 10, and the rollers are moved radially as in the first embodiment, by a tapered mandrel 9 until the joint is flowed into an integral connection, as in Fig. 11.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. The process of connecting the opposed walls of sheet metal radiators which consists in interlocking the metal of the two walls in an annular inwardly extending joint, and in radially condensing the same to such a degree as to convert the opposed walls of the joint into a substantially homogeneous mass, whereby an absolutely water and steam-proof joint is formed.

2. The process of connecting the opposed walls of sheet metal radiators which consists in forming bosses on said walls, the one with a radially presented annular groove and the other with an annular flange entering said groove, then in radially condensing the metal of the joint to form a substantially homogeneous connection between the opposed walls of the joint, whereby a steam-proof joint is formed.

The foregoing specification signed at Newcastle, Pennsylvania, this 30th day of March, 1906.

WILLIAM R. KINNEAR.

In presence of—
FREDRICK PETRY,
H. K. GREGORY.