No. 697,560. Patented Apr. 15, 1902.

J. A. STEINMETZ.

TUBULAR BOILER.

(Application filed Mar. 26, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

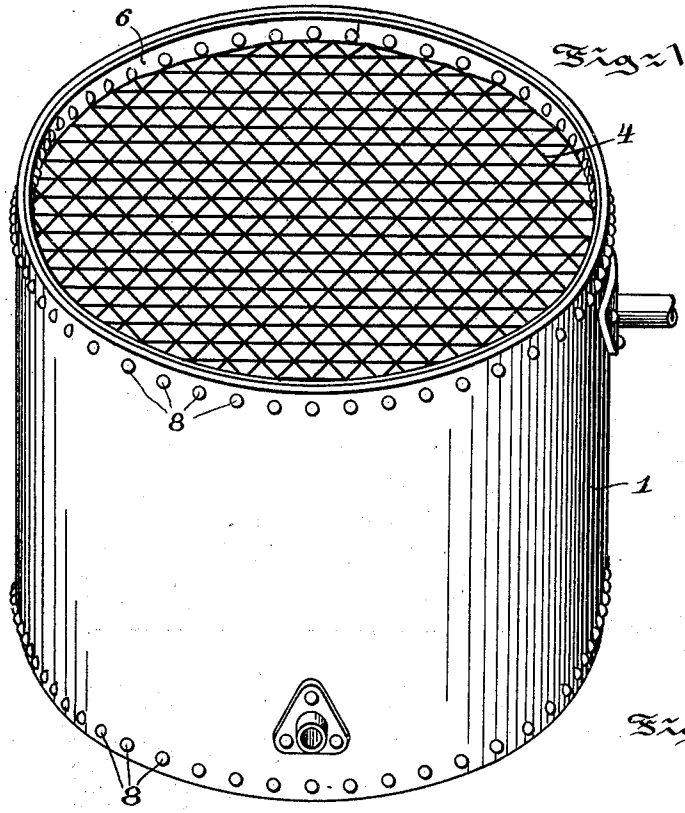

Fig. 3.

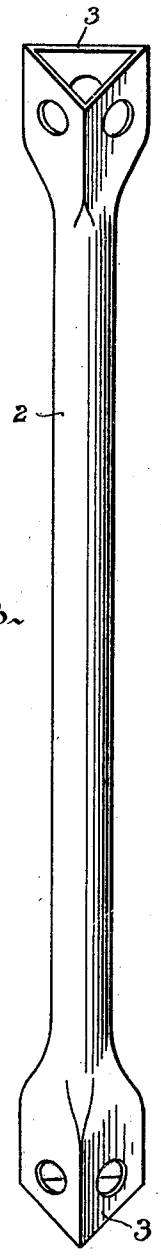

Fig. 2.

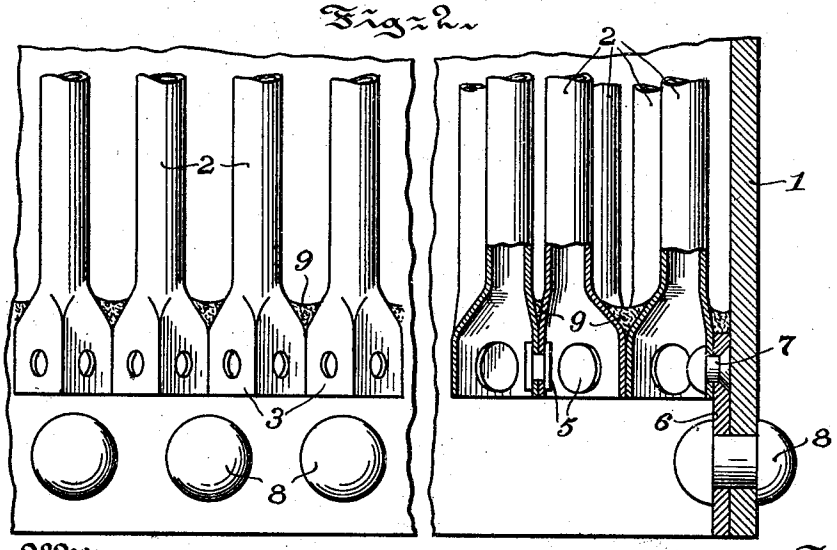

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Fig. 4.

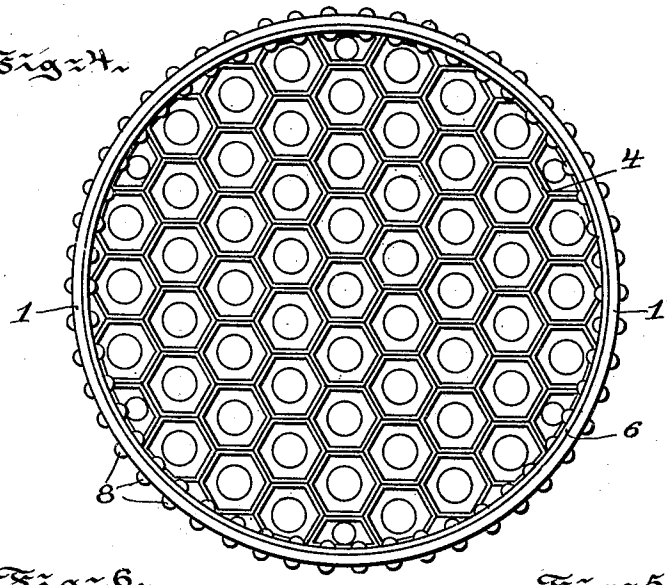


Fig. 6.

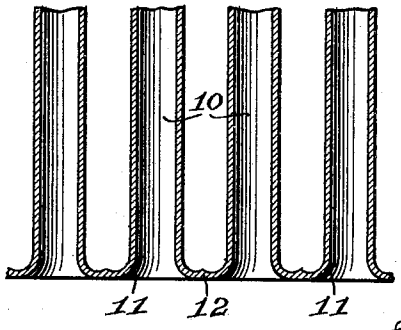


Fig. 5.

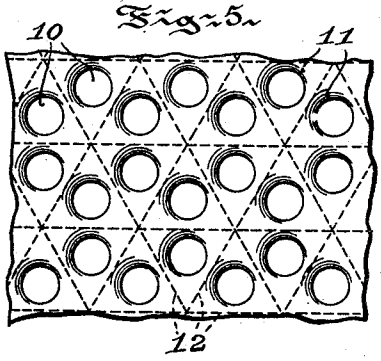
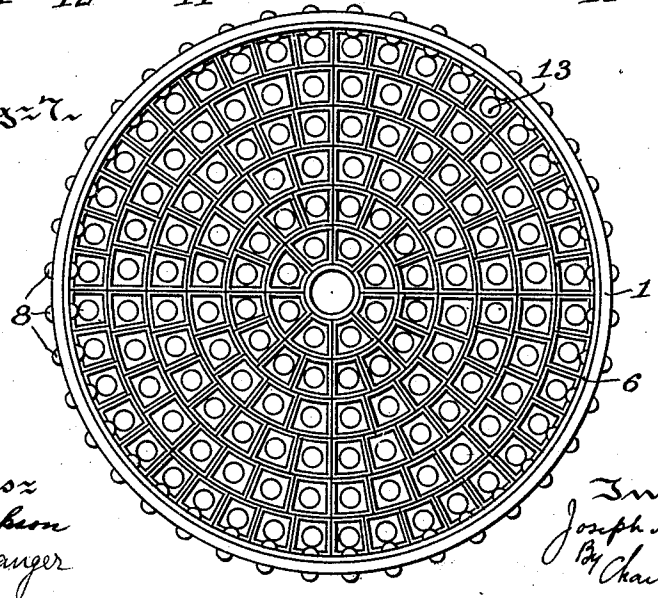


Fig. 7.



Witnesses:
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UNITED STATES PATENT OFFICE.

JOSEPH ALLISON STEINMETZ, OF PHILADELPHIA, PENNSYLVANIA.

TUBULAR BOILER.

SPECIFICATION forming part of Letters Patent No. 697,560, dated April 15, 1902.

Application filed March 26, 1901. Serial No. 52,968. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH ALLISON STEINMETZ, residing in Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Tubular Boilers, of which the following is a specification.

This invention comprises a boiler construction in which the ends of the fire-tubes employed are expanded and joined together to form the crown or head, by which the usual head or crown sheet and the operation of joining the tubes thereto are eliminated from the construction.

In carrying out my invention the ends of the tubes may be expanded to any shape permitting them to be joined together to form close joints, and the tube ends may be secured together by riveting, welding, or in any suitable manner.

Particularly in the small steam-boilers employing a large number of small fire-tubes, such as used in motor-vehicles, the operations of punching the crown-sheets and joining the tubes thereto involve difficulty, labor, and expense, which my improvements are designed to eliminate.

The characteristic features of my invention will fully appear from the following description, taken in connection with the accompanying drawings, of which—

Figure 1 is a perspective view of a boiler embodying my improvements. Fig. 2 is a vertical sectional view of a boiler-head made in accordance with my invention. Fig. 3 is a perspective view of a form of tube employed in the construction. Fig. 4 is a top plan view in illustration of a form of boiler-crown made in accordance with the invention. Fig. 5 is a top plan view of a section of boiler-crown in illustration of a second form of my invention. Fig. 6 is a vertical sectional view in further illustration of the construction illustrated in Fig. 5, and Fig. 7 is a top plan view in illustration of a boiler-crown employing a further modification of the construction.

Referring to the drawings, the usual drum or cylinder 1 is provided with tubes 2, having their ends expanded and secured together and to the drum in any manner suitable for forming the closed heads or crowns 4.

As illustrated in Figs. 1 to 3, inclusive, the construction comprises the tubes 2, having their ends 3 expanded to triangular forms, which are fitted together, joined by the rivets 5, and secured within the drum 1, so that the connected tube ends form crowns therefor. The attachment to the drum may be made by means of a band 6, secured to the tubes by the rivets 7 and to the drum by the rivets 8. The joints thus formed may be sealed by means of hard spelter or other suitable material 9.

As illustrated in Fig. 4, the tube ends may be expanded to a hexagonal form and joined to form the closed head 4, the tubes being joined and connected within the drum 1 either as heretofore or hereinafter described.

As illustrated in Figs. 5 and 6, the tubes, as 10, may have their ends 11 flared or turned over and welded together, as shown at the parts 12, in any known manner, as by the process of electric welding or electrolytic deposition.

As illustrated in Fig. 7, the form of the expanded tube ends may be varied to any shape convenient and suitable for joining to form a crown, as the quadrangular forms 13, bound by radial lines and arcs of concentric circles, the ends thus formed being adapted to fit together in rings concentric to the drum 1.

It will be seen that various modifications may be made in the details of construction without departing from the principle of my invention, which involves a boiler having heads or crowns formed by joining together and to the drum the ends of the fire-tubes expanded by a mandrel or in any known manner, so as to close the boiler ends without the use of the usual crown-sheets.

Having described my invention, I claim—

1. A boiler comprising a drum, and fire-tubes having their ends expanded and welded together in lieu of a crown-sheet, substantially as specified.

2. A boiler comprising a drum, fire-tubes having expanded ends fitted and connected together so as to form a crown, and a band connecting said drum and tubes, substantially as specified.

In testimony whereof I have hereunto set my hand, this 23d day of March, 1901, in the presence of the subscribing witnesses.

JOSEPH ALLISON STEINMETZ.

Witnesses:
THOMAS S. GATES,
PERCIVAL H. GRANGER.