4. Sheets. Sheet. 1.

F. W. Webb,

Boiler Furnace.

No. 98,726. Patented Jan. 11. 1870.

Fig. 1.

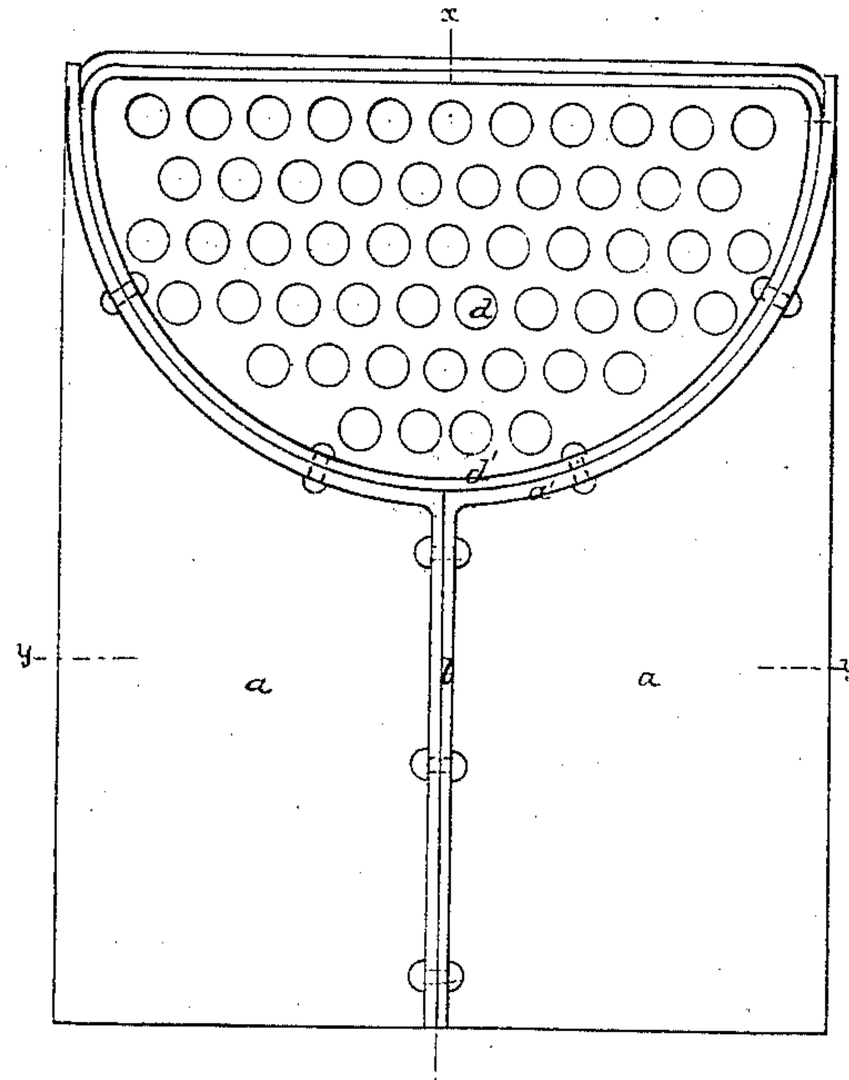


Fig. 2.

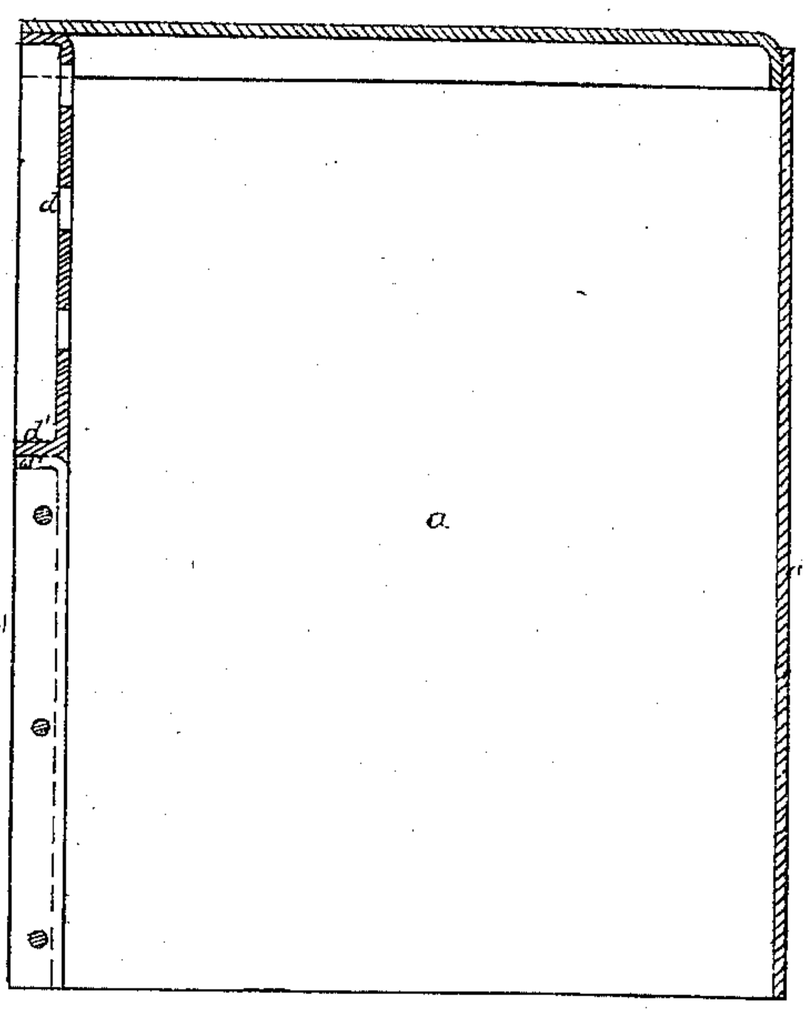
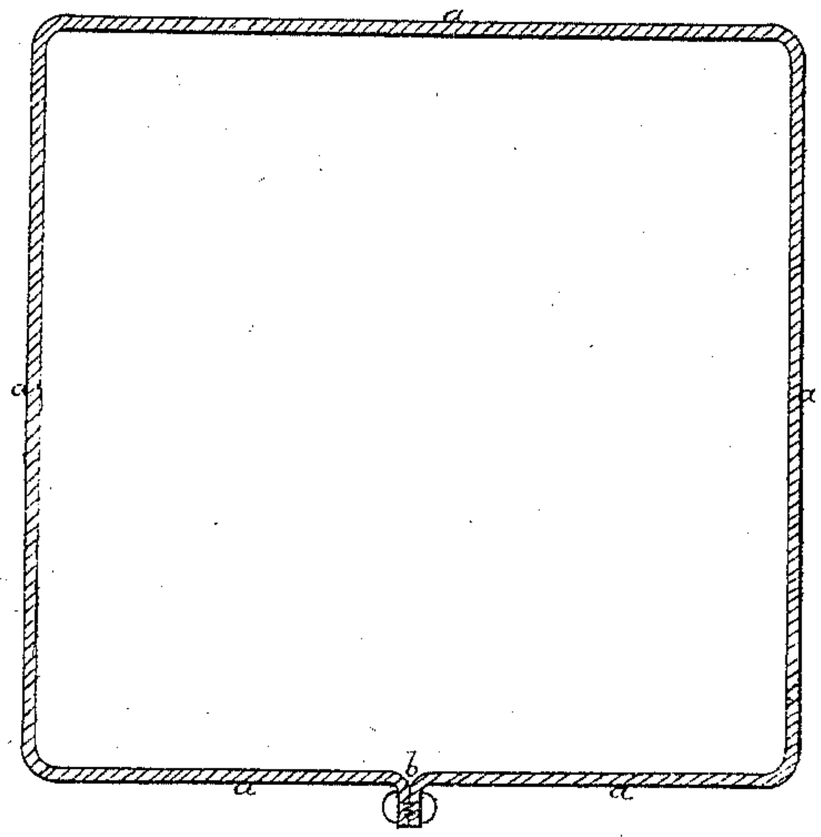


Fig. 3.



Witnesses

William Platt.

James Thornley

Inventor

F. William Webb

4. Sheets, Sheet. 2.

F. W. Webb,

Boiler Furnace,

No. 98,126. Patented Jan. 11. 1870.

Fig. 1.

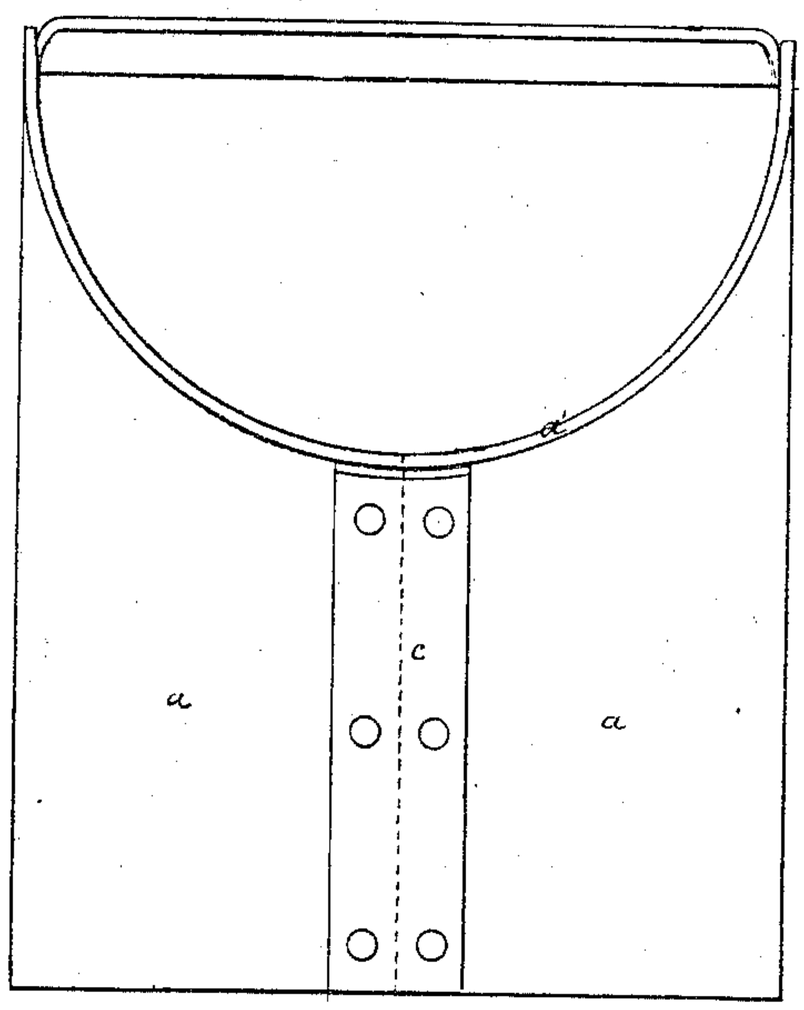
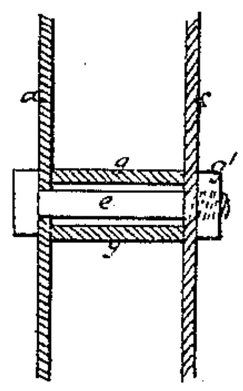


Fig. 8.



Witnesses

William Platt

James Thornley

Inventor

Frederick William Webb

4. Sheets. Sheet. 3.

F. W. Webb,

Boiler Furnace.

No. 98726. Patented Jan. 11. 1870.

Fig. 5.

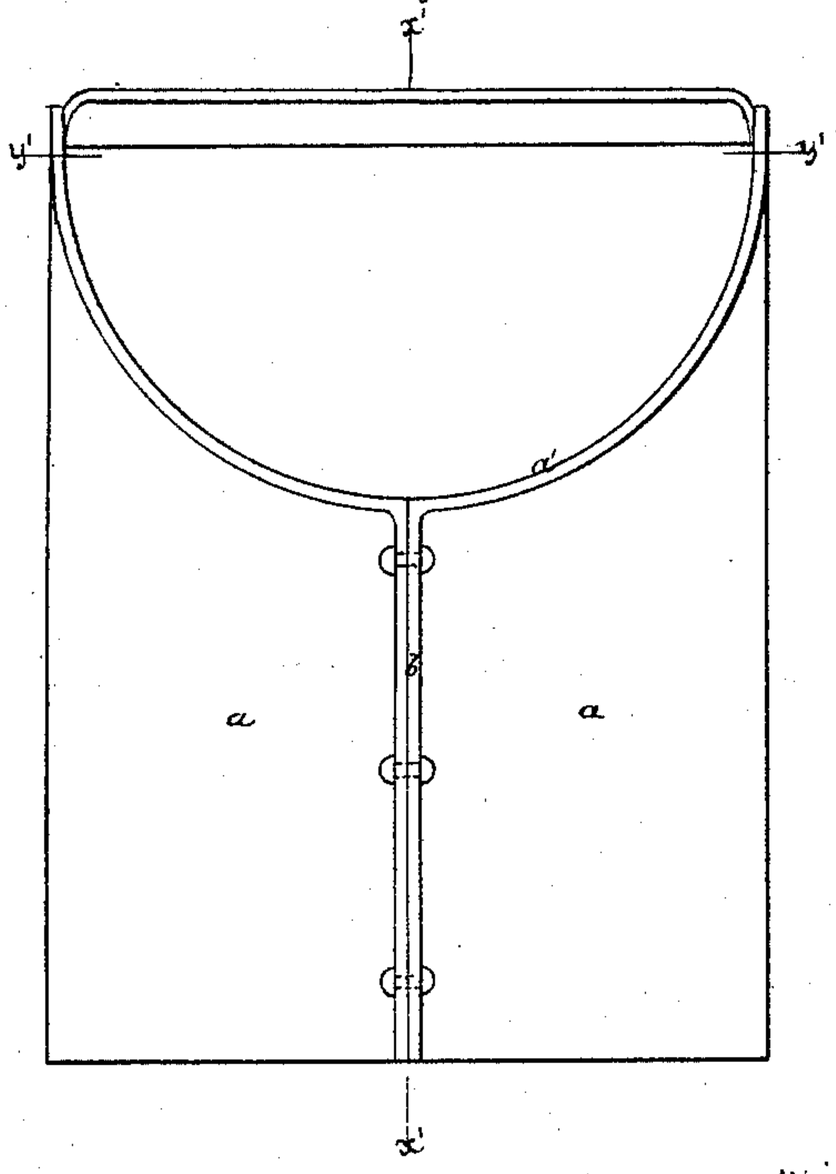


Fig. 6.

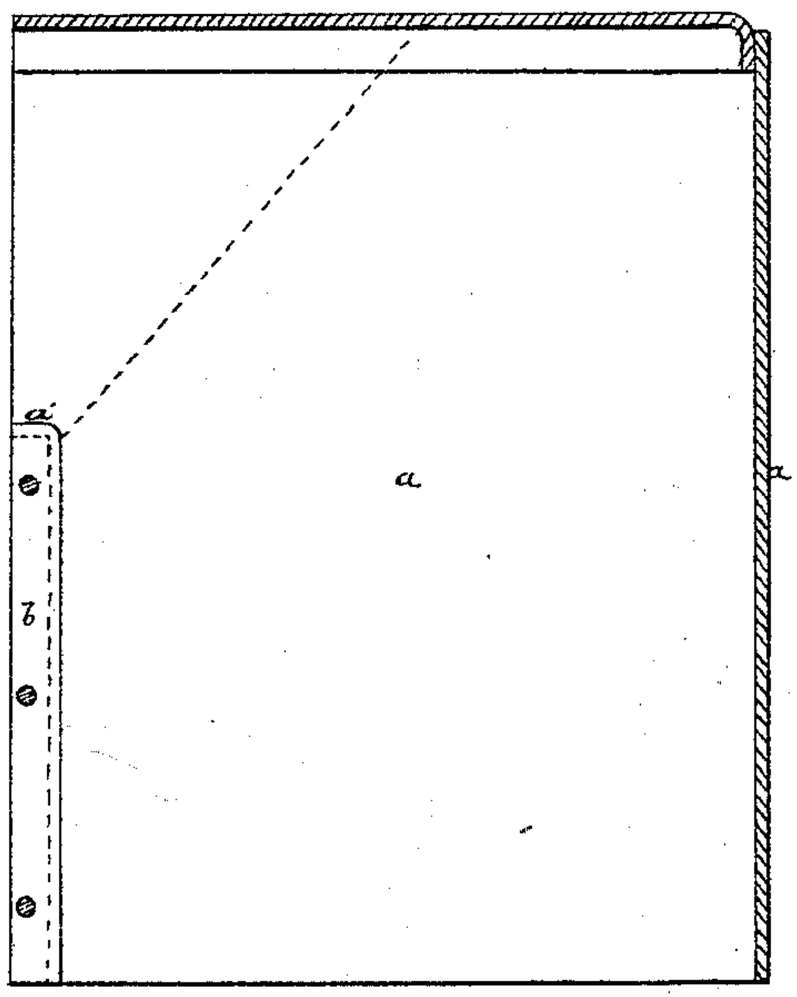
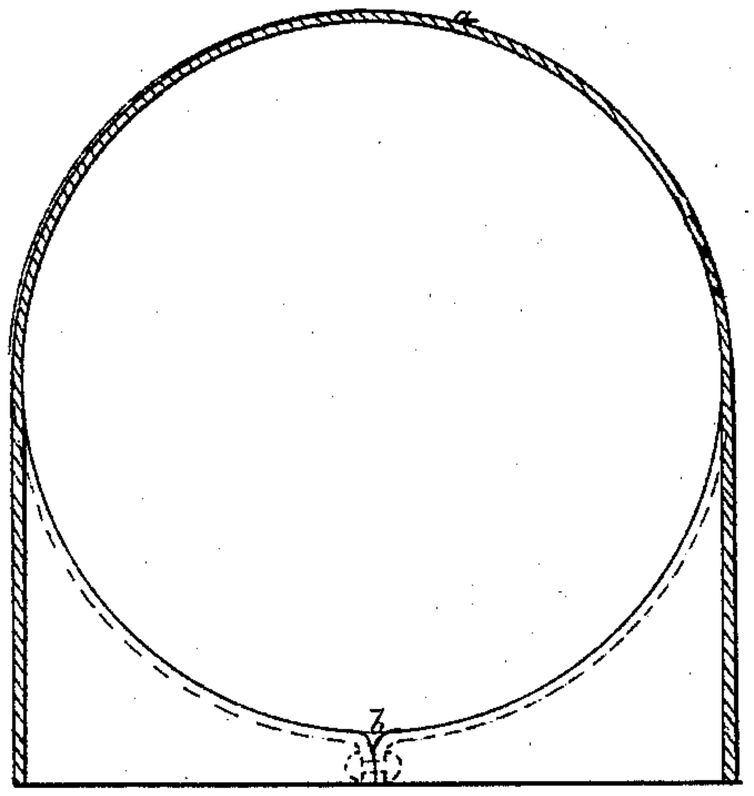


Fig. 7.



Witnesses.
William Platt.
James Thornley

Inventor.
Frederick William Webb

4. Sheets. Sheet. 4.

F. W. Webb,

Boiler Furnace.

No. 98,726. Patented Jan. 11. 1870.

Fig. 9.

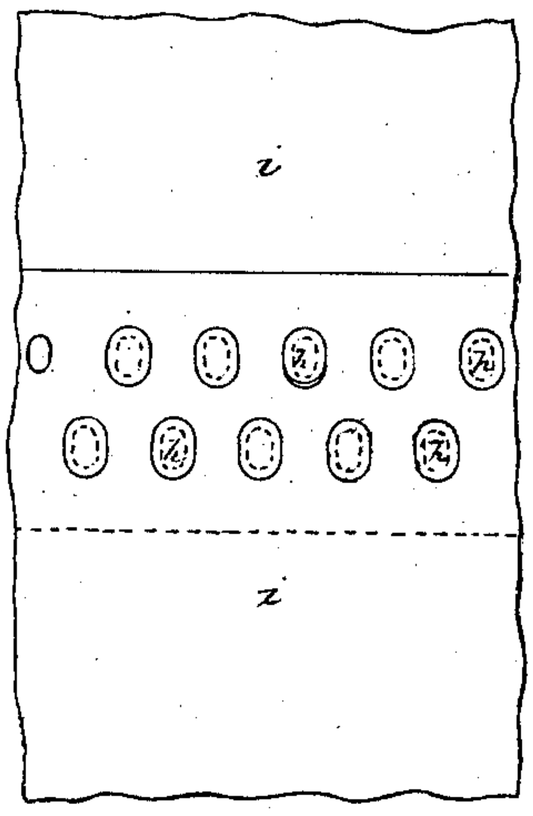


Fig. 10.

Fig. 11.

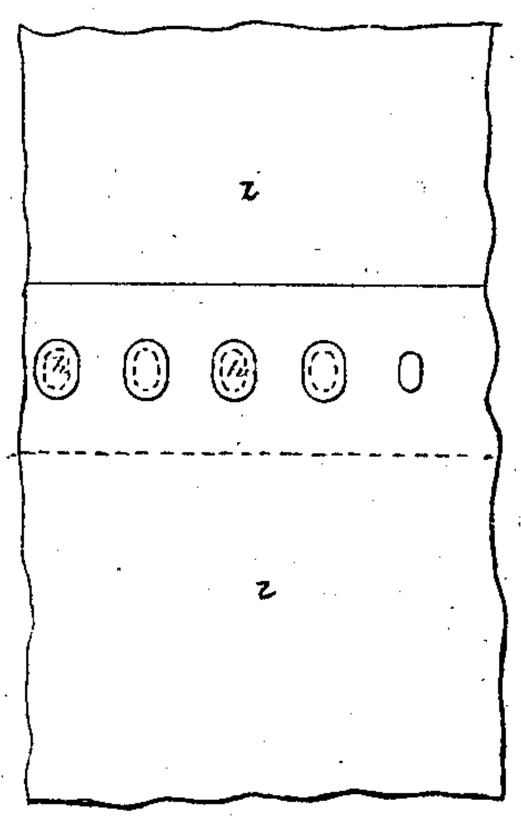
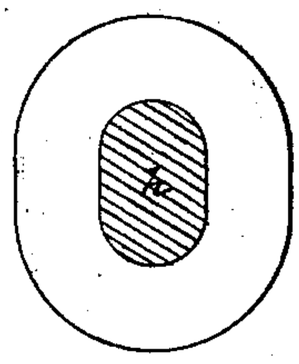


Fig. 12.



Witnesses
William Platt.
James Stromley

Inventor
Francis William Webb

United States Patent Office.

FRANCIS WILLIAM WEBB, OF BOLTON, ENGLAND.

Letters Patent No. 98,726, *dated January* 11, 1870.

IMPROVEMENT IN STEAM-GENERATORS.

The Schedule referred to in these Letters Patent and making part of the same

To all whom it may concern:

Be it known that I, FRANCIS WILLIAM WEBB, of Bolton, England, have invented certain new and useful "Improvements in the Construction of the Fire-Boxes and other Portions of Steam-Boilers;" and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

The said invention consists chiefly in forming the front, sides, and back of the fire-box, of a single sheet or plate of metal, whereby I am enabled to construct a fire-box which has no plate-edges exposed to the action of the fire, and also avoid riveted joints at the corners. I thus render the said fire-box cheaper of construction, and more convenient to secure inside the boiler. It is also more durable, through the absence of the riveted joints, and the greater elasticity of the box at the corners, which allows of its free expansion and contraction.

The said invention also consists in constructing the said fire-box with a separate tube-plate, which may be made thicker than the other portion of the box, and may be readily removed, if injured, and replaced by a new plate.

The said invention may be advantageously applied to the construction of fire-boxes of iron, but its importance is more clearly apparent in the construction of steel fire-boxes, wherein very thin plates are desirable, which plates cannot be made properly secure by riveting.

My improved fire-box may be made rectangular or circular, or of any other desired form in its horizontal section, and the one joint or seam, where the two ends of the plate meet, may be secured in various ways.

The said invention further consists in the use of rivets of an oval, elliptical, or oblong cross-sectional form, for securing the longitudinal seams in steam-boilers, whereby I am enabled to give to the boiler great shearing-strength at the seams, without greatly decreasing the sectional area of the plates between the rivet-holes, while at the same time the elasticity of the joints is increased.

In the accompanying drawings I have illustrated the application of my invention to steam-boilers and fire-boxes, and I will now proceed more fully to describe the same.

Description of the Drawings.

Figure 1 is a front view of a square fire-box, constructed according to my invention.

Figure 2 is a vertical section, on the line $x\ x$, fig. 1.

Figure 3 is a horizontal section, on the line $y\ y$, fig. 1.

Figure 4 is a front elevation of a similar fire-box, of slightly modified construction, as hereinafter explained.

Figure 5 is a front elevation of a circular fire-box, constructed according to my invention.

Figure 6 is a vertical section, on the line $x'\ x'$.

Figure 7 is a horizontal section, on the line $y'\ y'$.

Figure 8 illustrates the method of securing the fire-box to the outer box or casing of the boiler.

Figures 9 and 10 are a front view and section, through a joint or seam of double riveting, showing the application thereto of my improved rivets.

Figure 11 is a front view of a seam of single riveting.

Figure 12 is a transverse section of my improved rivets.

Like letters indicate the same parts throughout the drawings.

The single plate or sheet *a*, which forms the front, sides, and back of my improved fire-box, is curved or bent at the corners, (as shown in fig. 3,) by any convenient or suitable apparatus or machinery used in the working of metal plates, and its ends are united and secured together at *b*.

In fig. 1, I have shown the joint or seam *b*, made by flanges formed on each end of the plate, the said flanges being brought close together, and secured by rivets passed through them.

In fig. 4, the plate is secured by a but-joint, the edges being brought fairly together and riveted to the strip or bar *c*, in a manner well understood by boiler-makers, and others skilled in the working of metal plates.

In figs. 1 and 2, I have shown the tube-plate *d*, secured in its place.

In figs. 5, 6, and 7, I have shown the fire-box, with the tube-plate removed.

It will be seen, by reference to these figures, that the plate *a* is flanged at *a'*, for the reception of the tube-plate, which is also formed with a corresponding flange, *d'*, the two flanges being fitted and riveted together, as shown.

It is obvious, that, if desired, my improved fire-box may be constructed without the separate tube-plate, and may have the seam or joint in any convenient position.

I prefer to secure my improved fire-box within the outer box or casing, by passing bolts *e* through the plate *a* of the inner fire-box, and the plate *f* of the outer box or casing, and through ferrules or tubes *g*, arranged within the water-space between the two plates, as shown in fig. 8. These ferrules form stays, which keep the plates *a* and *f* at the proper distance apart, and at the same time, by means of the nuts *g'*, the said plates may be screwed tightly up to the ferrules *g*. By the use of these bolts, nuts, and ferrules,

I avoid tapping the plates *a* and *f*, and am therefore enabled to use thinner plates than could otherwise be employed, and the removal of the said stays and the fire-box, for cleaning, or other purposes, is also greatly facilitated.

By referring to figs. 9, 10, and 11, which illustrate the application of my improved rivets to the seams of joints of steam-boilers, it will be seen that the rivets *h* are arranged with their smallest diameter parallel with the line or seam of riveting, so that the metal of the rivets is disposed in the most advantageous direction to resist the shearing-strain caused by the pressure within the boiler.

It will also be obvious, that by using rivets of the form shown in fig. 12, or a substantially similar form, the holes for such rivets are formed without diminishing the area of the plates *i* between the rivet-holes, to the extent to which it is diminished in using ordinary circular rivets; consequently the joint or seam is rendered stronger, and its elasticity is increased by the better distribution of the diminished sectional area.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A fire-box for a steam-boiler, with its front, sides, and back constructed of a single plate or sheet of metal, substantially as set forth.

2. Constructing the said fire-box with a separate tube-plate, substantially as and for the purposes set forth.

3. Securing the joints or seams of steam-boilers with oval, elliptical, or oblong rivets, inserted through holes of corresponding form, and arranged to offer the greatest resistance to the shearing-strain caused by the pressure within the boiler, substantially as set forth.

FRANCIS WILLIAM WEBB. [L. S.]

Witnesses:

C. DONHOE,

I. S. HICKLING.