

E. GEARING.
STEAM BOILER FURNACE AND FLUE.
APPLICATION FILED APR. 23, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

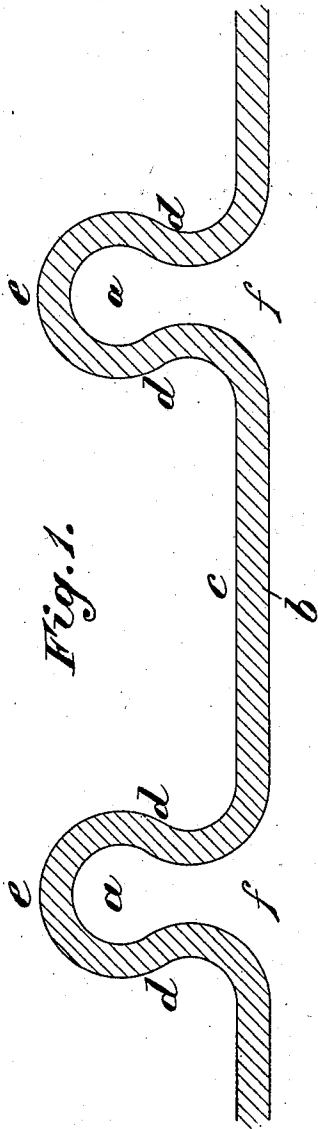


Fig. 1.

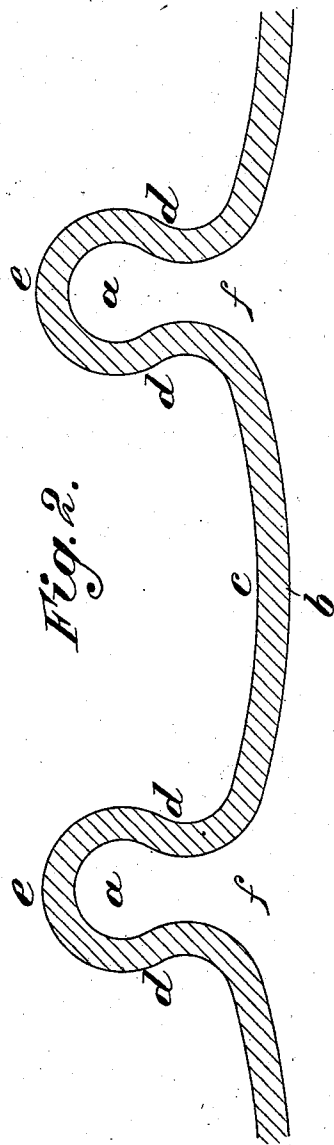


Fig. 2.

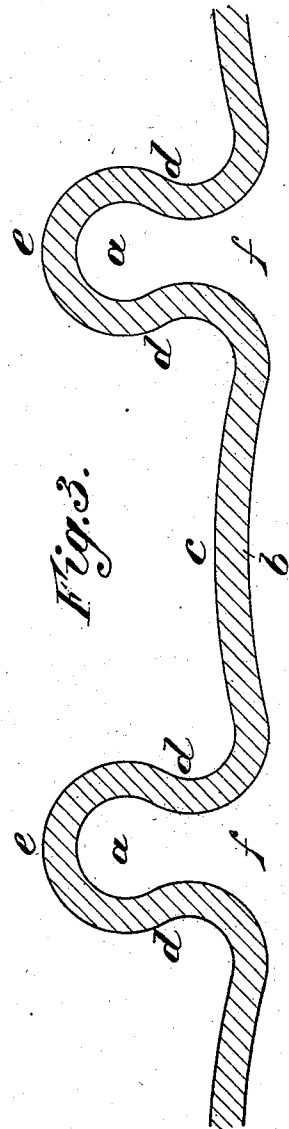


Fig. 3.

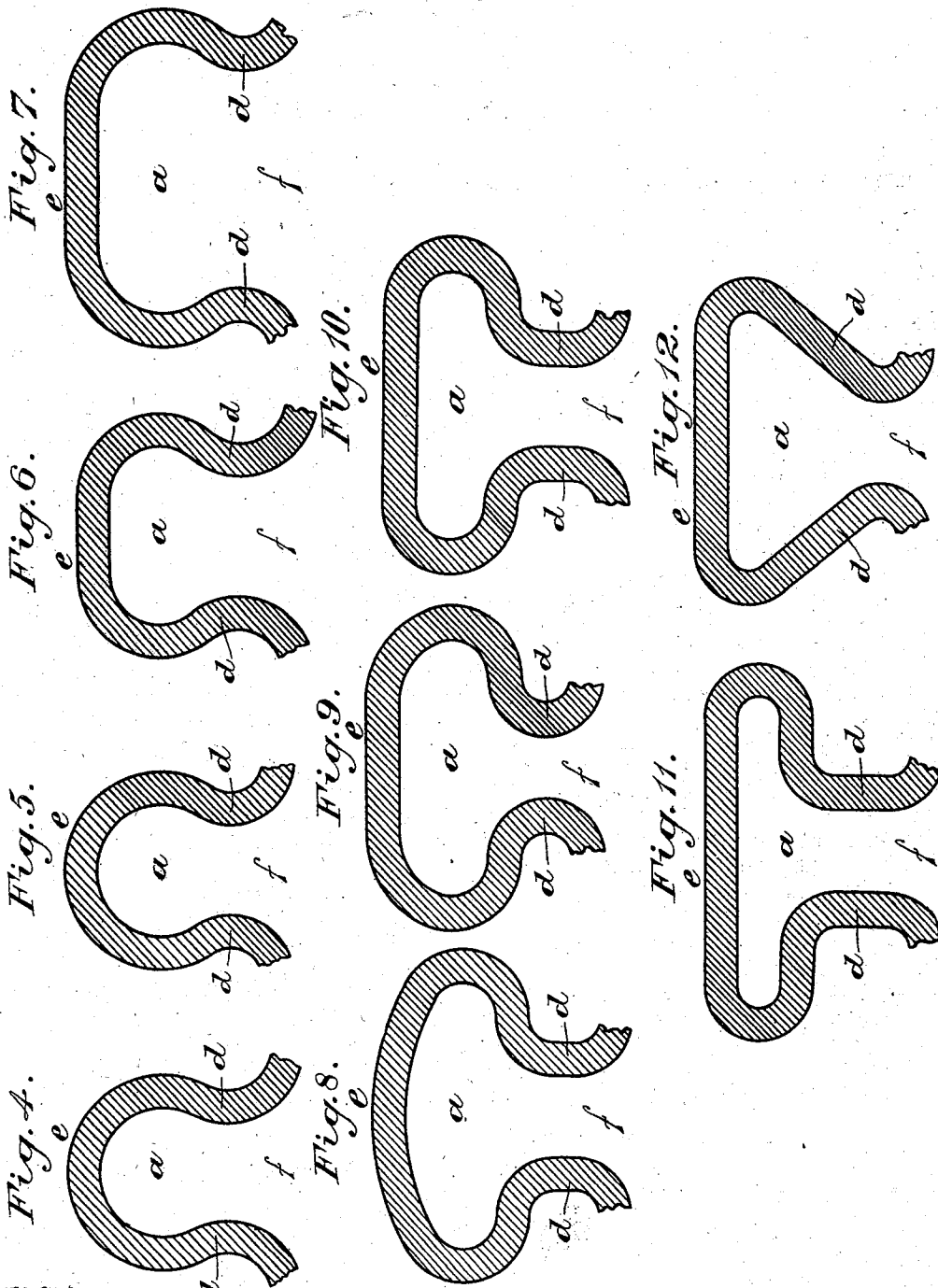
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Inventor:
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By A. P. Patterson, atty.

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2 SHEETS—SHEET 2.



Witnesses:
 Alice M. Koffman
 Charles P. Wright

Inventor:
 Ernest Gearing
 By A. S. Battison, atty.

UNITED STATES PATENT OFFICE.

ERNEST GEARING, OF HARROGATE, ENGLAND.

STEAM-BOILER FURNACE AND FLUE.

SPECIFICATION forming part of Letters Patent No. 720,418, dated February 10, 1903.

Application filed April 23, 1902. Serial No. 104,398. (No model.)

To all whom it may concern:

Be it known that I, ERNEST GEARING, a subject of the King of Great Britain and Ireland, residing at Harrogate, in the county of York, England, have invented Improvements in Steam-Boiler Furnaces and Flues, of which the following is a specification.

Steam-boiler furnaces and flues (hereinafter called "furnaces") have been made with strengthening-ribs at short intervals, the metal between such ribs being left plain or curved, also of the forms commercially well known, respectively, as "Fox's corrugated furnace" and the "Morison suspension-furnace," and of various other forms in longitudinal section; and my invention has reference to an improved construction having for its object such a disposition of the metal as shall produce a furnace stronger to resist external pressure than such as heretofore usually employed. For this purpose I make the furnace-wall of a form which, as seen in longitudinal section, comprises arch-like outward projections resembling sections of hollow bulbs (projecting outwardly into the water-space of the boiler) and intervening connecting portions, either straight or curved. For distinction I call the said outward projections "bulb-like" projections.

In the accompanying drawings, Figure 1 shows a longitudinal section of a portion of the wall of a furnace according to this invention. Figs. 2 and 3 are similar views illustrating modified forms of furnaces also according to this invention. Figs. 4, 5, 6, 7, 8, 9, 10, 11, and 12 illustrate various formations of bulb-like projections which may be adopted in carrying out my invention.

Referring to Figs. 1, 2, and 3, *a a* are bulb-like projections, and *b b* are intervening connecting portions.

In Fig. 1 the connecting portions *b* intervening between the bulb-like projections *a* are cylindrical—*i. e.*, straight as seen in longitudinal section—while in Figs. 2 and 3 the said intervening portions *b* are curved as seen in longitudinal section.

The direction of the curvature of the connecting portions *b* in the example illustrated by Fig. 2 is such as to present concave sur-

faces to the water, (*c* being the water side of the furnace,) and the direction of curvature of the intermediate parts *b* in the example illustrated in Fig. 3 is such as to present convex surfaces to the water.

The connecting portions *b* may be of other forms than those illustrated. Furthermore, it is to be understood that the bulb-like projections *a* may vary more or less in form without departure from my invention, provided always that the two side walls *d d* of each such projection be so formed that they are nearest to one another at some point intermediate between the outer part *e* of the bulb-like projection—namely, that part which is of largest diameter—and the innermost part *f*—namely, that which is of smallest diameter—as will be seen to be the case in each of the modifications respectively illustrated (as some examples) by Figs. 4, 5, 6, 7, 8, 9, 10, 11, and 12.

In a furnace of circular cross-section the bulb-like projections *a* will be annular in a plane at right angles to the axis of the furnace.

It will be noticed that in each of the examples illustrated by Figs. 1, 2, and 3 the bulb-like projections *a* are short compared to the intervening connecting portions *b* and are of curvilinear form as seen in longitudinal section of the furnace.

I consider it desirable that the bulb-like projections *a* should be relatively short and usually desirable that they should be curvilinear in form.

One way in which furnaces according to my invention may be made is by first bending up and then welding a plate of suitable dimensions, preferably of steel, so as to form a tube, then by the well-known rolling process corrugating such tube to a form more or less approaching the desired ultimate formation, and afterward subjecting the so corrugated tube to endwise pressure in a hydraulic or other press provided with a mandrel and with dies of suitable form, (all of which may be collapsible,) for example according to the invention described in the application for a patent deposited by William Rainforth the same day as my present application.

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It is to be understood that I do not limit myself to this method of producing furnaces according to my invention.

What I claim is—

- 5 1. In a steam-boiler furnace an outwardly-projecting portion which as seen in a longitudinal section of the wall of said furnace comprises two side walls so formed that they are nearest to one another at some point intermediate between the outer part of said outwardly-projecting portion namely that part which is of largest diameter and the innermost part namely that which is of smallest diameter substantially as described.
- 10 2. A steam-boiler furnace whose wall is of a form which, as seen in longitudinal section, comprises outwardly-projecting portions each resembling a section of a hollow bulb and intervening connecting portions, as set forth.
- 15 20 3. A steam-boiler furnace whose wall is of a form which, as seen in longitudinal section, comprises short outward projections resembling sections of hollow bulbs and long intervening connecting portions, as set forth.
- 25 4. A steam-boiler furnace whose wall is of a form which, as seen in longitudinal section, comprises outwardly-projecting portions resembling sections of hollow bulbs, said bulb-like parts being wholly curvilinear, and intervening connecting portions, as set forth.
- 30 5. A steam-boiler furnace whose wall is of a form which, as seen in longitudinal section, comprises outwardly-projecting portions resembling sections of hollow bulbs, said bulb-like parts being wholly curvilinear, and intervening connecting portions, the outward bulb-like parts being short and the intervening connecting portions long, as set forth.
- 35 40 6. A steam-boiler furnace whose wall is of a form which, as seen in longitudinal section, comprises outwardly-projecting portions resembling sections of hollow bulbs and curved intervening connecting portions, as set forth.
- 45 7. A steam-boiler furnace whose wall is of a form which, as seen in longitudinal section, comprises outwardly-projecting portions resembling sections of hollow bulbs and curved intervening connecting portions presenting convex surfaces to the water, as set forth.
- 50 55 8. A steam-boiler furnace whose wall is of a form which, as seen in longitudinal section, comprises outwardly-projecting portions resembling sections of hollow bulbs, said bulb-like parts being wholly curvilinear, and curved intervening connecting portions presenting convex surfaces to the water, as set forth.
- 60 65 9. A steam-boiler furnace whose wall is of a form which, as seen in longitudinal section, comprises outwardly-projecting portions resembling sections of hollow bulbs, and curved intervening connecting portions presenting convex surfaces to the water, the outward bulb-like parts being short and the intervening connecting portions long, as set forth.
- 70 75 10. A steam-boiler furnace whose wall is of a form which, as seen in longitudinal section, comprises outwardly-projecting portions resembling sections of hollow bulbs, said bulb-like parts being wholly curvilinear, and curved intervening connecting portions presenting convex surfaces to the water, the outward bulb-like parts being short and the intervening connecting portions long, as set forth.

Signed at Leeds, in the county of York, England, this 3d day of April, 1902.

ERNEST GEARING.

Witnesses:

W. H. MCELLROY,
HARRY NEWILL.