

(Model.)

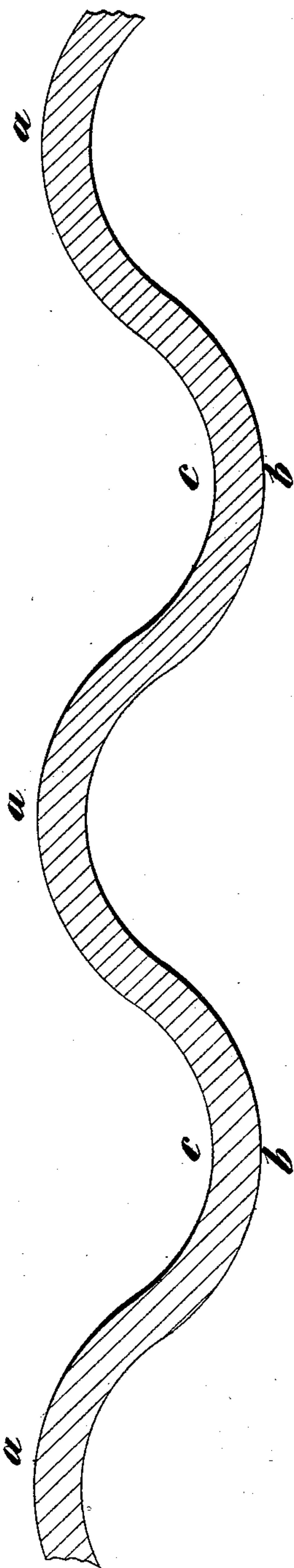
3 Sheets—Sheet 1.

D. B. MORISON.
STEAM BOILER FLUE AND FIRE BOX.

No. 477,770.

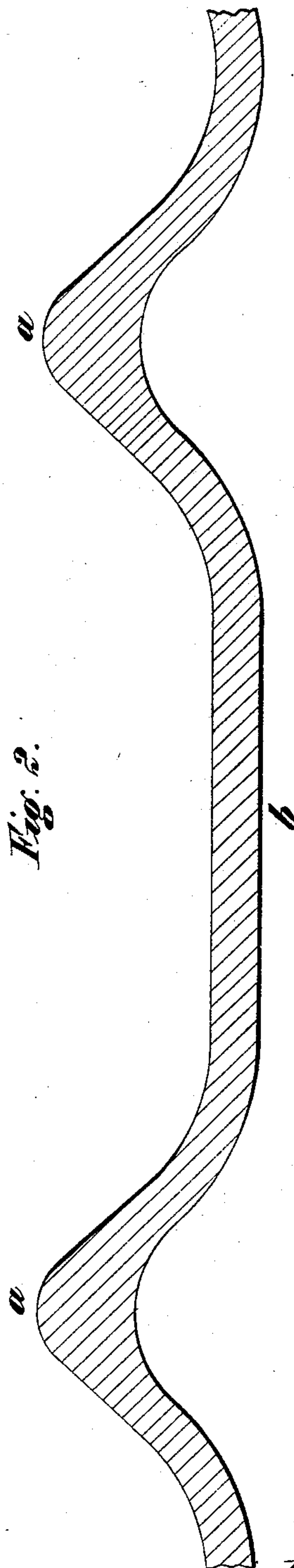
Patented June 28, 1892.

Fig. 1.



Witnesses:
E. C. Bluffy
H. E. Peck

Fig. 2.



Inventor
D. B. Morison
per *O. E. Bluffy*
attys

(Model.)

3 Sheets—Sheet 2.

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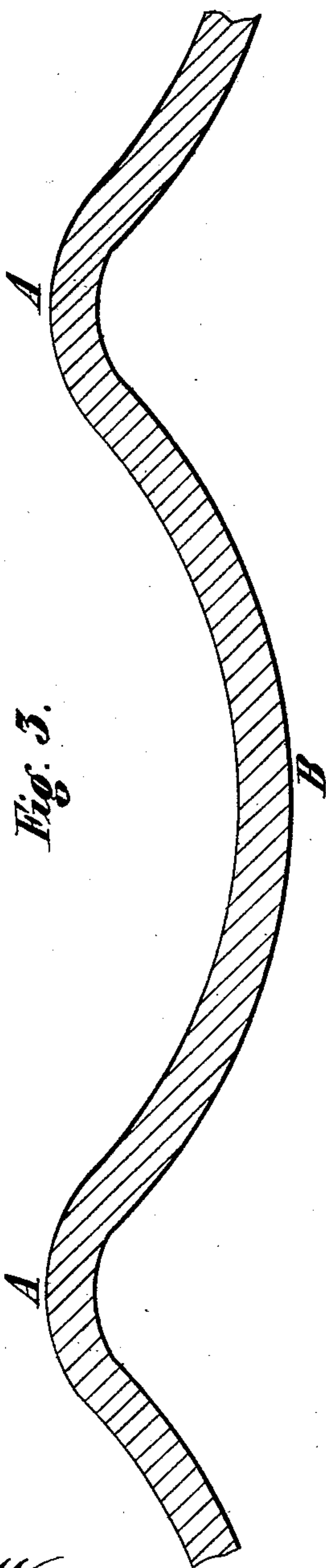


Fig. 3.

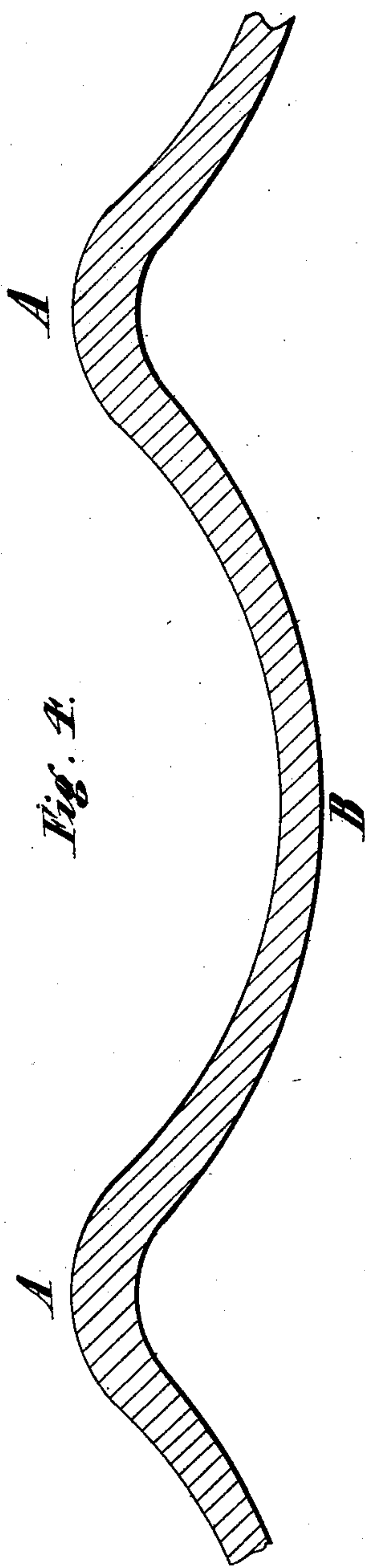


Fig. 4.

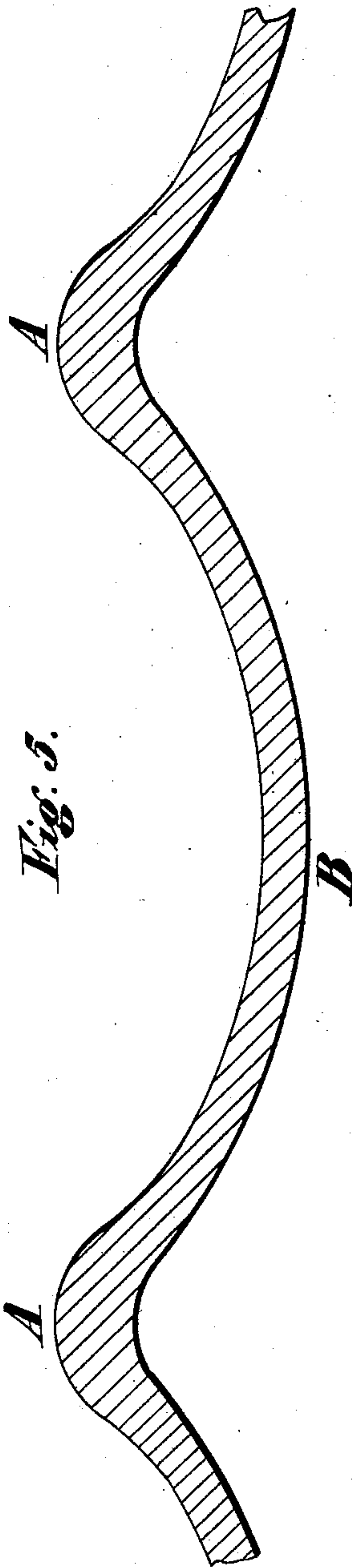


Fig. 5.

Witnesses.
E. C. Shuffy
H. E. Peck

Inventor.
D. B. Morison
per O. Shuffy
Att.

(Model.)

3 Sheets—Sheet 3.

D. B. MORISON.
-STEAM BOILER FLUE AND FIRE BOX.

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Fig. 7.

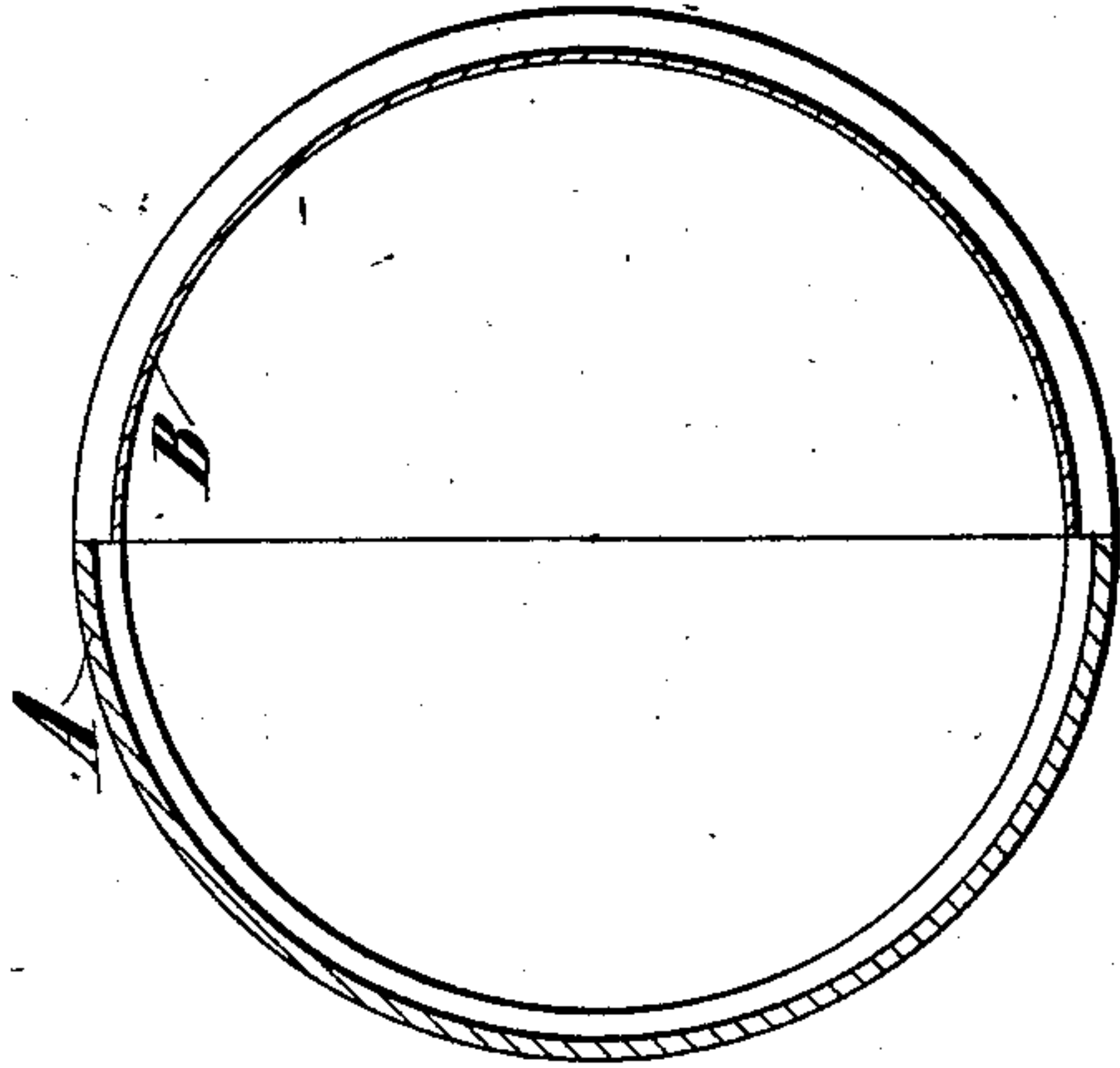
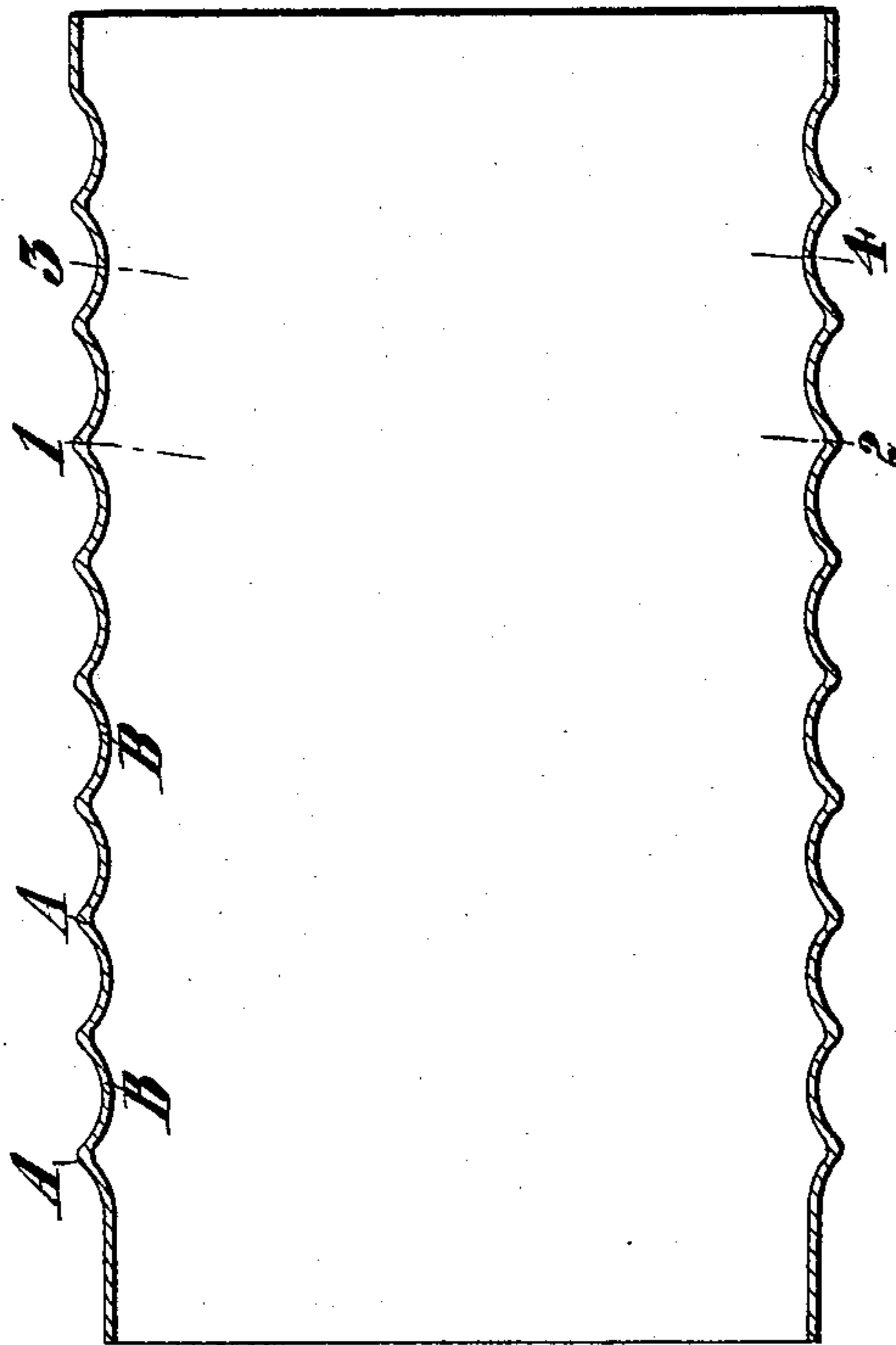


Fig. 6.



Witnesses.

E. C. Bluff
H. E. Peck

Inventor.

D. B. Morison
per O. E. Bluff
Atty

UNITED STATES PATENT OFFICE.

DONALD BARNS MORISON, OF HARTLEPOOL, ENGLAND.

STEAM-BOILER FLUE AND FIRE-BOX.

SPECIFICATION forming part of Letters Patent No. 477,770, dated June 28, 1892.

Application filed September 10, 1890. Serial No. 364,572. (Model.) Patented in England March 27, 1890, No. 4,806.

To all whom it may concern:

Be it known that I, DONALD BARNS MORISON, a subject of the Queen of Great Britain and Ireland, residing at Hartlepool, in the county of Durham, Kingdom of Great Britain and Ireland, have invented Improvements in Steam-Boiler Flues and Fire-Boxes, (which invention has been patented to me in Great Britain, No. 4,806, dated March 27, 1890,) of which the following is a specification.

In the accompanying drawings, Figure 1 is a longitudinal section of one common form of corrugations. Fig. 2 is a similar view of another old form. Figs. 3, 4, and 5 are similar views showing my improvement. Figs. 6 and 7 are longitudinal and transverse sections of a boiler or similar device embodying my improvement.

Boiler flues or fire-boxes of circular cross-section have been proposed to be made of various forms of longitudinal section, two forms of the corrugated type being usually adopted in practice—viz., that in which the corrugations are of uniform kind—for example, as represented in Fig. 1 of the annexed drawings, in which the external corrugations *a* and the internal corrugations *b* have practically the same depth, width, and curvature—and that represented by way of example in Fig. 2, in which the corrugations or ridges *a* project outward and the intervening portion *b* of the flue is cylindrical or, as seen in longitudinal section, straight. In practice I have found both these forms of furnace open to objection. In the form first mentioned, Fig. 1, the channels *c* between the outwardly-projecting corrugations *a*, being comparatively narrow, have the effect of causing concentration of deposit on the water side of the corrugations *b*, and as these corrugations *b* are then subjected to greater intensity of temperature on the reverse side—i. e., that against which the fire acts—than at any other parts of the furnace the material is so distressed that small cracks often develop. The secondly-mentioned form of corrugated flue or fire-box, Fig. 2, is objectionable because, as I have found, the strength given by the outwardly-projecting corrugations *a* is not uniformly distributed throughout the material between the corrugations, and when solid matter accumulates upon the flue the cylindrical

portions *b* between the aforesaid corrugations *a* are found, practically, to have a tendency to “sag” or form indentations or pockets.

Now the object of my invention is to obviate the foregoing objections, to which end I construct a flue or fire-box as shown in Fig. 3, which is a longitudinal vertical section of part of a flue or fire-box. In cross-section the flue or fire-box is circular. In longitudinal section the inwardly-projecting corrugations *B* have much less curvature than the outwardly-projecting ridges or corrugations *A*. These outwardly-projecting ridges or corrugations *A* thus form the supporting ridges or corrugations from which the inwardly-projecting corrugations *B* receive additional strength to resist collapse. The curved form of the inwardly-projecting corrugations assists in distributing this additional strength in a uniform manner. The inwardly-projecting corrugations *B* in a flue or fire-box constructed in accordance with this invention are much less angular than those of the first-named form, Fig. 1, and are therefore less liable to the objections enumerated with regard to that form. At the same time the furnace can be more easily scaled and when necessary repaired. As compared with the second form of flue or fire-box mentioned, Fig. 2, there is in mine no flat part between the ridges or corrugations *A* and the strength of the flue or fire-box is more uniformly distributed.

The thickness of the material of which the flue or fire-box is made may be uniform or it may vary. In Fig. 3 the material is shown as of uniform thickness. Fig. 4 shows a variable section in which the material is thicker at and on each side of the outwardly-projecting ridges *A*. In Fig. 5 the thickness is greatest at the crown of the outwardly-projecting and supporting ridges *A* and least at the central portions of the inwardly-projecting parts *B*, the variation in thickness being symmetrical on each side of each corrugation. The corrugations can be formed in any suitable manner—as, for example, by rolling, as well understood.

Fig. 6 shows in longitudinal section, to a smaller scale, a flue corrugated according to my invention. Fig. 7 is a cross-section partly in the line 1 2 and partly in the line 3 4.

I am fully aware of United States Patents

No. 304,973 to Strong and No. 372,487 to Purves, and they illustrate, substantially, the forms of corrugations first referred to in the above specification, the patent to Strong showing the corrugations made of reverse compass curves, while the patent to Purves shows the projecting parts thickened and curved on their under sides, while the projections are connected by substantially straight intervening portions, as illustrated in Fig. 2 of the drawings accompanying this specification. It will be seen that my invention differs from these in that the portions A, forming projecting and supporting ridges, are of a curvature much greater than the intermediate projecting corrugations B. The first projections A are substantially compass curves; but the intermediate corrugations B are substantially in the form of a catenary curve. It has been found that these curves present the greatest resistance against collapse of the boiler from pressure, and it is further found that the liability of scale accumulating in this curve is less than in the ordinary compass curves, and if it does accumulate it can be more readily cleaned or removed from the suspension or catenary curved portion than from the compass-drawn curves. I make no claim to either structure shown in the patents referred to nor

to anything shown and described in British Patent No. 4,834, of 1886; but

What I do claim is—

1. A corrugated steam-boiler flue or fire-box in which the material between the supporting curved ridges is disposed in the form of corrugations of much less curvature than the supporting-ridges and following, substantially, the line of a catenary curve between the ridges, substantially as described.

2. A corrugated steam-boiler flue or fire-box in which the material between the curved supporting-ridges is disposed in the form of corrugations of much less curvature than said ridges and following, substantially, the line of a catenary curve, the supporting-ridges being of greater thickness on their crowns than the intervening parts, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DONALD BARNES MORISON.

Witnesses:

FRED. SMITH,

I. B. STROVER, Jr.,

Both of West Hartlepool, Clerks to Messrs. Turnbull & Tilly, Solicitors and Notaries.