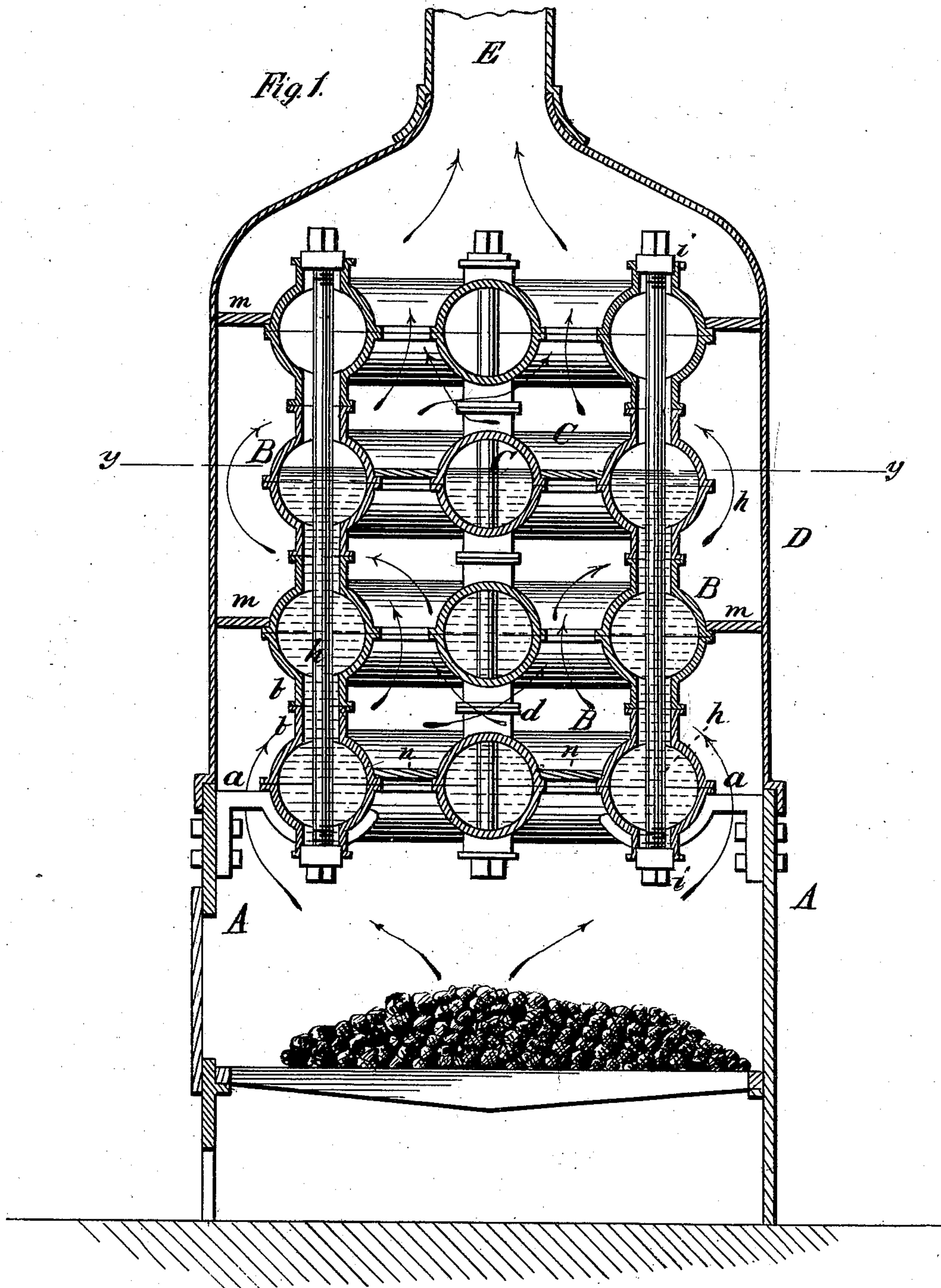


J. W. HARD.

CAST-IRON SECTIONAL BOILER.

No. 177,635.

Patented May 23, 1876.



WITNESSES  
*H. Bates*  
*Robert Corbett*

INVENTOR,  
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Fig. 2.

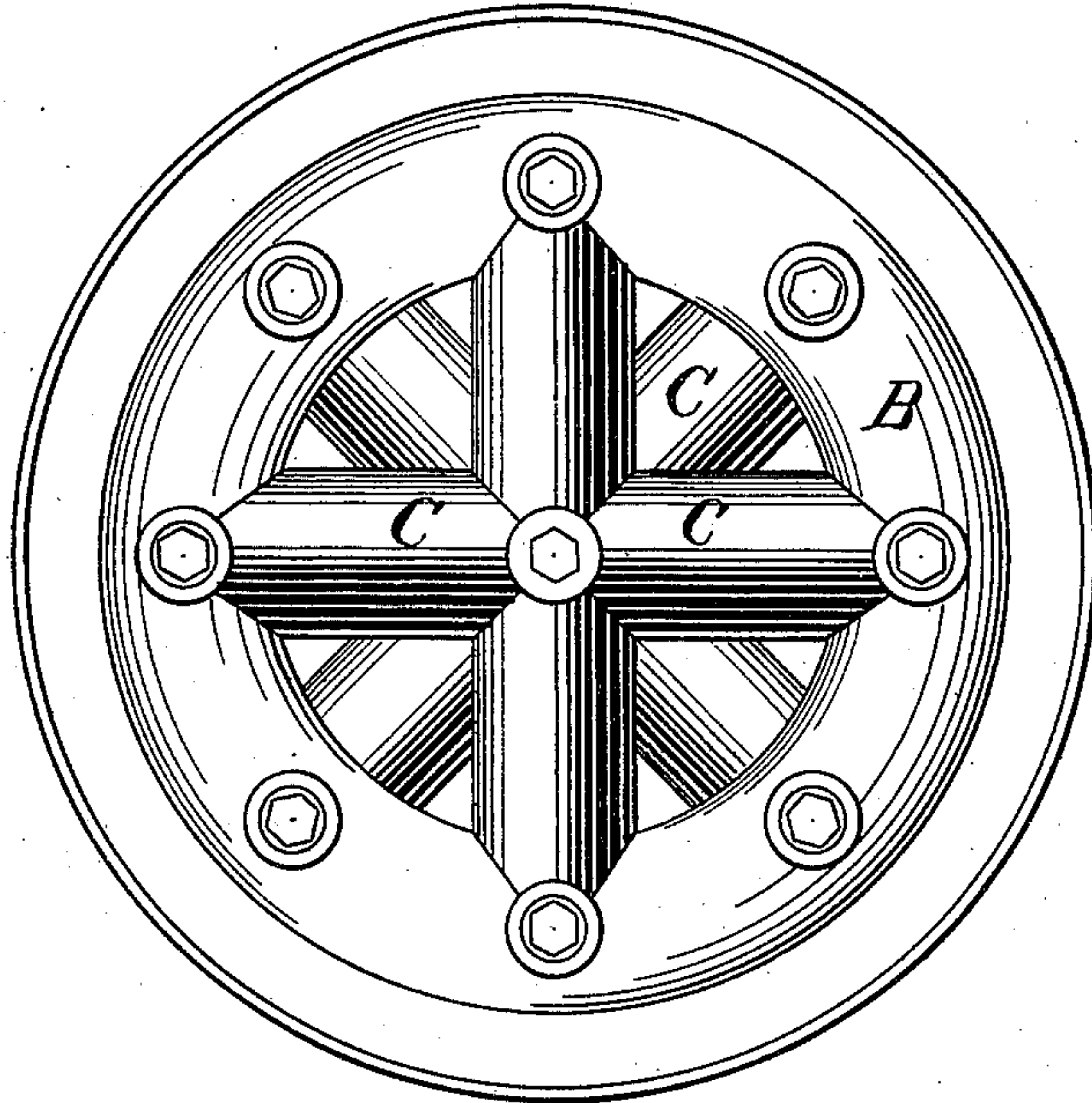
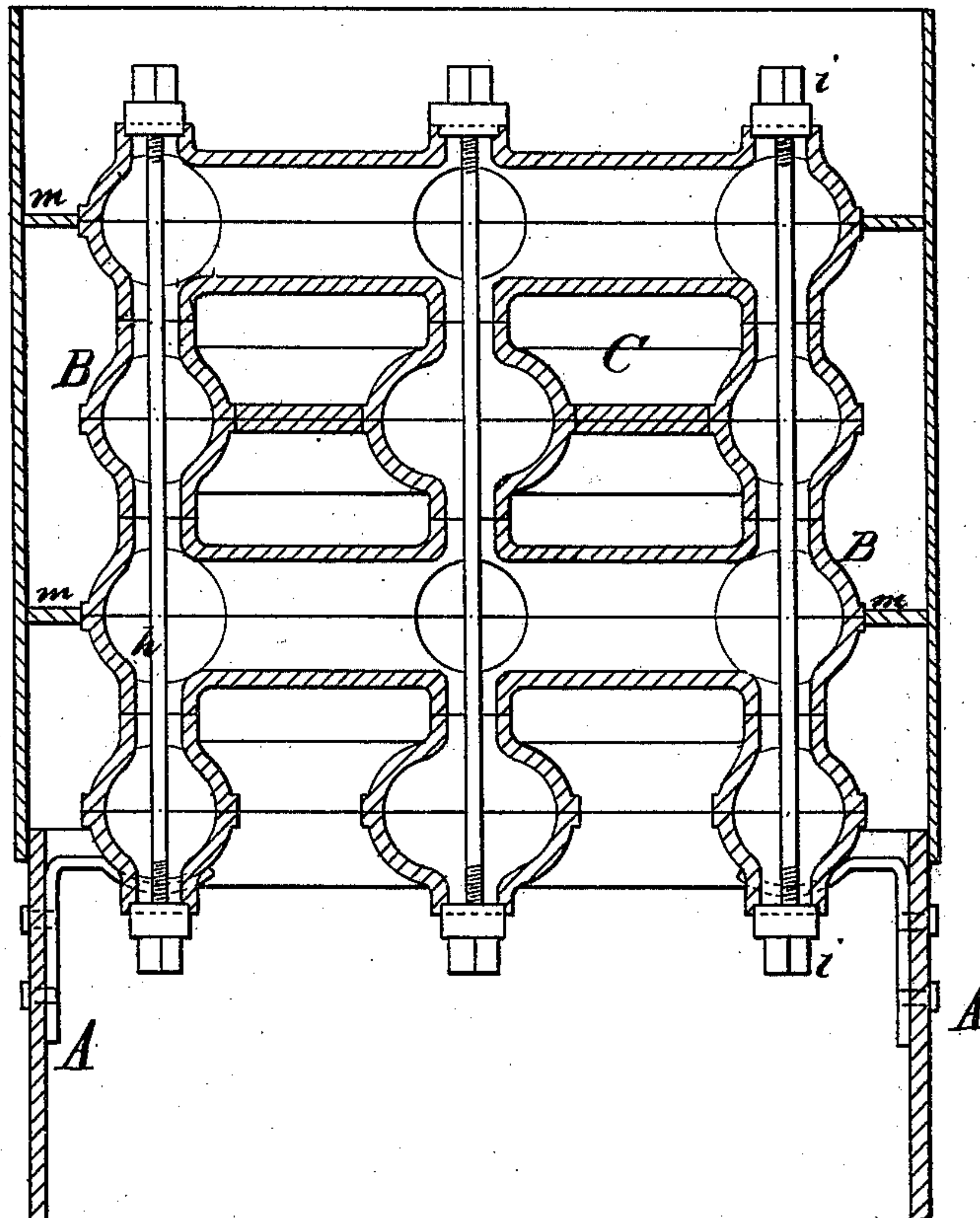


Fig. 3.



WITNESSES

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# UNITED STATES PATENT OFFICE.

JOHN W. HARD, OF DECORAH, IOWA.

## IMPROVEMENT IN CAST-IRON SECTIONAL BOILERS.

Specification forming part of Letters Patent No. **177,635**, dated May 23, 1876; application filed February 19, 1876.

*To all whom it may concern:*

Be it known that I, JOHN W. HARD, of Decorah, in the county of Winneshiek and State of Iowa, have invented a new and valuable Improvement in Cast-Iron Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of a vertical central section of my steam-boiler, and Fig. 2 is a plan view thereof. Fig. 3 is a sectional detail view.

The object of my invention is to improve the construction of steam-boilers, as will be hereinafter more fully set forth.

In the annexed drawings, A represents the base of my boiler, constructed in any suitable manner to contain the fire-box and ash-pit. On the interior of the base A are suitable lugs or flanges *a a*, to support the boiler. The boiler is made in sections, each section consisting of a circular tube, B, horizontally divided into halves, with two tubular arms, C C, similarly divided, crossing each other at right angles in the center. The tube B is cast with hollow bosses *b b*, at suitable intervals, on top and bottom, and a central hollow boss, *d*, is also cast at top and bottom, at the intersection of the arms C C, as shown. Each section thus constructed is cast in two parts with suitable flanges, to be bolted firmly together. As many of these sections as may be desired are placed on top of each other, the bosses corresponding, as shown, and long bolts *h* passed through, and the sections then fastened together by nuts *i* on the ends of said bolts.

It will be seen that, by this construction, each section forms four triangular openings for the passage of the products of combustion, and in fastening the sections together they should be turned in such a manner that the tubes C of each section should be directly over the spaces between the tubes of the section immediately below. This is fully shown in Figs. 2 and 3. In adjusting the sections of

the boiler the center collars *d* act as turn-tables upon which the sections can be turned properly.

By this construction of the sections B I am able to cast an entire section without the use of sand-cores.

The feed-water is to enter at the bottom, and the steam taken out at the top, in the usual manner.

The boiler is surrounded by a wrought-iron jacket or shell, D, supported upon the base A, and formed with a smoke-outlet, E, at the top. Between the shell D and every alternate section of the boiler is placed an annular plate, *m*, to close the space between them, and on the other sections are placed plates *n*, to close the spaces between the arms C, as fully shown in Fig. 1.

By this means, it will be seen, the products of combustion are caused to take a zigzag course—*i. e.*, from the outside inward, and from the center outward; or, in other words, they first pass around the outside of the first section, and, meeting the annular plate *m* around the second section, they are deflected inward and pass through the inside of the second section; then, meeting the center plates *n* of the third section, they are deflected outward and pass around the outside of said third section, and so on to the top.

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

In a steam-boiler, the horizontal sections, consisting of circular tubes B, cast in equal divisions, and tubular cross-arms C, provided with hollow bosses *b d*, bolts *h*, and nuts *i*, in combination with the surrounding shell D, annular deflecting plates *m*, and triangular deflecting plates *n*, all constructed and arranged substantially as and for the purpose set forth.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

JOHN W. HARD.

Witnesses:

CHAS. WALDO,  
JONATHAN MILLS.