

(No Model.)

J. D. HULINGS.  
STEAM BOILER.

No. 483,805.

Patented Oct. 4, 1892.

Fig I.

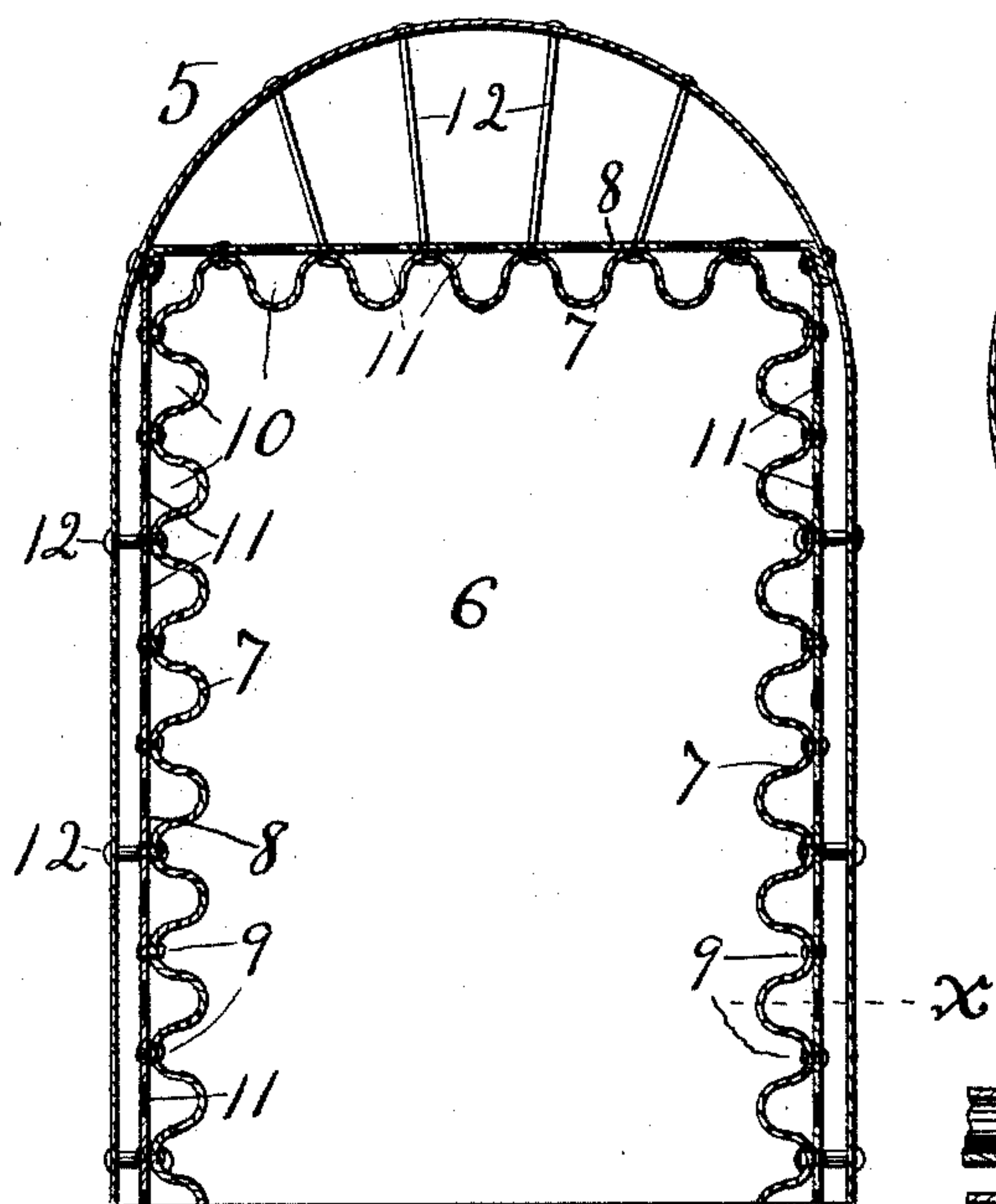


Fig II.

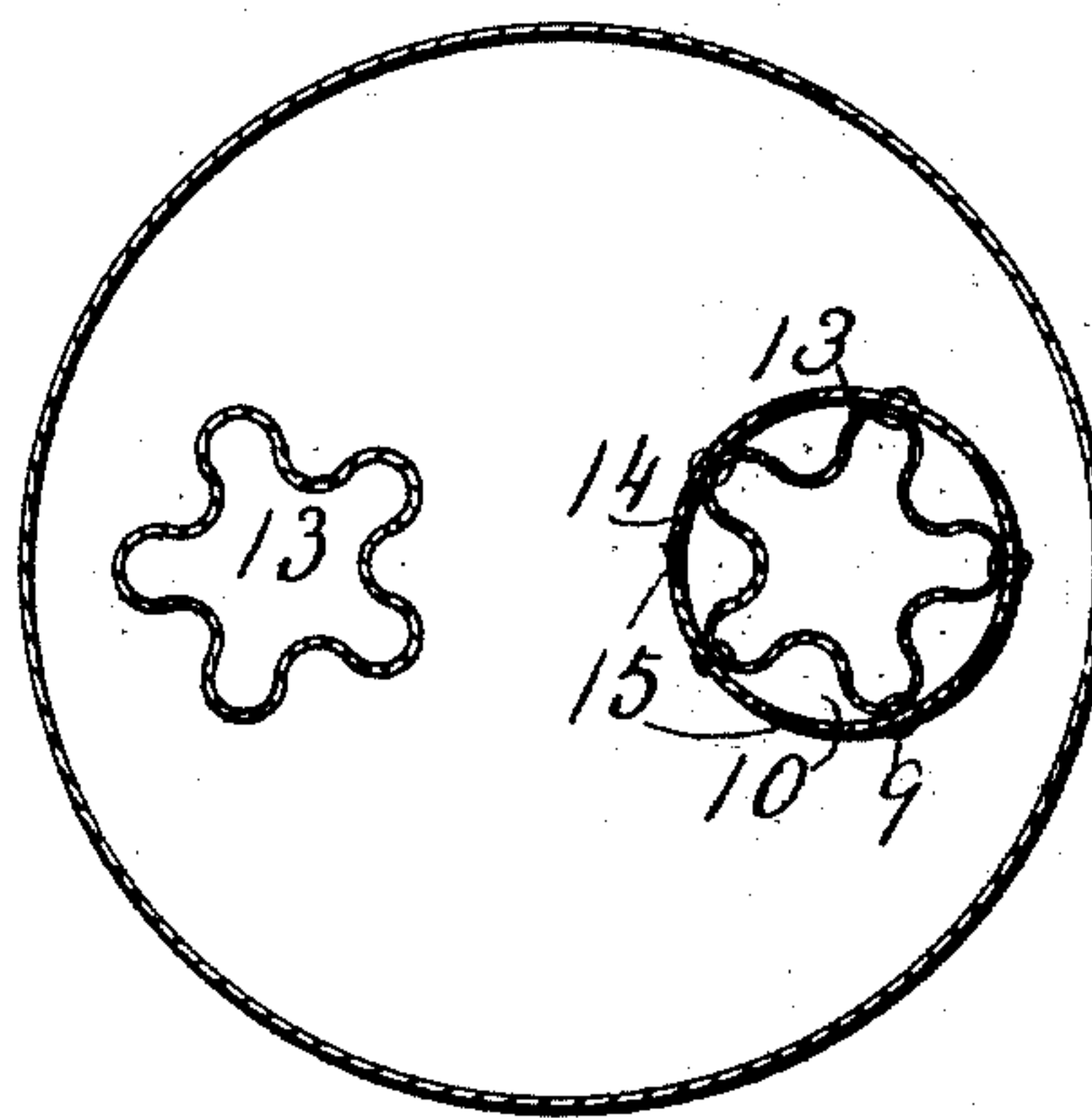
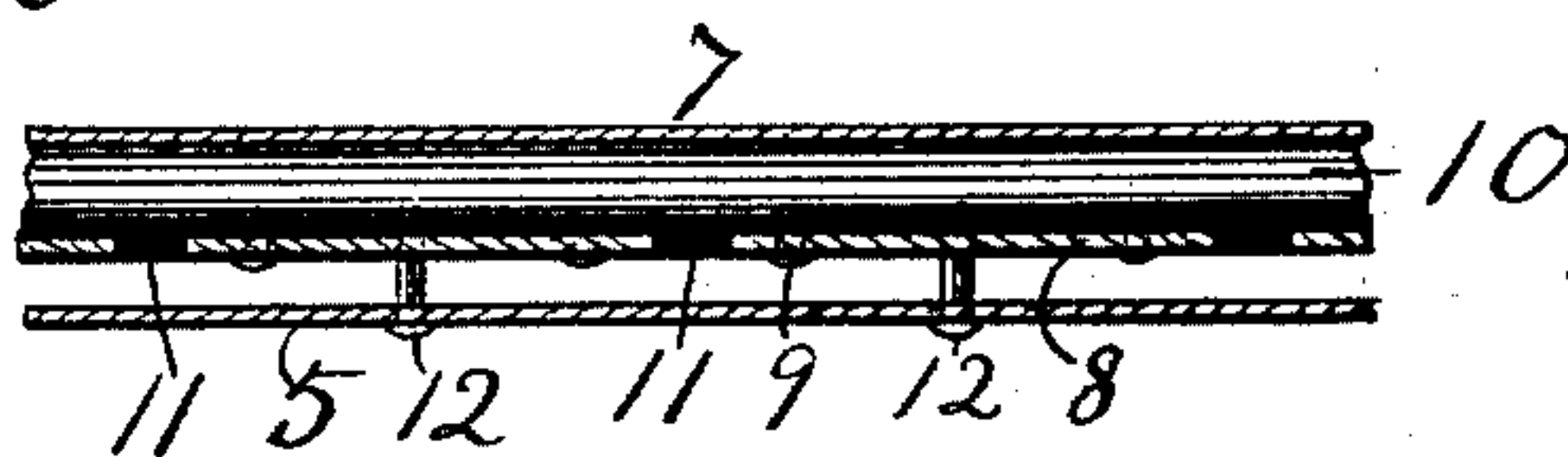


Fig III.



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# UNITED STATES PATENT OFFICE.

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## STEAM-BOILER.

**SPECIFICATION** forming part of Letters Patent No. 483,805, dated October 4, 1892.

Application filed May 18, 1892. Serial No. 433,410. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN D. HULINGS, a citizen of the United States, residing at Hulings, in the county of Tucker and State of West Virginia, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to engine-boilers; and its object is to provide a greater amount of heating-surface to the boiler for a given amount of fire-space.

To this end my invention consists in the construction and combination of parts forming a steam-boiler hereinafter described and claimed, reference being had to the accompanying drawings, in which—

Figure I represents an end view, with the front plate removed, of a steam-boiler of the locomotive style. Fig. II represents an end view of a two-flued boiler of the stationary kind with the front plate removed; and Fig. III is a longitudinal horizontal section at  $x$ , Fig. I.

5 represents the shell of the boiler, the vertical sides of which are flat or plane along that portion occupied by the fire-chamber 6.

7 represents the inner shell or fire-plate forming the fire-box of the boiler, which plate is corrugated into horizontal flutes or troughs along both sides and the top of the fire-box.

8 represents a middle plate located between the corrugated fire-plate 7 and the shell 5. The fire-plate 7 is firmly secured by rivets 9 to the middle plate 8, thus forming a series of pipes 10 between the corrugations and the said middle plate.

11 represents a series of holes or passages communicating between these pipes 10 and the water-space between the outer shell 5 and the middle plate 8.

12 represents a series of bolts connecting the shell and the middle plate, so as to resist the expansion of steam when the boiler is in service.

It is my design to corrugate the whole of the interior surface of the fire-box and of the flues which lead therefrom wherever I find it

practicable to do so, and for the purposes of the claims I shall call all these portions with which the fire or heat comes in direct contact "fire-plates."

In carrying out my idea with stationary boilers I may corrugate the flues, as shown at 13, Fig. II, and to this I may add an intermediate plate or tube 14, to which the inner flue may be secured by rivets on the principle described, the tube 14 corresponding in this instance to the intermediate plate 8 hereinbefore described, and the passages or pipes formed between the said corrugations of the flues 13 and the pipes 14 may be connected with the boiler by holes or openings 15 through the pipe 14, corresponding with the openings 11 through the plate 8.

It will readily be seen that a fire-box of given dimensions has more than double the heating-surface when its walls are formed of my corrugated fire-plates than when formed of plain plates, and by distributing the communicating holes 11 and 15 all along the pipes of the corrugations the water which becomes heated in the corrugations is readily and quickly displaced by a great many little streams over the whole surface of the fire-box, thus causing a rapid and even circulation of water throughout the boiler without the water being formed into any general current. These many perforations through the middle plate are considered to be a matter of great importance in the economy of making steam. Some advantages of this corrugated fire-plate may be obtained by providing the pipes of the corrugations each with outlets at its ends only; but I consider the many perforations much more effective.

Having thus fully described my invention, what I believe to be new, and desire to secure by Letters Patent, is the following:

1. The combination, in a steam-boiler, of an outer shell, a fire-box within of corrugated plate, and an intermediate plate secured to the corrugated plate and forming a series of pipes therewith, the said intermediate plate being perforated along the said pipes, substantially as described.

2. The combination, in a steam-boiler, of an outer shell, a corrugated fire-plate within the



shell, and an intermediate plate secured to the corrugated plate, substantially as described.

3. The combination, in a steam-boiler, of an  
5 outer shell, a corrugated fire-plate within the shell, a plate intermediate between the shell and fire-plate, rivets firmly securing the intermediate plate to the corrugated fire-plate, and stay-bolts securing both the fire-plate and

the intermediate plate to the shell, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN D. HULINGS.

Witnesses:

H. W. JONES,

S. WILMOTH.