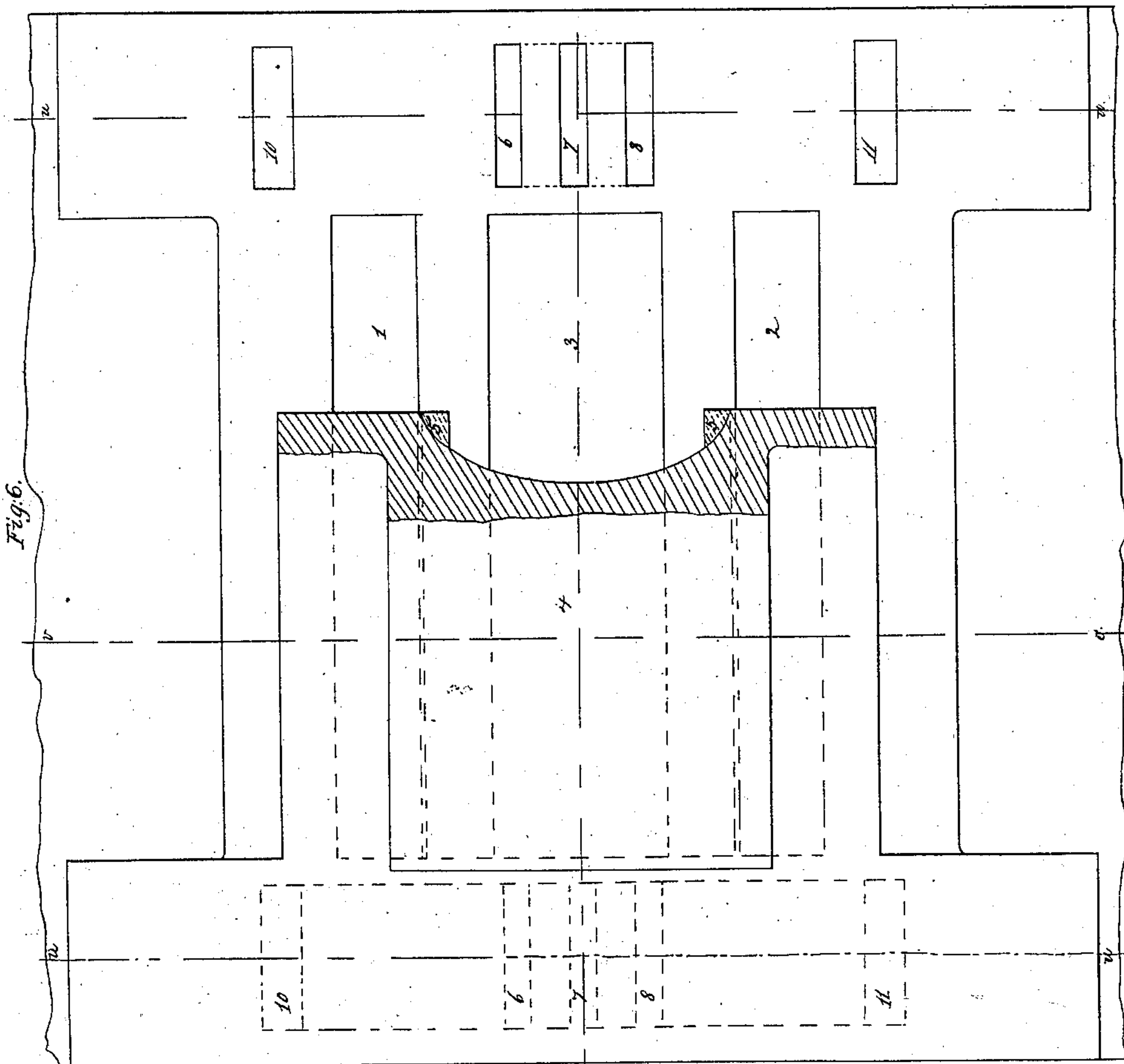
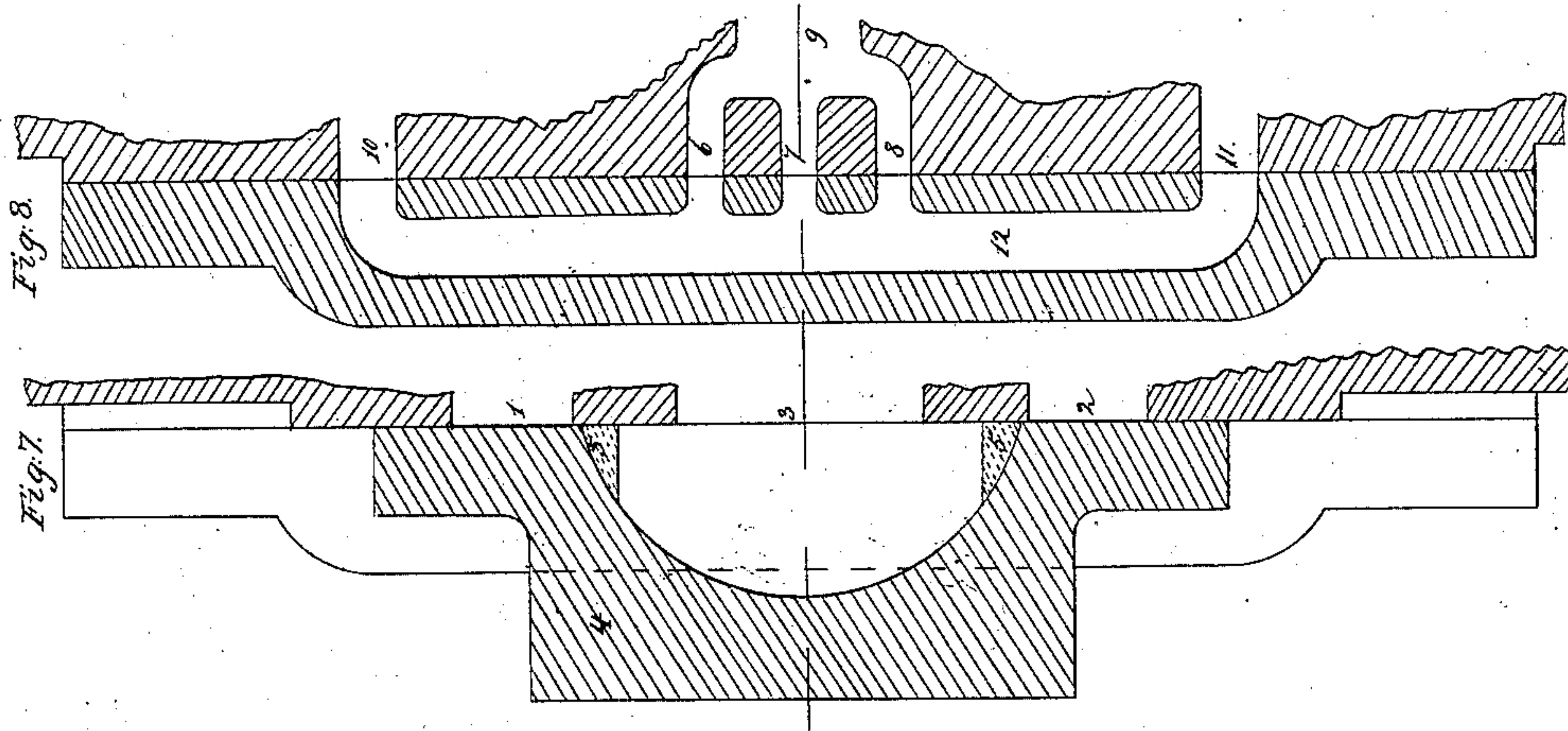


F. B. Stevens,
Steam-Boiler Water-Heater.

N^o 35,788.

Patented July 1, 1862.



Witnesses
John A. Smith
Albert S. Quinn

Inventor.
F. B. Stevens

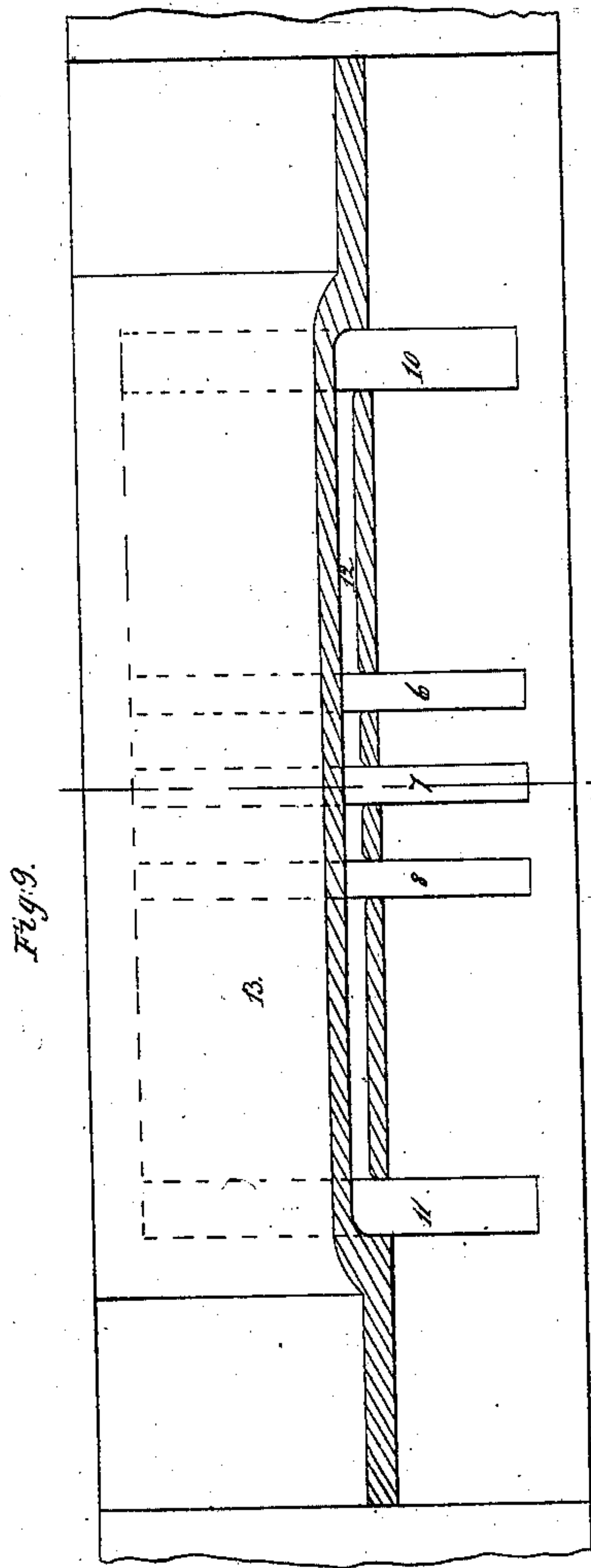
2 Sheets, Sheet 2.

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Steam-Boiler Water-Heater.

N^o 35,788.

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Witnesses.
John H. King
Albert J. Eason

Inventor.
Francis B. Stevens

UNITED STATES PATENT OFFICE.

FRANCIS B. STEVENS, OF NEW YORK, N. Y.

IMPROVEMENT IN VALVES FOR HEATING FEED-WATER FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. 35,788, dated July 1, 1862.

To all whom it may concern:

Be it known that I, FRANCIS B. STEVENS, of the city, county, and State of New York, have invented a new and useful Improvement in Heating the Feed-Water of Steam-Boilers; and I do hereby declare that the following is a full and exact description thereof.

My improvement relates to those steam-engines in which the feed-water is heated by steam taken from the induction side of the piston through additional eduction-valves; and my object is to improve this method by forming the additional valve by narrow ports or openings made in a slide-valve having a motion coincident with that of the main valves of the engine in such manner that when the main valves are midway in their throw then the slide-valve forming the additional eduction-valve will also be midway in its throw and the additional eduction-valve will be wide open, and by connecting the narrow ports thus formed to an opening placed midway in the length of the cylinder. The additional valve thus formed can either be placed on the sides of the ordinary three-ported slide-valve, or it can be placed in a separate chest and used in combination with any description of valve. When this additional eduction-valve is formed on the sides of the ordinary three-ported slide-valve, I give a certain degree of lap or cover on the eduction or exhaust side, and I form the additional openings in the valve-seat the same width or nearly the same width as the added lap, and I place the corresponding openings in the slide so that the communication between the cylinder and the heater continues open during the short interval that the added lap retards the exhaust.

The openings in the valve-seat lead to the interior of the cylinder by small openings made in the cylinder at or near the middle of its length, so that the piston passes these openings on each stroke, and, as the additional eduction-valve never begins to open until the piston has completed more than one-half of its stroke and has passed these small openings, the steam will pass from the cylinder to the heater through the same valve-openings on both strokes of the piston.

Figure VI is a horizontal view of a slide-valve and its seat, such as are commonly used in locomotive-engines. The valve and its seat

are drawn full size. The maximum throw or motion of the valve is five inches. A portion of the valve is represented removed, as indicated by the broken line, so that the openings in the seat may be visible. The additional valve-openings in the sides of the slide-valve and of its seat are also shown. Fig. VII is a section of Fig. VI, taken through the dotted line *v v*, and showing the main valve-openings. Fig. VIII is a section of Fig. VI, taken through the dotted lines *u u*, and showing the additional eduction-openings.

1 is the opening on the valve-seat leading to the end of the cylinder.

2 is the opening on the valve seat leading to the other end of the cylinder.

3 is the middle opening in the valve-seat leading to the exhaust-pipe.

4 is the valve. The dotted lines at 5 show the lap or cover added on the eduction sides of the valve.

6, 7, and 8 are narrow additional openings in the valve-seat, connected together at 9 and then communicating with the interior of the cylinder through small round holes placed in the center of its length.

10 and 11 are the additional eduction-openings in the valve-seat, connected together and leading to the heater.

12 is a chamber on each side of the slide-valve, connecting the openings in the valve-seat leading to the heater.

The valve is drawn in the middle of its motion and the openings forming the additional eduction-valve are shown wide open. These openings are shown equal in width to the added lap—namely, three-eighths of an inch—and they will open and close while the valve moves through a space twice the width of the opening, or three-fourths of an inch.

The openings 6, 7, and 8 are three-eighths of an inch wide by two inches long, and are made three in number on each side, in order to get the necessary area without increasing too much the size of the valve. If only one opening on each side were made, it would have to be six inches long instead of two inches.

The additional eduction-valve can be formed by a separate valve placed in a separate chest, instead of being placed on the sides of the main valve.

Fig. IX represents a horizontal view of the valve and seat when made separate. The section is the same as Fig. VIII.

13 is the valve, which must have a motion coincident with the main valve.

The apertures are shown four inches long instead of two inches, the area being kept the same as when placed on the side of the main valve.

As the pressure of the steam through the apertures 6, 7, 8, 10, and 11 all bend to force the valve 13 upward from its seat, steam from the boiler is introduced through a small tube into the valve-chest to keep the valve 13 on its seat by its pressure on top of the valve. This tube need not in any case be larger than a quarter of an inch in diameter, as there is no consumption of steam. The additional eduction-valve thus arranged can be used in combination with either slide or puppet valves for the main eduction.

What I claim as my invention is—

1. The additional eduction-valve openings 6, 7, 8, 10, and 11, formed by narrow ports in a slide-valve and arranged to be wide open when this valve is midway in its throw, substantially as shown and described; but I do not claim these ports otherwise than in combination with heating the feed-water of a steam-engine by steam withdrawn from the induction side of the piston through an aperture made in the center of the length of the cylinder.

2. In the same connection and combination, forming these additional eduction-ports on the two sides of a three-ported valve.

3. In the same connection and combination, using the pressure of steam from the boiler to keep the additional eduction slide-valve on its seat.

FRANCIS B. STEVENS.

Witnesses:

ALBERT S. EASUM,
A. ADAMS.