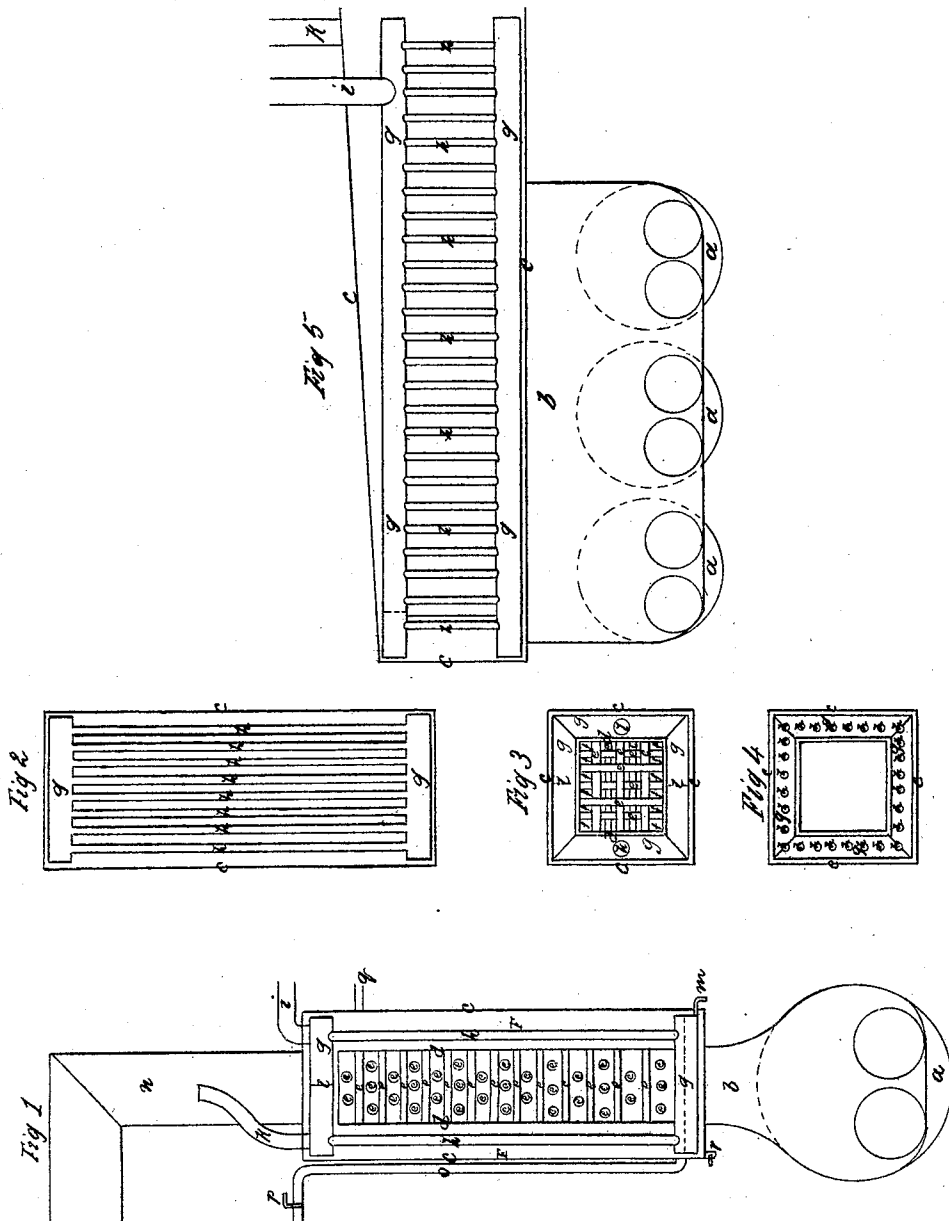


S. W. FRANCE.

Improvement in Feed-Water Heaters for Steam-Boilers.

No. 130,122.

Patented Aug. 6, 1872.



Witnesses.

M. Brennan

Joseph W. H. H. H.

Inventor.

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Fig 6

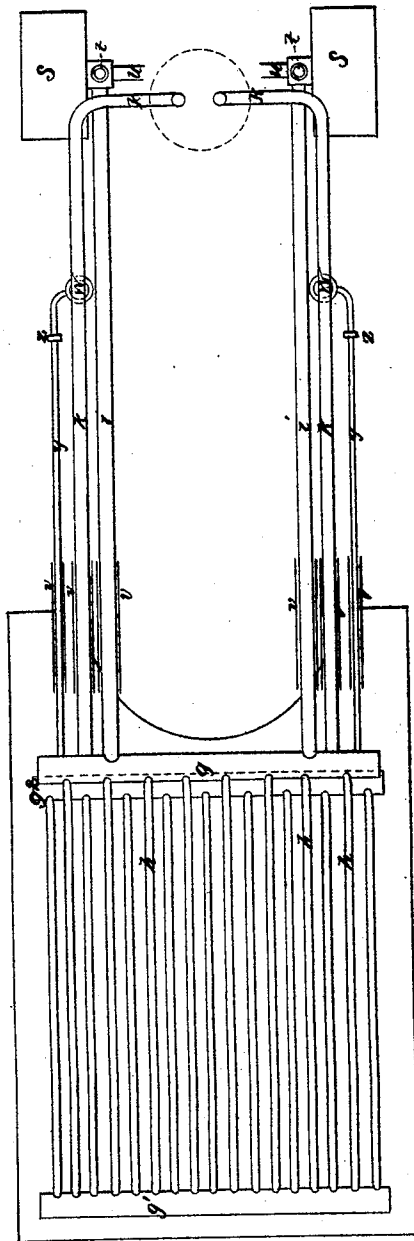
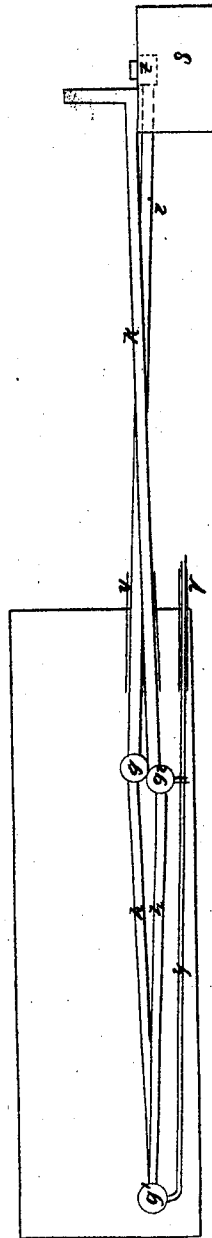


Fig 7



Witnesses:
M. Breunau

[Signature]

Inventor

Simon W France

UNITED STATES PATENT OFFICE.

SIMON W. FRANCE, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN FEED-WATER HEATERS FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. 130,122, dated August 6, 1872.

To all whom it may concern:

Be it known that I, SIMON W. FRANCE, of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in Feed-Water Heaters for Steam-Engines for the purpose of economizing water and fuel; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing.

The object of my invention is to economize fuel and water by using the waste heat from the furnace passing off through the smoke-pipe and the exhaust steam from the engine in combination, for heating the feed-water before introducing it into the boiler.

My invention consists in a square or cylindrical box, constructed of boiler-iron or other suitable metal, within which is another box, of similar shape and material, forming the lower section of the smoke-escape pipe. These two boxes are joined together at their upper and lower ends so as to form a water-tight space or chamber completely surrounding the inner box to hold the feed-water. The inner box is perforated with holes, in which tubes are tightly fitted, passing from side to side, traversing the inner or smoke-escape chamber, and through which the water can pass freely from side to side of the surrounding water-chamber. This box is placed over the breeching of the boiler, and the heat and smoke from the furnace, after passing through the boiler, pass through the interstices between the transverse tubes, heating the water in said tubes and the surrounding water-chamber. There are also a number of small tubes running through the water-chamber, which convey the exhaust steam through said water chamber or jacket, and which steam further serves to heat the water, so that the feed-water before entering the boiler is heated by the combined action of the escaping heat from the furnace and the escaping exhaust steam.

In the annexed drawing, Figure 1 represents a vertical section of my apparatus, which may be either square or cylindrical. Fig. 2 represents one of the four sections of the series of pipes by which the exhaust steam is conveyed through the water. Fig. 3 represents a top

view of my water jacket or heater. Fig. 4 represents a bottom view of the same.

In Fig. 1, *a* represents the boiler in ordinary use; *b*, the breeching, by which smoke and heat are conveyed from the boiler-flues into the inner chamber of the heater. *c c* in the several figures is the water shell or box, and *d d* the inner box or shell of the heater. *F* is the space between the outer and inner boxes, forming the water-jacket, and *fff* are the spaces or interstices through which the smoke and hot air admitted at the bottom of the heater from the breeching pass up through the inner chamber. *eee* are the transverse tubes connected with opposite sides of the inner shell *d d*. *n* is the smoke-flue, into which the smoke and uncondensed exhaust steam pass from the heater. *g g* are large pipes at the upper and lower ends of the heater, and are connected together by small pipes *h h* passing through the water-chamber, and conveying exhaust steam.

I do not limit myself, however, to this precise means of conducting the exhaust steam through the water, as it is manifest that the same effect will be produced by conducting the said steam through the water-jacket by any metal pipes, box, or chamber that shall be completely surrounded by and in contact with the water to be heated.

i in Fig. 1 is the pipe by which exhaust steam is conveyed into the upper pipe *g*, and forced downward by means of a partition or stoppage, *l*, through the small tubes *h h*; then through the lower pipe *g*, and upward, through tubes *h h*, on the other side to the upper pipe *g*, and thence escapes through pipe *k* into smoke-flue *n*. The small pipe *m* in Fig. 1 carries off the condensed water from pipe *g* to cold-water pipe *q* or pump. *o* in Fig. 1 is the pipe by which water is conveyed into the chamber between the outer and inner shells of the heater. *q* is the discharge-pipe, which conveys the heated water to the boiler, and is placed some distance below the top of the heater. *r* is a cock, by which the water is drawn from the chamber between the shells of the heater whenever it is necessary to have it cleaned.

Fig. 5 represents another way of applying my said invention when there are several boil-

ers; and the several parts are represented by the same letters as in the foregoing part of this specification.

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

The water-jacket surrounding a section of the smoke-escape flue, with the cross-tubes *e* passing through said flue, in combination with the steam-tubes *g g* and *h h* or other equivalent means for conducting exhaust steam through

said water-jacket to aid in heating the water therein, so that the feed-water shall be heated by the combined action of the smoke and heated air escaping from the furnace and the exhaust steam from the engine, substantially as described.

SIMON W. FRANCE.

Witnesses:

M. BRENNAN,

CHAS. A. MITTLEBAGER.