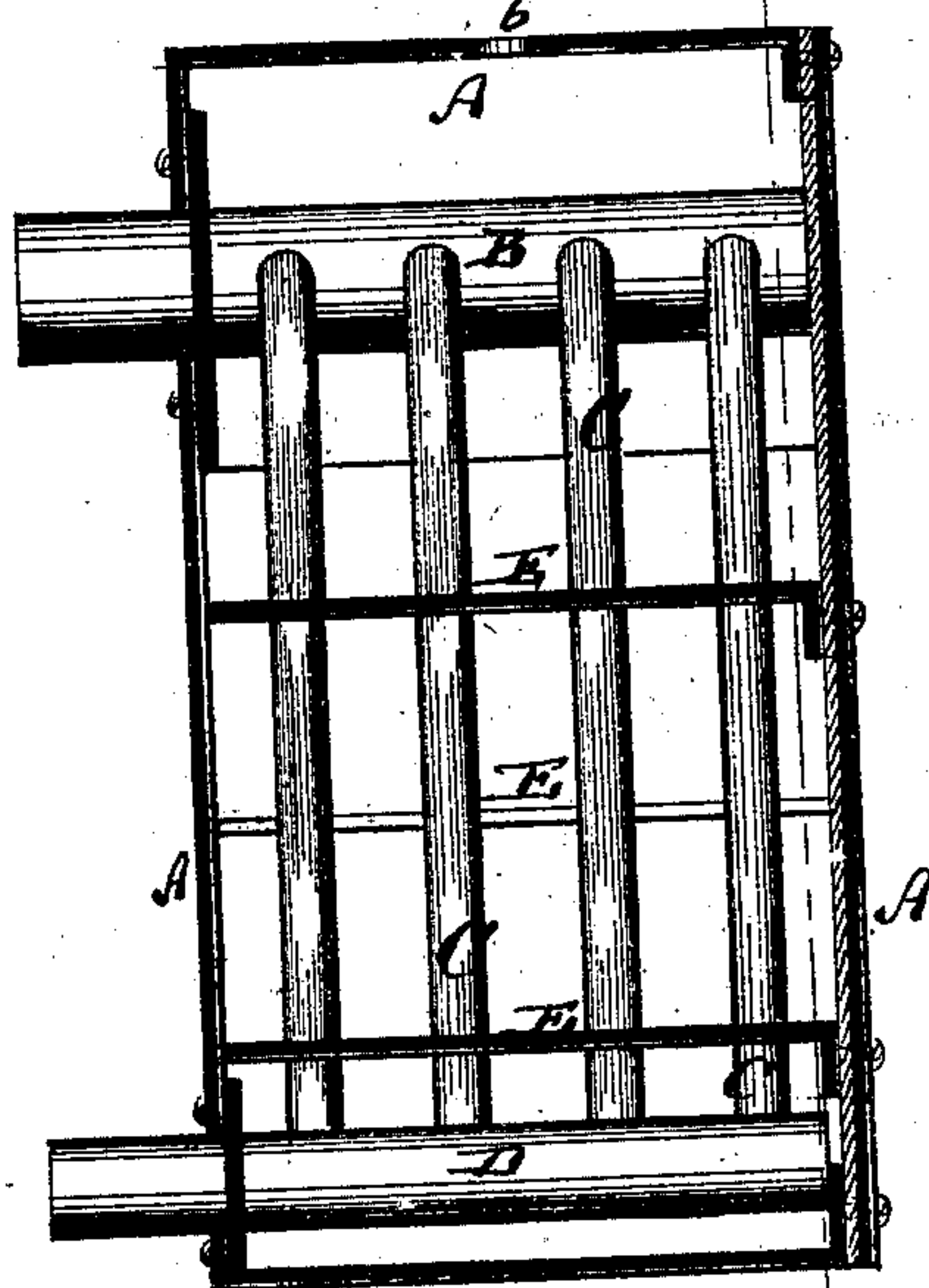
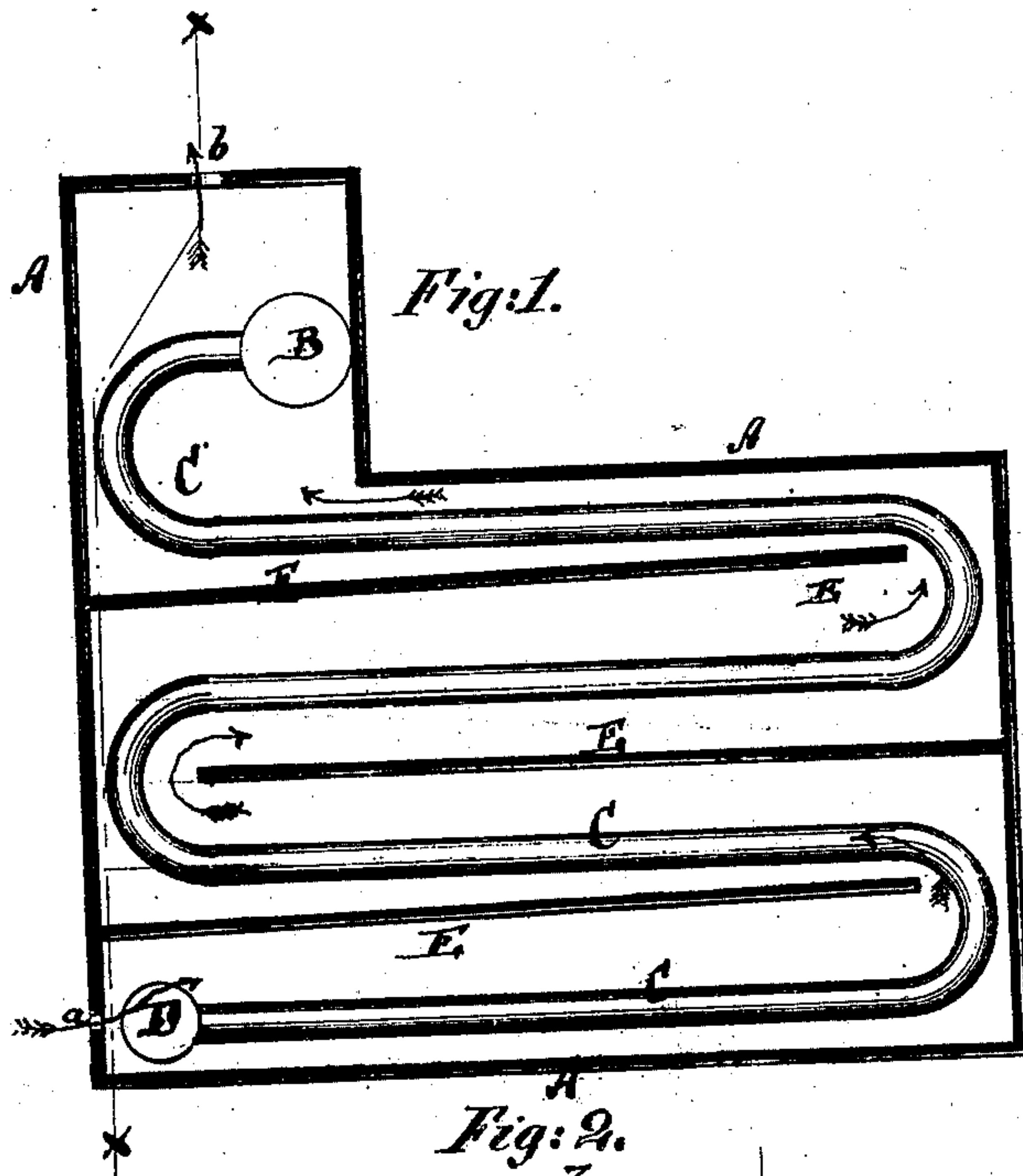


E. B. Johnson,

Steam Boiler Heater.

No. 99,573.

Patented Feb. 8. 1870.



Witnesses
M. Vorländer
Geo. W. Mabie

Inventor
E. B. Johnson
per: [Signature]
Attorneys.

UNITED STATES PATENT OFFICE.

ENOS B. JOHNSON, OF CHICAGO, ILLINOIS.

IMPROVED FEED-WATER HEATER FOR STEAM-GENERATORS.

Specification forming part of Letters Patent No. 99,573, dated February 8, 1870.

To all whom it may concern:

Be it known that I, ENOS B. JOHNSON, of Chicago, in the county of Cook and State of Illinois, have invented a new and Improved Feed-Water Heater; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a vertical longitudinal section of my improved feed-water heater. Fig. 2 is a vertical transverse section of the same, taken on the plane of the line *x x*, Fig. 1.

Similar letters of reference indicate corresponding parts.

This invention relates to a new apparatus for heating the feed-water of steam-generators by means of the exhaust-steam for the purpose of utilizing the heat of the steam.

The invention consists in the general arrangement, in a water-chest, of detaining-shelves and serpentine steam-pipes, all combined in such manner that the water ascending in the box will by the shelves be caused to take a circuitous course, following the windings of the steam-pipe, while the steam entering from above passes through the water and gives off its heat to the same. The water is by this apparatus rapidly and thoroughly heated, and fuel is economized, as almost the entire heat of the steam will be utilized.

A in the drawings represents a chest made of iron, of suitable size and shape. In its upper part is arranged a transverse steam-pipe, B, from which a series of smaller pipes, C C, extend in winding course through the chest to a lower transverse discharge-pipe, D. Within the chest are also arranged horizontal or nearly horizontal shelves E E, which project alternately from opposite sides into the windings of the pipes C, as is clearly shown in Fig. 1. The water to be heated enters the lower part of the chest at *a*, and escapes at *b* from the upper end. It rises as it becomes warm. The steam enters the pipe B and passes through the pipes C into D, whence it escapes. The steam, it will be observed, enters the chest where the water escapes, and gives off the greatest quantity of heat immediately before the water enters the boiler. The surplus heat of the steam is then absorbed by the water in the lower part of the chest. The shelves cause the water, in ascending, to follow the circuitous course of the pipes C.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

A feed-water heater consisting of the chest A, serpentine steam-pipes C, and shelves E, all combined to operate substantially as herein shown and described.

ENOS B. JOHNSON.

Witnesses:

B. W. BOWEN,

JOHN C. BARKER.