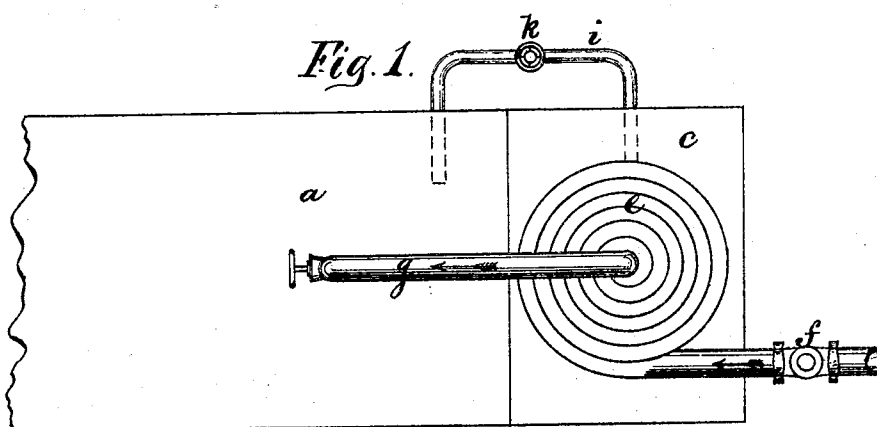
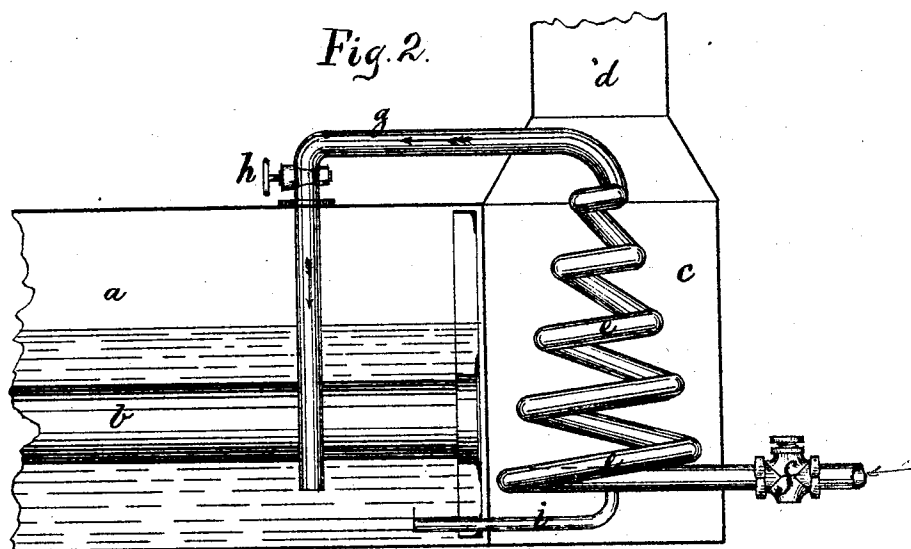


J. H. HALE & A. C. WHITNEY.

Feed-Water Heaters.

No. 145,059.

Patented Dec. 2, 1873.



Witnesses:
George O. Phelps.
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UNITED STATES PATENT OFFICE.

JOHN H. HALE AND ALFRED C. WHITNEY, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN FEED-WATER HEATERS.

Specification forming part of Letters Patent No. **145,059**, dated December 2, 1873; application filed October 30, 1873.

To all whom it may concern:

Be it known that we, JOHN H. HALE and ALFRED C. WHITNEY, both of Boston, in the county of Suffolk and State of Massachusetts, have jointly invented certain new and useful Improvements in Feed-Water Heaters for Boilers; and we 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

Our invention relates to improvements in feed-water heaters for steam-boilers, &c., consisting in the employment of a spiral tube of suitable metal, placed in the connection between the boiler and the chimney, through which the feed-water is forced before it enters the boiler. The spiral tube or pipe aforesaid is made of a decreasing outside diameter toward its upper end, so as to present a larger surface to the escaping hot gases from the flues or tubes on the boiler, and also for the purpose of preventing the sparks from going out through the chimney. The feed-water is forced in through the lower end of the spiral tube, and, after passing through the whole of it, is forced from the upper end thereof into the boiler. In combination with said spiral heating-pipe, we employ a check-valve in the lower end of said pipe, so as to prevent the pressure in the boiler from forcing out the water from the spiral heating-tube, by which arrangement we are able at all times to retain water in the spiral heating-tube, and thereby prevent the heating-tube from overheating.

By the employment of this our improved feed-water heater, we are able to heat the water to more than 300° Fahrenheit before it enters the boiler, and thus effect a great saving in the amount of fuel used for the generation of steam in the boiler.

On the drawing, Figure 1 represents a ground plan of our invention, and Fig. 2 represents a sectional elevation of the same.

Similar letters refer to similar parts wherever they occur on the different parts of the drawings.

a represents an ordinary boiler, provided with flues or tubes *b*, through which the hot products from the fire-place are conducted to the chamber or connection *c*, as usual. *d* represents the chimney leading from the connection *c*. In the chamber *c* we locate a spirally-wound pipe, *e*, as shown in Fig. 2. The spiral pipe *e* is made of a larger outside diameter at the bottom than at the top, as shown in Fig. 2, the object of which is to present a large surface for the heated products to act upon, and also for the purpose of arresting the sparks that are conducted from the flues to the chamber *c*. To the lower end of the spiral pipe *e* is connected a check-valve, *f*, outside the chamber *c*, for the purpose of preventing the water from escaping from our spiral heater.

It will be seen by reference to the drawings that our spiral heater is made without any joints whatever in the heating-chamber *c*, and that, therefore, all leakage, on account of the expansion and contraction of the spiral pipe *e*, is entirely obviated.

The water, after passing through our improved heater *e*, is forced through a connecting-pipe, *g*, into the boiler *a*.

By the use of our improved feed-water heater *e*, we are able to accomplish two purposes, namely, a considerable reduction of the amount of fuel used for generating a certain quantity of steam, and, secondly, to arrest the sparks in the chamber *c*, and prevent them going up the chimney.

To prevent the water and steam from being forced out through the pipe *g* in case it should break or get damaged, we provide the said pipe *g*, as close to the boiler as possible, with a stop-valve, *h*, as shown in the drawing.

A small pipe, *i*, provided with a stop-valve, *k*, connects the lower part of the spiral *e* to the water-space in the boiler *a*, for the purpose of keeping up a constant circulation of the water in the heater *e*, even if the feed-pumps should get out of order, and no water forced from without through the heater *e*. By means of the stop-valve *k* and pipe *i*, we are also able to regulate the proper circulation of the water through the feed-pipe *e*.

Having thus fully described the nature, con-

struction, and operation of our invention, we wish to secure by Letters Patent, and claim—

The combination of a boiler, *a*, smoke-box *c*, chimney *d*, the spirally-wound tapering feed-pipe *e*, check-valve *f*, connecting-pipe *g*, stop-valve *h*, regulating-pipe *i*, and the stop-valve *k*, when combined and arranged substantially as herein shown and described.

In testimony that we claim the foregoing we have hereunto set our hands this 10th day of October, 1873.

JOHN H. HALE.

ALFRED C. WHITNEY.

Witnesses:

ALBAN ANDRÉN,

GEORGE E. PHELPS.