(Model.)

2 Sheets—Sheet 1.

A. R. YOUNG.

FEED WATER HEATER.

No. 264,400. Patented Sept. 12, 1882.

Fig. 1.

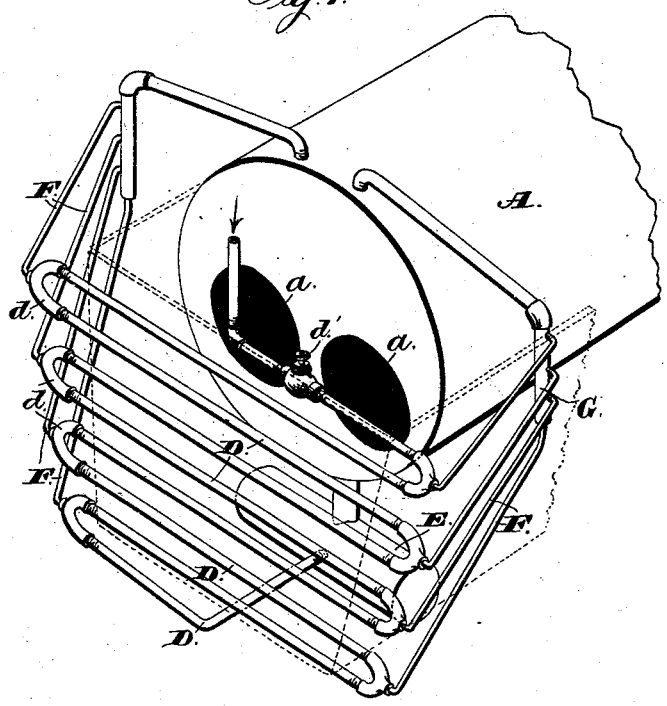
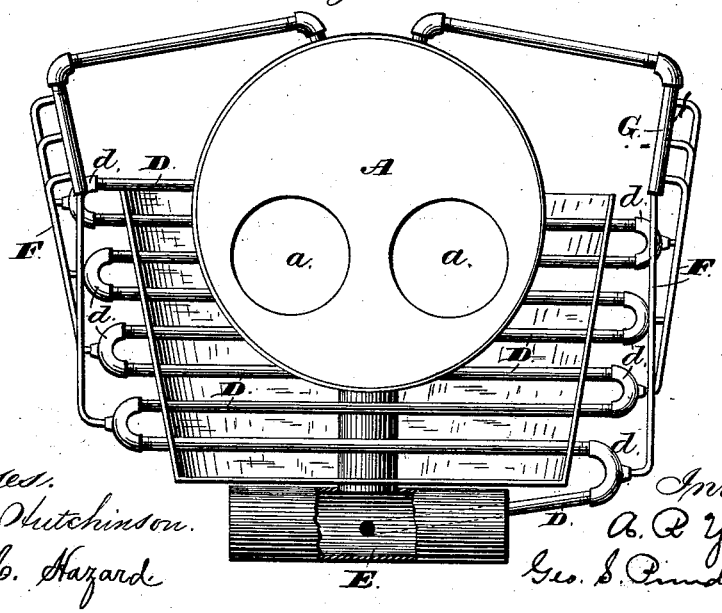


Fig. 2.



Witnesses:
Jas. E. Hutchinson.
Henry C. Hazard

Inventor.
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Geo. S. Pindle, his Atty

(Model.) 2 Sheets—Sheet 2.

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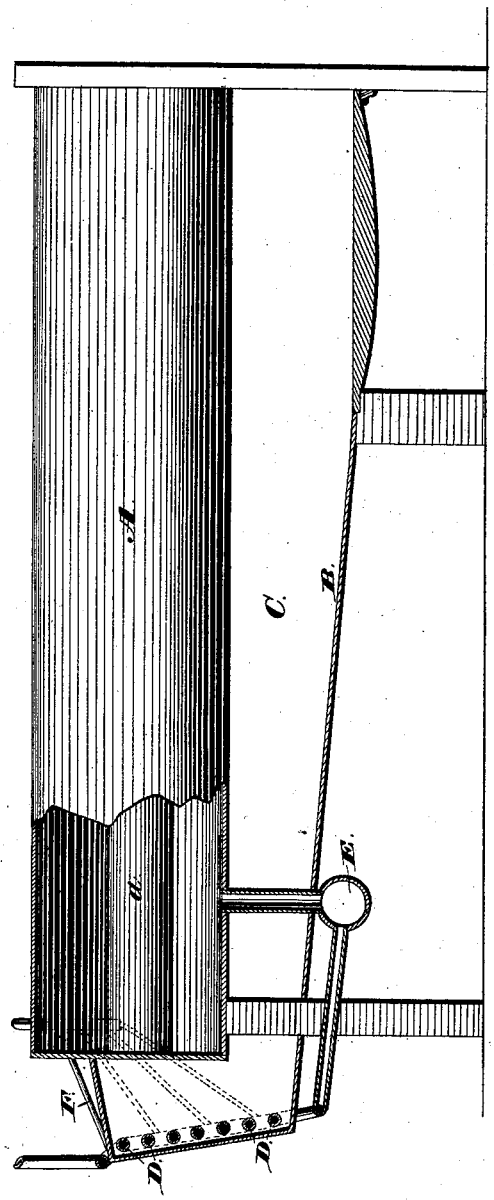
Fig. 3.



Witnesses:
Jas. E. Hutchinson
Henry C. Hazard

Inventor.
A. R. Young, by
Geo. S. Prindle, his Attty

UNITED STATES PATENT OFFICE.

AUGUSTUS R. YOUNG, OF STILLWATER, MINNESOTA.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 264,400, dated September 12, 1882.

Application filed April 22, 1882. (Model.)

To all whom it may concern:

Be it known that I, AUGUSTUS R. YOUNG, of Stillwater, in the county of Washington, and in the State of Minnesota, have invented certain new and useful Improvements in Feed-Water Heaters for Boilers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a perspective view of my apparatus from the rear as applied to a boiler, the casing of said boiler being indicated by dotted lines. Fig. 2 is a front elevation of the same, and Fig. 3 is a central longitudinal section of said boiler as set and provided with my apparatus.

Letters of like name and kind refer to like parts in each of the figures.

The design of my invention is to utilize a portion of the waste heat within the fire-box or smoke-box of a steam-boiler by causing the same to heat the feed-water; and to this end it consists principally in combining with a steam-boiler water-pipes arranged across the rear end thereof, within the smoke-arch, and connected with the mud-drum, and pipes connecting said water-pipes with the steam-space of said boiler, whereby feed-water may be heated by being conveyed in a zigzag course from a point above said boiler downward to said drum, and steam generated within said pipes may pass directly into said boiler, substantially as and for the purpose hereinafter specified.

It consists, further, in the means employed for connecting the feed-water pipes with the steam-space of the boiler, substantially as and for the purpose hereinafter shown.

My invention is designed more especially for use in connection with the ordinary return-flue boilers, such as are employed upon steamers navigating the Mississippi and its tributaries, although it may be applied with equal advantage to other forms of boilers, and its operation will be sufficiently illustrated by showing it as employed in connection with said return-flue boilers.

In the annexed drawings, A represents a return-flue boiler of usual form, which has its lower portion inclosed with brick or oven B, so as to form beneath its front end a fire-box, and from the same to and in rear of its rear end a flue, C, through which the gaseous products of combustion may pass from said fire-box to and into the flues *a* of said boiler, through which flues said gases pass forward to and into a smoke-stack, all in the usual way.

At the rear end of the boiler A, within the smoke-flue C, is a pipe, D, which extends in a zigzag form transversely across said flue, with its upper end above the boiler-flues *a* and connected with a water-supply and its lower end beneath the bottom of said flue C and connected with a mud-drum, E, or in other manner placed in communication with said boiler, whereby water may be supplied to the latter to compensate for the loss occasioned by conversion into steam, leakage, &c.

The pipe D is arranged with its return-bends *d* outside of the casing B, so as to be easily accessible, and from each of said bends a pipe, F, extends forward and upward to and is connected with a pipe, G, which extends to and communicates with the upper portion or steam-space of the boiler A.

The apparatus is now complete and operates as follows, viz: The feed-water for the boiler A enters the upper end of the pipe D, at which point is provided a check-valve, *d'*, and from thence passes downward through said pipe, and finally enters said boiler. The heating escaping products of combustion from the fire-box, passing rearward through the flue C, impinge upon said pipe and impart to the same and to its liquid contents a portion of their heat, after which they pass into and through the boiler-flues *a*. The heat received by the water within the pipe D is sufficient to raise its temperature to or above the boiling-point, so as to cause the production of steam, which steam, instead of forming an obstruction to the free passage of water through said pipe, escapes through the pipes F and G into the boiler A, leaving said water free in its movements.

If desired, the sides as well as the rear end of the smoke-flue may be provided with water and steam pipes, or the same may be placed within the fire-box or smoke-box, it being a matter of convenience only how extensively and at what points said pipes are applied.

The apparatus described enables any desired proportion of heat contained within the

escaping gaseous products of combustion to be utilized for the heating of feed-water and the production of steam, and just in proportion to the extent of said pipes will be the saving in fuel effected by their use.

In addition to the advantages before stated, the feed-water is heated to such a point before entering the boiler as to prevent any injury to the plates thereof from unequal expansion, while when the usual apparatus is employed the temperature of the feed-water is so much less than that of the boiler as to cause the plates immediately around the inlet to contract and frequently to become ruptured.

Having thus fully set forth the nature and merits of my invention, what I claim as new is—

1. In combination with a steam-boiler, water-pipes arranged across the rear end thereof, within the smoke-arch, and connected with the mud-drum, and pipes connecting said water-pipes directly with the steam-space of said boiler, whereby feed-water may be heated by being conveyed in a zigzag course from a point above said boiler downward to said drum, and steam generated within said pipes may pass directly into said boiler, substantially as and for the purpose specified.

2. In combination with the boiler A, and with the feed-water pipes D, arranged horizontally across the rear end of the same, the steam-pipes F, intersecting said pipes D at the bends *d* and connecting the same with the steam-space of said boiler, substantially as and for the purpose shown.

In testimony that I claim the foregoing I have hereunto set my hand this 29th day of March, 1882.

A. R. YOUNG.

Witnesses:
GEO. S. PRINDLE,
JAS. BROWN.