E. E. HERMANS & W. D. SMITH.
Feed Water Heater and Purifier.

No. 196,013. Patented Oct. 9, 1877.

Fig. 1

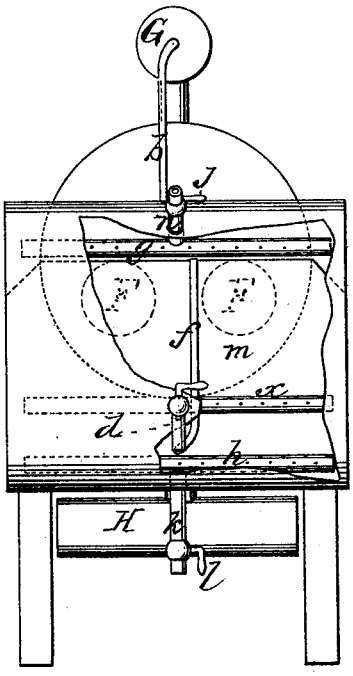
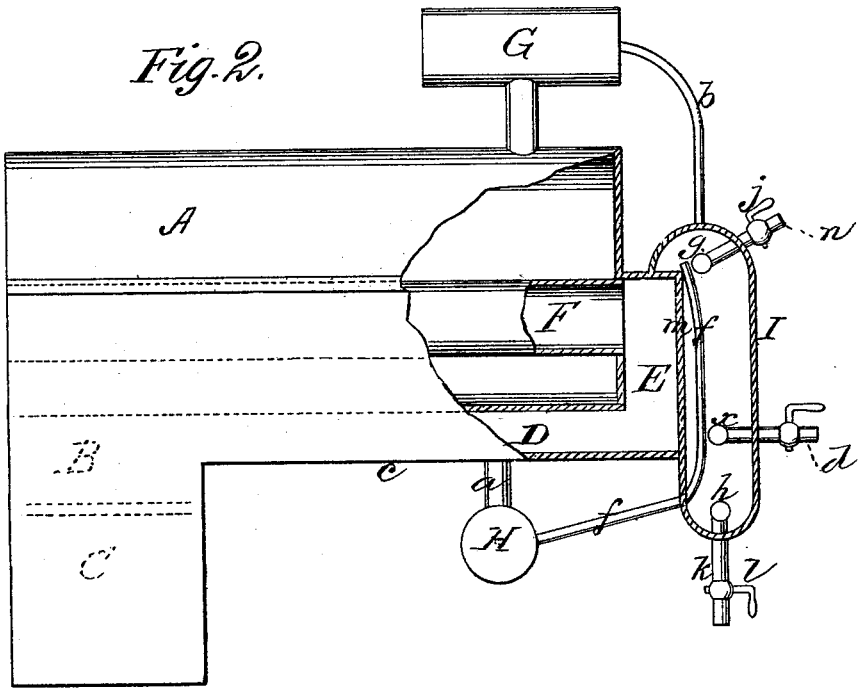


Fig. 2.



WITNESSES
Villette Anderson,
Frank J. Masi

INVENTORS
Edward E. Hermans,
William D. Smith.
by E. W. Anderson.
ATTORNEY

UNITED STATES PATENT OFFICE.

EDWARD E. HERMANS, OF REED'S LANDING, MINNESOTA, AND WILLIAM D. SMITH, OF KEITHSBURG, ILLINOIS.

IMPROVEMENT IN FEED-WATER HEATERS AND PURIFIERS.

Specification forming part of Letters Patent No. **196,013**, dated October 9, 1877; application filed August 25, 1877.

To all whom it may concern:

Be it known that we, EDWARD E. HERMANS, of Reed's Landing, Minnesota, and WILLIAM D. SMITH, of Keithsburg, in the county of Mercer and State of Illinois, have invented a new and valuable Improvement in Feed-Water Heaters and Purifiers; and we do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of an end view of the boiler, showing the heater and purifier applied, and Fig. 2 is a side elevation of the same, with the heater in section.

This invention has relation to improvements in feed-water heaters and purifiers for steam-boilers; and the nature of the invention consists in the construction and novel arrangement of the various devices used, as will be hereinafter more fully set forth.

In the annexed drawings, the letter A indicates an ordinary steam-boiler, having the furnace B, ash-pit C, the fire-bed flue D, extending from the furnace to the back of the boiler, where it connects with a vertical flue or flues, E, opening into the return-flues F.

The boiler has the usual steam-dome G, or its equivalent, and is provided with a mud-drum, A, communicating with the water-space of the boiler by a pipe, *a*, in which the impurities in the boiler will naturally settle.

I represents the water-heating chamber, of which the rear wall of the return-flue E is wholly, or in part, the divisional wall between the furnace and the said chamber. This latter is formed of boiler-plate of suitable strength, and is adequately stay-bolted. It is connected with the steam-dome, or, in the absence thereof, with the steam-space of the boiler by means of a pipe, *b*.

The heating-chamber extends below the fire-bed *c* a certain distance, preferably, and water is forced into it through a tube, *d*, near its lower end, into a horizontal perforated discharge-pipe, by a suitable pump.

f represents a metallic pipe opening at one end into the mud-drum of the boiler, extending thence through the heater-wall, and carried up within the same to a point near the top of the heater I. The water, as it enters the said heater through pipe *d* and the discharge-tube *x*, comes in contact with the rear wall of the furnace or return-flue E, and is greatly heated before it reaches the open upper end of the pipe *f*. This heating causes the mud to be deposited or precipitated to the bottom of the heater, while the lighter impurities rise to the surface.

During the pumping, and the intervals between successive operations, an equilibrium is established between the steam-pressure in the heater and boiler, and the safety-valve upon the one is made to relieve both from undue strain.

At the bottom of the heating-chamber is arranged a pipe, *h*, closed at both ends and provided with a number of spaced perforations. This pipe is connected to a pipe, *k*, extending through the heater-wall, and provided with a steam-cock, *l*. When this latter is open, the accumulation of mud and other foreign impurities will be forced through pipes *h* and *k* out of the heating-chamber. At the upper end of the latter is arranged a similar pipe, *g*, that is also perforated and provided with a blow-off pipe, *n*, closed or opened by a suitable cock, *j*. This cock being open, scum and other floating impurities will be blown out of the heating-chamber I before the feed-water reaches the upper end of the direct feed-pipe *f*, leading into the water-space or mud-drum of the boiler. The water is thus freed of all foreign matter, and admitted to the boiler in a pure state.

By this means caking of the boiler is, to a great extent, prevented, and the necessity of frequent stoppages, for the purpose of cleaning the boiler, obviated.

What we claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a feed-water heater-chamber, having a suitable induct, *d x*, and a boiler, of a pipe leading from the steam-space of the boiler to the heater, and a pipe extend-

ing from the water-space of the boiler through the heater-wall upward to the upper part of the said heater, substantially as specified.

2. The combination, with the boiler A and heating-chamber I, separated by a diaphragm, *m*, forming a furnace-wall of the pipe *b* leading from the steam-space of the boiler to the heater, the pipe *f* leading from the water-space of the former into the latter, and extending upward to its upper part, and the blow-off pipes *h g* perforated, as described, and provided with cocks *l k* and *j n*, extending through the heating-chamber wall, substantially as specified.

In testimony that we claim the above we have hereunto subscribed our names in the presence of two witnesses.

EDWARD E. HERMANS.
WILLIAM D. SMITH.

Witnesses:
OLVER DUSSCHE,
LUKE C. MALIN.