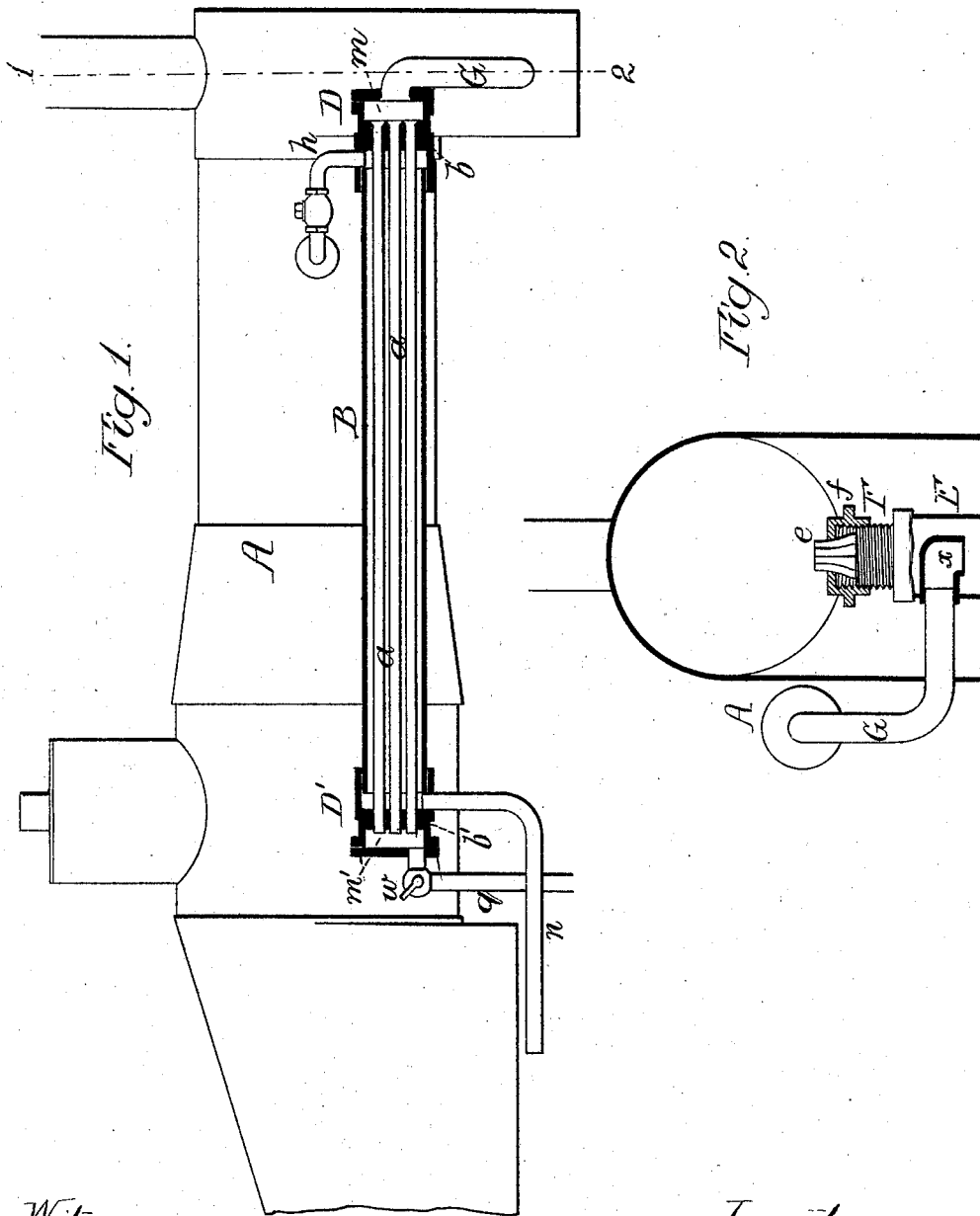


J. E. WOOTTEN.
 Feed-Water Heater for Locomotive.

No. 203,518.

Patented May 7, 1878.



Witnesses.

Henry Howson Jr.
 Harry Smith

Inventor
 John E. Wootten
 by his Attorneys
 Howson and Son.

UNITED STATES PATENT OFFICE.

JOHN E. WOOTTEN, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN FEED-WATER HEATERS FOR LOCOMOTIVES.

Specification forming part of Letters Patent No. 203,518, dated May 7, 1878; application filed March 28, 1878.

To all whom it may concern:

Be it known that I, JOHN E. WOOTTEN, of Philadelphia, Pennsylvania, have invented a new and useful Improvement in Feed-Water Heaters for Locomotives, of which the following is a specification:

The object of my invention is to increase the heat of feed-water in locomotives before it enters the boiler; and this object I attain in the manner which I will now proceed to describe, reference being had to the accompanying drawing, in which—

Figure 1 is a side view of a locomotive-boiler with the feed-water heater in section, and Fig. 2 a section on the line 1 2.

A is the locomotive-boiler, on the side of which is arranged the feed-water heater, consisting, in the present instance, of a tubular casing, B, secured to the front and rear heads D and D'. This casing contains tubes *a*, which, at one end, pass through a partition or tube-sheet, *b*, in the head D, and are secured to the same by riveting or otherwise, the opposite ends of the tubes passing through and fitting snugly, but so as to slide freely in the partition or tube-sheet *b'* of the head D'.

E is the exhaust-chamber, communicating in one direction with the exhaust-passages of the cylinders, and in the other direction with the variable exhaust-nozzle F.

There are many different kinds of nozzles the orifices of which can be contracted or expanded by means of devices under the control of the engineer, and any of these may be used in connection with my invention.

The end of the nozzle consists, in the present instance, of elastic strips *e* of metal arranged in a circle, and overlapping each other, the strips being so formed, in relation to an opening in a screw-cap, *f*, that on screwing down the latter the orifice of the nozzle will be contracted, and expanded when the cap is raised. It should be here understood that this is a well-known device, and hence that I neither claim nor confine myself to it.

A pipe, G, communicates at one end with a chamber, *m*, in the head D of the heater, and at the other end with the exhaust-chamber E, within which the pipe is turned down so as to expose its open end *x* directly to the course of the exhaust-steam, a portion of which, conse-

quently, enters the pipe and passes into the tubes of the heater.

A force-pipe, *n*, conveys the feed-water from the pump of the engine to the interior of the heater near the rear end of the same, and this water, by contact with the tubes *a*, becomes heated, before it passes into the boiler, through a pipe, *h*, near the front end of the said heater.

A waste-pipe, *g*, furnished with a suitable cock, *w*, which is under the control of the engineer, serves to convey the water of condensation from the chamber *m'* at the rear end of the heater, and also serves a further purpose, which will be rendered apparent hereinafter.

The heater must necessarily be subjected to variations of temperature, resulting in alternate expansion and contraction, which tubes could not in all cases resist if they were permanently secured at both ends. Hence the rear ends are permitted to slide in the tube-sheet *b'* of the head D', for a slight leakage at this end of the heater would be immaterial, such feed-water as may penetrate through the tube-sheet around the tube passing off through the waste-pipe *g* with the water of condensation.

The quantity of exhaust-steam admitted to the heater may be regulated by the variable exhaust-nozzle, for the more the latter is contracted the greater will be the volume of exhaust-steam admitted to the heater, the supply of steam to the latter being diminished as the orifice of the nozzle is expanded.

The cock *w* may also be used as a means of regulating the supply of steam admitted to the heater, and at the same time promoting the economy of fuel, for if the condition of the fire is such that more of the exhaust-steam can be spared from the service of promoting draft, the size of the aperture for the escape of the water of condensation from the heater may be increased, in which case a greater volume of steam will pass through the tubes uncondensed, and consequently the feed-water will attain a proportionately higher temperature before it reaches the boiler.

There may be a communication between the steam-space of the boiler and one of the ends of the heater, so that, if desirable, live steam may be used in the said heater in place of or in conjunction with exhaust-steam.

I do not desire to claim, broadly, the com-

bination, in a locomotive, of the exhaust-nozzle and a feed-water heater with a pipe for conveying part of the exhaust-steam to the said heater; but

I claim as my invention—

1. The combination, in a locomotive, of a feed-water heater with a pipe terminating within the exhaust-chamber of the cylinder, and having its open end turned downward, and directly exposed to the upward course of the exhaust-steam in the said chamber, all substantially as set forth.

2. The combination of the exhaust-chamber and variable exhaust-nozzle of a locomotive-engine with a feed-water heater and a pipe forming a communication between the said heater and the exhaust-chamber, all substantially as specified.

3. The combination of a feed-water heater which derives its heat from exhaust-steam with an outlet or waste pipe and cock or valve *w*.

4. A feed-water heater consisting of an outer casing for receiving the feed-water, a series of tubes, through which the exhaust-steam passes, and two fixed tube-sheets, to one of which are secured the said tubes, which are arranged to slide in the other tube-plate, all as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN E. WOOTTEN.

Witnesses:

HARRY A. CRAWFORD,
HARRY SMITH.