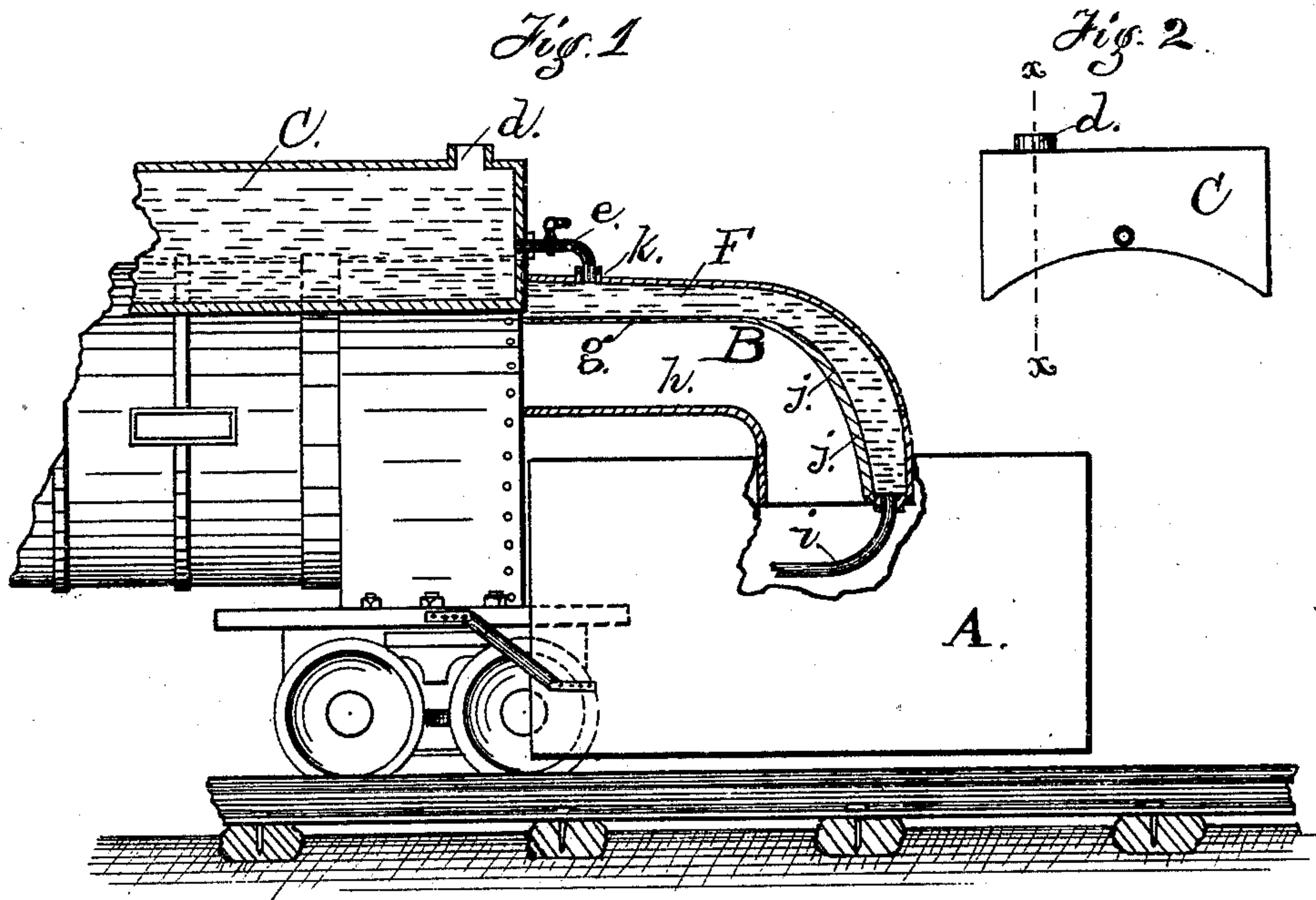


W. HALSTED.

LOCOMOTIVE FEED-WATER HEATER.

No. 170,729.

Patented Dec. 7, 1875.



Witnesses.

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UNITED STATES PATENT OFFICE

WILLIAM HALSTED, OF TRENTON, NEW JERSEY.

IMPROVEMENT IN LOCOMOTIVE FEED-WATER HEATERS.

Specification forming part of Letters Patent No. **170,729**, dated December 7, 1875; application filed October 23, 1875.

To all whom it may concern:

Be it known that I, WILLIAM HALSTED, of the city of Trenton, county of Mercer and State of New Jersey, have invented an Improved Mode and Apparatus for Heating Feed-Water for Locomotive and other Boilers; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

My improvements consist in combining, with a horizontal smoke stack or pipe, a water-compartment located directly above it; in combining with such a smoke-pipe and compartment a tank connected with the compartment; and in combining with such smoke-pipe and compartment a tube leading from the compartment to the boiler, all as more particularly herein-after set forth.

In the drawings, Figure 1 represents the forward end of a locomotive with my improvements applied thereto, a part being in section; Fig. 2, a front view of the tank detached.

A indicates a triangular box placed over the cow-catcher, and B a horizontal smoke-stack, whose forward end discharges into such box, substantially as in my Patent No. 168,091, dated September 28, 1875. C is a small tank located on the top of the forward part of the boiler, its bottom being preferably concave to conform to the convex surface of the boiler, and it may be made to extend from four to five feet back on top of the boiler, and be from two to three feet in width, and from six to twelve inches in height. It has a small opening, *d*, in its top, through which it may be supplied with water. A force-pump may be connected with it, by means of which water for its supply may be drawn through a pipe or water-tank of the locomotive and forced into this tank C. The front part of this tank is connected by a pipe, *e*, or other proper means, with the water-tight compartment F, which is immediately above the smoke-stack B, this compartment being best formed or constructed by placing a longitudinal partition or diaphragm, *g*, in the horizontal smoke-stack, nearer to its top than

to its bottom, so that its upper or water compartment F may be about one-third the size of the lower compartment *h*, or smoke-stack proper, which is below the diaphragm *g*, and through which the heat, cinders, and smoke must pass down into the box A. During such passage of these heated products of combustion through this compartment *h* they continually impart their heat to the water in the compartment F, which is directly above it, the top of F being the bottom of *h*. At the bottom or lower end of the hot-water compartment F a tube, *i*, is attached, and which may be extended and connected to any appropriate part of the boiler, and through which the heated water may, by means of a force-pump or any other suitable means, be projected into the boiler; and this may be repeated as often as is necessary during the whole period that steam is being generated.

At the curve *j* of the smoke-pipe, near where it enters the box A, the sheet-iron or other metal which forms the upper part *g* of the flue or smoke-stack proper *h* should be made much thicker—say, about double or more the thickness of its other part—so that any steam which may be exhausted into the smoke-pipe shall not, by striking against this curve, wear it out sooner than other parts.

As the highest part of the water-compartment F is above the smoke pipe or stack B, a small opening, *k*, in the top of F may be made, through which, by means of a tube or other device, water may be introduced into F.

Instead of exhausting steam into the smoke-pipe, I may also exhaust it into the small tank C on the top of the boiler by means of any ordinary pipes, or exhaust it directly into the top of the water-compartment F, and in this way I utilize all the heating qualities of all the steam, which heretofore has been permitted to escape, either through the smoke-pipe or otherwise, and apply it directly to the heating of the feed-water; and, after doing its duty of heating, it is, in its condensed form, returned as hot water into the boiler, thus, in fact, using it over and over again in the forms both of water and of steam.

I claim—

1. The combination, with the horizontal lo-

comotive smoke-pipe, of a water-compartment located directly above and upon the same, substantially as shown and described.

2. The combination, with the horizontal locomotive smoke-pipe and with the water-compartment F, of a tank, C, connected with such compartment, substantially as shown and described.

3. The combination of the horizontal smoke-pipe, water-compartment F, and tube i, leading to the boiler, substantially as shown and described.

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Witnesses:

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JOHN T. HAYNES.