

R. W. Hale,

Steam-Boiler Water-Heater.

N^o 36,614.

Patented Oct. 7, 1862.

Fig. 2

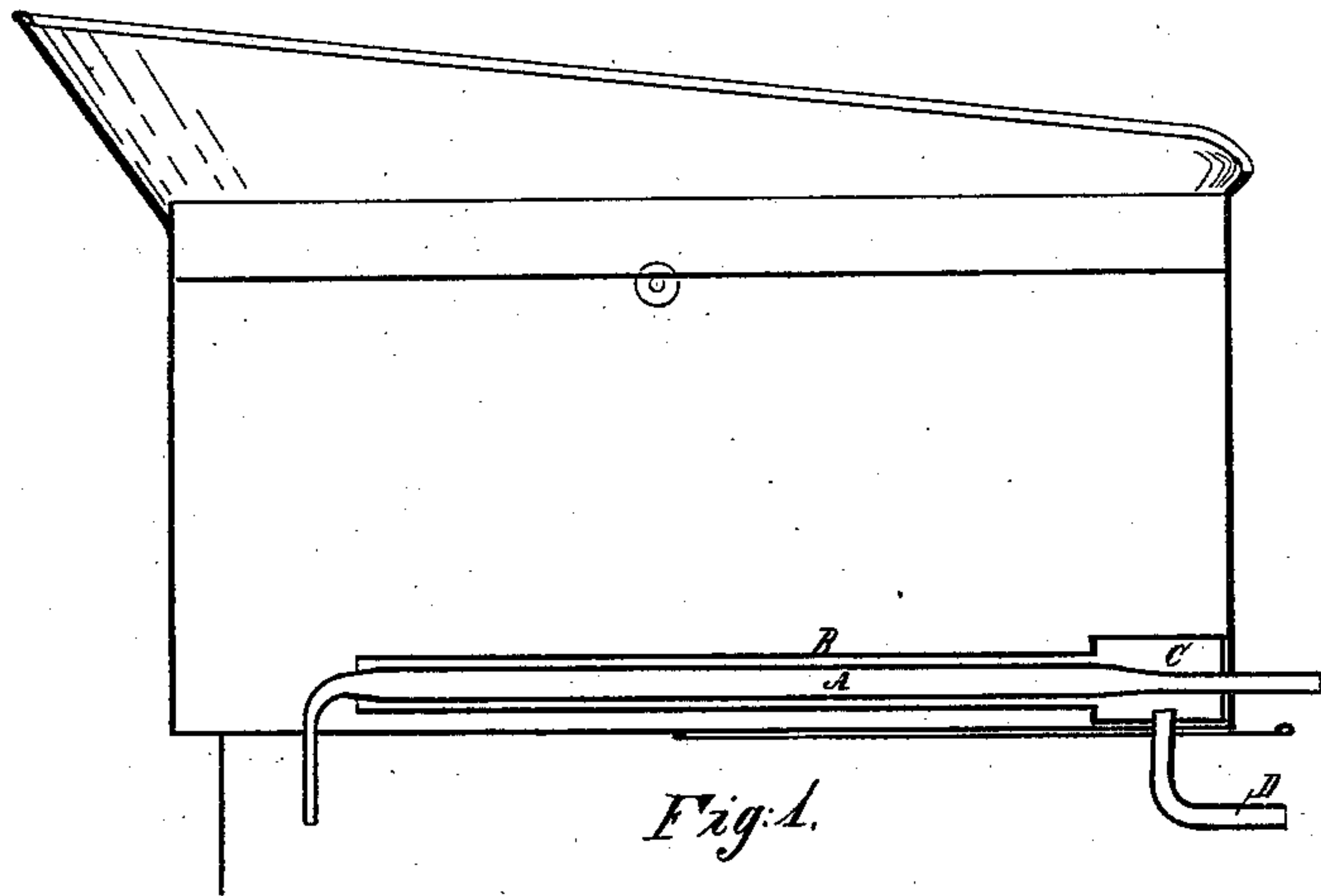
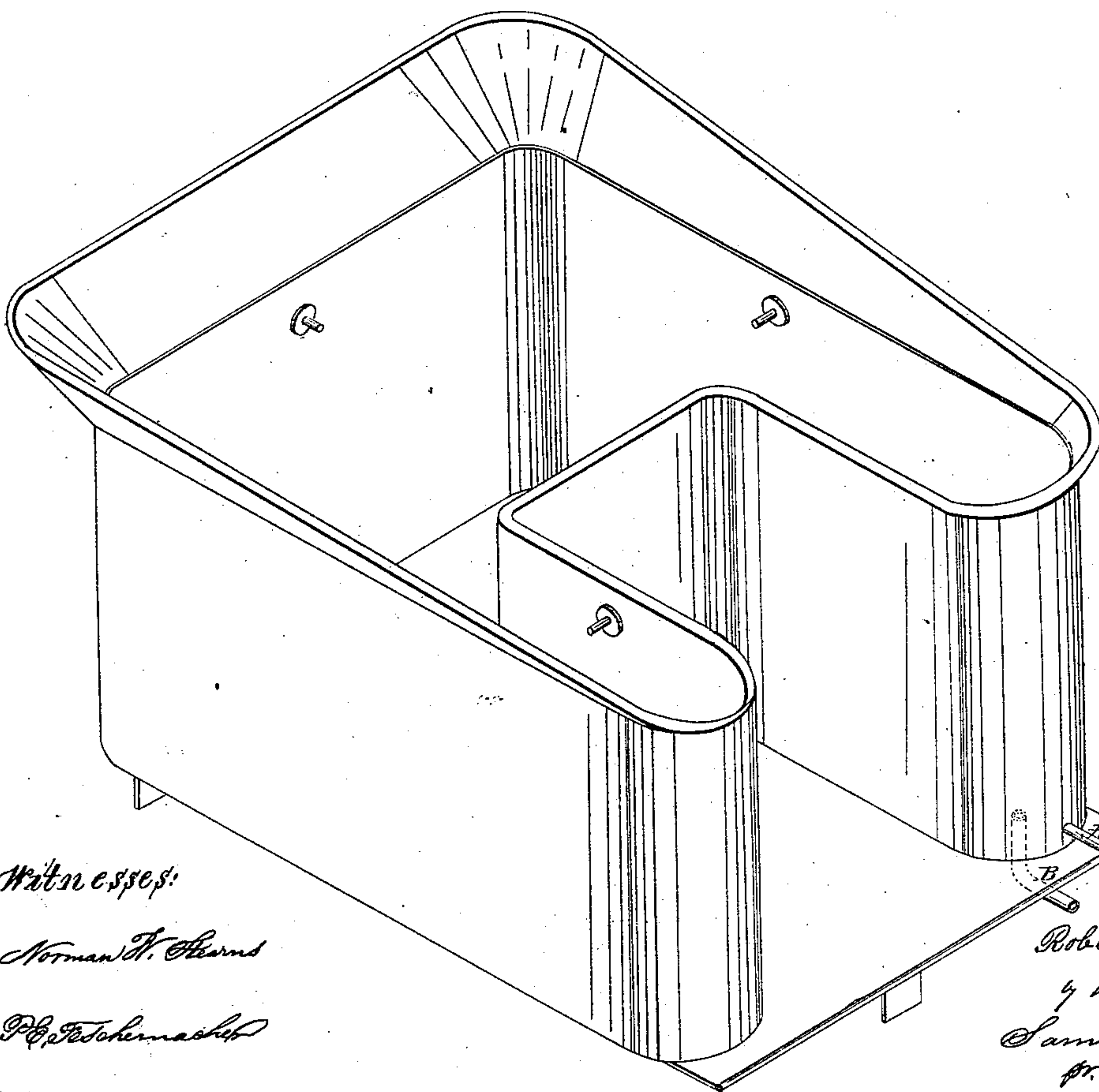


Fig. 1.



Witnesses:

Norman H. Sharns

P. C. Fitchmacher

Inventor:

Robert W. Hale

by his attorney,

Samuel G. Cooper
per Roach,

UNITED STATES PATENT OFFICE.

ROBERT W. HALE, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN FEED-WATER-HEATING APPARATUS.

Specification forming part of Letters Patent No. 36,614, dated October 7, 1862.

To all whom it may concern:

Be it known that I, ROBERT W. HALE, of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improved Method of Heating the Feed-Water of Steam-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, in which—

Figure 1 is a view of the tender of a locomotive-engine. Fig. 2 is a vertical longitudinal section through the same.

Before describing my invention it may be stated that the advantages resulting from heating the feed-water of steam-engines by the waste heat and steam are well known, and various plans of apparatus for accomplishing this object are in general use on stationary engines; but I am not aware that any apparatus heretofore devised for heating the feed-water of locomotives has operated with such success as to receive the approval of locomotive-builders and railway-managers.

Attempts have been made to heat the water of locomotives by means of coils of pipe and vessels of various forms placed in the chimney and smoke-arch, through which the water has been forced on its way to the boiler; but it is found in actual use that these pipes and vessels leak and are constantly getting out of order, that they impede the draft and condense the exhaust-steam in the chimney, causing rust, and are in other ways objectionable. Another plan attempted has been to discharge a small part of the exhaust-steam directly into the tank; but it is found that a portion of the oil used to lubricate the cylinders is carried over in the pipe with the steam and is mixed with the water which is pumped into the boiler, where it causes foaming or priming to such an extent as to render this method of heating the water impracticable. It has also been attempted to heat the water for locomotives by passing a portion of the exhaust-steam through a coil of pipe placed in the tank; but it is found that the body of water contained in the tank is so large that the small quantity of steam available for heating purposes has but little effect until the engine has run a considerable time.

The object of my invention is to heat that portion of the water required for immediate use to a high degree, so that the boiler may

be supplied with hot water immediately on starting the engine and to avoid the difficulties before referred to; and my invention consists in passing a portion of the exhaust-steam through a metallic pipe which is surrounded by a second pipe of non-heat-conducting material of a size slightly larger than the steam-pipe, the feed-water from the tank being caused to pass in a thin sheet through the space between the two pipes on its way to the boiler, whereby I am enabled to supply the boiler with hot water immediately after the engine is started; and to do this with but little loss by evaporation or otherwise and by the consumption of but a small portion of the exhaust-steam.

To enable others skilled in the art to understand my invention, I will proceed to describe the manner in which I have carried it out.

A portion of the exhaust-steam is brought from the engine by a suitable elastic conduit to the metallic pipe A, which lies near the bottom of the water-tank of the tender. At its induction end this pipe may be an inch and a quarter in diameter, or thereabout, but immediately after it enters the tank it is enlarged to a diameter of three inches (more or less) in order to give a large heating-surface, and at its eduction end, which is passed through the bottom of the tank, (as seen in Fig. 2,) it is again contracted to a diameter of an inch, or thereabout, that the uncondensed steam may not pass off too freely. The tube A is incased and surrounded by a tube, B, which is made of wood or of some other non-heat-conducting material, which is enlarged at its forward end so as to form a chamber or reservoir, C, from which the feed-water for the engine is drawn through the pipe D, which is commanded by a suitable regulating-cock in the customary manner. Between the two pipes A and B there is an annular space of half an inch, or thereabout, through which the water will pass in contact with the heated tube A to the reservoir C, and thence to the engine.

It is obvious that the space between the exterior of the steam-pipe and the interior of the water-pipe will vary with the requirements of different engines. In general it should be as large as may be and not produce a circulation of the water within the tube B, by which the heated water would return again to the

tank, while on the other hand it should not be so small as to throttle the feed-pump or cause the water to flow too rapidly through it. There are many ways by which these pipes may be arranged without departing from the spirit of my invention—for example, they may be caused to return again to the forward end of the tender, and thus afford twice the amount of heating-surface; or the exterior pipe, B, may be made much larger than is represented in the drawings, and may be closed at its rear end and allowed to communicate with the water in the tank by means of a small hole on its under side. These constructions are manifestly but modifications of my invention and need not be further described.

It will be seen that when the feed-pump is in operation the water from the tank will be drawn in a thin sheet over the whole length of the pipe which conveys the exhaust-steam, and will thereby become highly heated before it reaches the reservoir C, and that the non-conducting nature of the pipe B will prevent

the heat thus communicated to the water within it from being absorbed by the water within the tank and lost by evaporation. It is also evident that the pipes A and B may be placed outside the tender instead of inside; but the arrangement which I have represented and described above is that which I prefer. Any suitable plan may be adopted for the purpose of taking off a portion of the exhaust-steam; but I prefer the methods adopted by Robert Hale and patented by him on the 5th May, 1857, and 13th September, 1859.

What I claim as my invention, and desire to secure by Letters Patent, is—

The method herein described of heating the feed-water of steam-engines by means of an exhaust-steam pipe and a surrounding water-pipe, combined and operating in the manner set forth, for the purpose specified.

ROBERT W. HALE.

Witnesses:

THOS. R. ROACH,
O. B. ROOT.