

T. H. IRWIN.
Feed-Water Heater for Locomotives.
No. 203,158. Patented April 30, 1878.

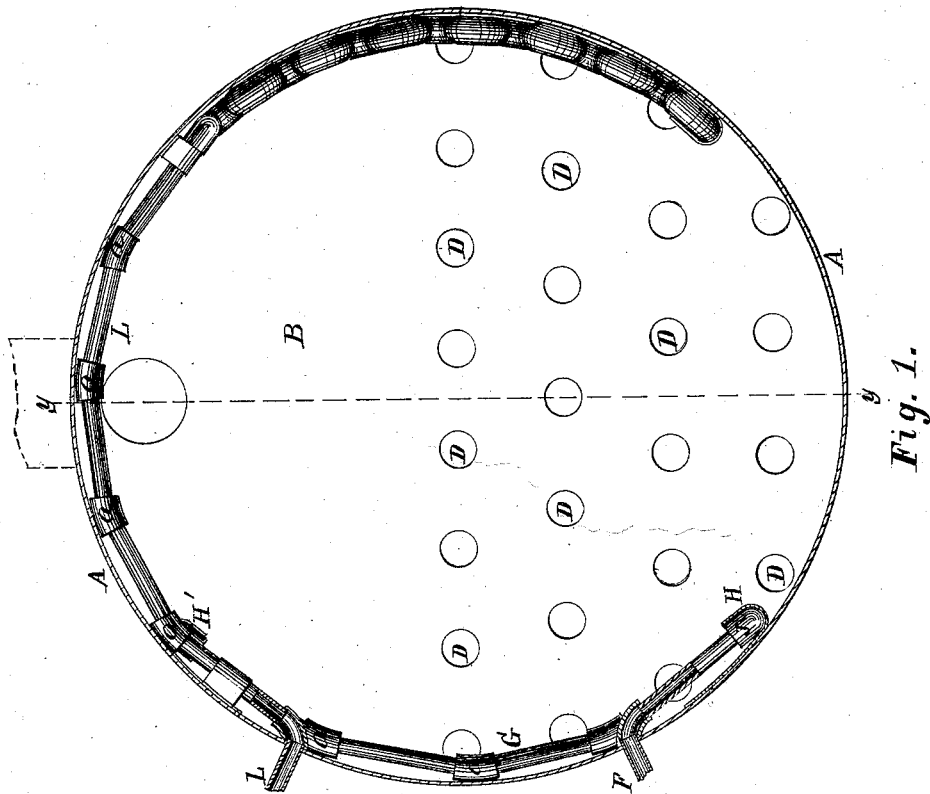


Fig. 1.

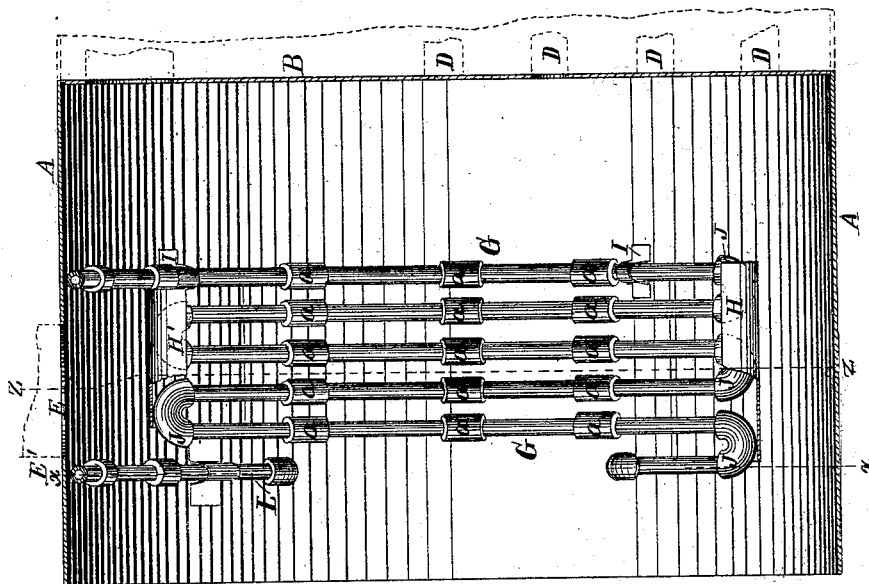


Fig. 2.

Witnesses:
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C. H. Dodd.

Inventor:
Thompson & Irwin
By *N. C. Lombard.*
Attorney.

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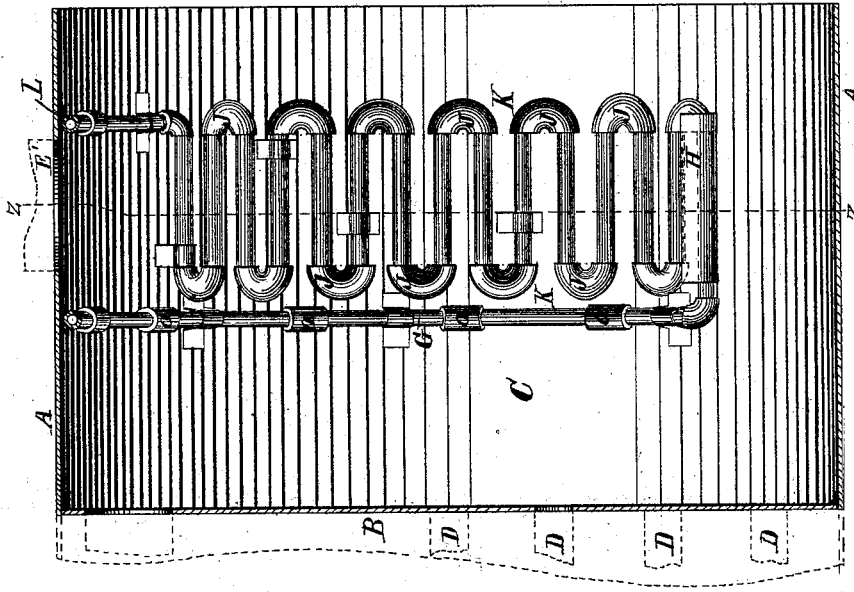


Fig. 3.

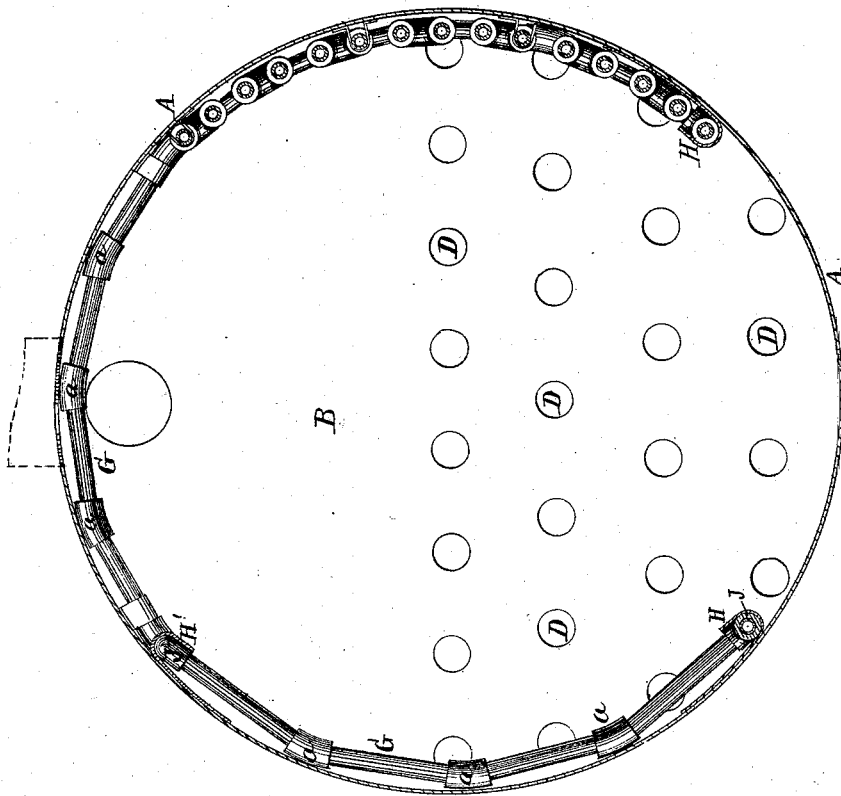


Fig. 4.

Witnesses:
E. A. Kemmerway
G. H. Dodd.

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UNITED STATES PATENT OFFICE.

THOMPSON H. IRWIN, OF DENNISON, OHIO, ASSIGNOR OF ONE-HALF HIS
RIGHT TO WILLIAM P. EDWARDS, OF SAME PLACE.

IMPROVEMENT IN FEED-WATER HEATERS FOR LOCOMOTIVES.

Specification forming part of Letters Patent No. **203,158**, dated April 30, 1878; application filed
March 9, 1878.

To all whom it may concern:

Be it known that I, THOMPSON H. IRWIN, of Dennison, in the county of Tuscarawas and State of Ohio, have invented certain new and useful Improvements in Feed-Water Heaters for Locomotives, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to that class of feed-water heaters in which the waste-heat which ordinarily escapes through the smoke-stack is utilized for the purpose of heating the feed-water; and has for its object an increase in the area of the surface of the heater exposed to the action of the hot gases escaping through the smoke-box, whereby a greater proportion of the waste-heat is utilized, and the feed-water is consequently raised to a higher degree of temperature before entering the boiler; and also such a construction and arrangement of the heater that, while it is adapted to utilize the waste-heat to advantage, it shall not interfere with the ready cleaning of the boiler-tubes, or the necessary repairs of the exhaust-pipes or other devices contained within the smoke-box.

The invention consists in placing in the smoke-box of a boiler a coil of pipe, arranged about the outer circumference of the smoke-box in close proximity to the outer shell of the boiler, said pipe being alternately bent back and forth upon itself, so as to form a cluster of pipes parallel with each other, connected by semicircular bends, each of said bends and straight portions of pipe being equidistant from the shell of the smoke-box, one end of said cluster of pipes being connected to the feed-pump and the other end to the check-valve, in such a manner that the feed-water, after leaving the pump, is forced through the entire length of the heater-pipe within the smoke-box, traversing all of the bends and turns thereof, and exposed to the direct heat of the hot gases and products of combustion passing through said smoke-box, and is then discharged through the check-valve into the boiler.

My invention further consists in arranging said heater-pipe in two clusters upon opposite sides of the smoke-box, connected together by a pipe passing from one cluster to the other at or

near the top or bottom of the smoke-box, in such a manner that the feed-water, after traversing the entire length of the pipe forming the cluster upon one side, passes through the connecting-pipe, to and through the entire length of the pipe forming the cluster upon the other side of the smoke-box, and thence is discharged through the check-valve into the boiler.

My invention further consists in arranging the cluster or clusters of piping to form the feed-water heater within the smoke-box, in such a manner that the feed-water, in passing through the same, shall alternately pass and repass around or partially around the outer circumference of the smoke-box, as will be described.

Figure 1 of the drawings is a transverse section through the smoke-box of a locomotive-boiler on line *x x* on Fig. 2, looking toward the tube-sheet, and showing my improved feed-water heater applied thereto. Fig. 2 is a longitudinal section on line *y y* on Fig. 1, looking toward the left, and illustrating one method of arranging the pipes of the heater. Fig. 3 is a similar section on the same line, looking toward the right side of Fig. 1, and showing a modified arrangement of the heater-pipes in elevation; and Fig. 4 is a transverse section on line *z z* on Figs. 2 and 3, looking toward the tube-sheet.

A is the outer shell of the boiler, extending forward beyond the forward tube-sheet B, and forming the inclosing cylindrical walls of the smoke-box C, from which the hot gases or products of combustion, after passing through the tubes D D, escape through the opening E to the smoke-stack or chimney, a portion of which is shown in dotted lines at E'.

F is a pipe adapted to be coupled to the feed-pump, (not shown,) and extending therefrom, through the shell A, into the smoke-box C, where it is connected to a cluster of alternately descending and ascending pipes, G, arranged side by side, and curved to correspond nearly to the curve of the shell A of the smoke-box, in close proximity to which they are secured by the curved supports H and H' and straps I, said pipes being coupled at their ends by means of the semicircular pipe-couplings J, in such a manner as to virtually form one continuous pipe throughout the entire cluster or

coil, which, after several foldings back and forth, extends across the top or upper side of the smoke-box, and connects with a similar cluster or coil, K, upon the opposite side of the smoke-box; from which the pipe L, extending across the upper part of the smoke-box, leads through the shell A and connects with the check-valve. (Not shown in the drawings.)

The clusters or coils of heater-pipe may be made up of pipes bent to the curve of the boiler-shell A, or from short straight pipes and bent couplings *a a*, together with the semicircular couplings J, as shown in Fig. 2; or they may be made up of straight pipes arranged horizontally and connected by the semicircular couplings J, as shown in Fig. 3; and the cluster or coil may extend from the support H upon one side upward and across the top of the smoke-box and downward to the corresponding support H on the other side; or the heater-pipe may be arranged in two clusters or coils upon opposite sides of the smoke-box, as shown.

When the feed-pump is set in motion, water is forced through the pipe F, to and through all of the pipes G of the coil upon one side of the smoke-box, thence across the top of the smoke-box through the connecting-pipe, to and through the coil or cluster of pipes K upon the other side, and thence through the pipe L to and through the check-valve into the boiler.

I am aware that a coil of pipe has been placed in the smoke-box of a locomotive for the purpose of heating the feed-water before admitting it to the boiler; but, so far as my knowledge extends, such coils have always been arranged in the center of the smoke-box, directly in front of the tubes and surrounding the exhaust and petticoat pipes, and were objectionable in that they interfered with the cleaning of the tubes, and had to be removed whenever it became necessary to repair the exhaust or petticoat pipes; and, further, they were comparatively ineffective, for the reason that the area of the surface of the coils exposed to the action of the hot gases was too small.

I do not therefore claim, broadly, utilizing the waste-heat of the products of combustion for heating the feed-water for a boiler. Neither do I claim, broadly, placing a coil or cluster of pipes in the smoke-box of a boiler for the purpose of heating the feed-water by forcing it through said coil irrespective of the position and arrangement of said coil; but

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A cluster or coil of pipe arranged circumferentially within the smoke-box of a boiler, in close proximity to and with all of its folds or coils equidistant from and parallel, or nearly parallel, with the inclosing-shell of said smoke-box, the two ends of said pipe projecting through said shell, and adapted to connect at one end with the feed-pump, and at the other with the check-valve, all arranged and adapted to operate substantially as and for the purposes described.

2. A feed-water heater made up of two clusters or coils of pipe arranged upon opposite sides of the interior of the smoke-box of a boiler, with all of their folds or coils in close proximity to and parallel, or nearly parallel, to the cylindrical shell of said smoke-box, and connected together to form one continuous pipe, one end of which is adapted to connect with the feed-pump, and the other end to the check-valve, substantially as and for the purposes described.

3. A feed-water heater consisting of a cluster or coil of pipe, the several folds or coils of which extend circumferentially around, or partially around, the smoke-box, in close proximity to and parallel, or nearly parallel, to the inclosing-shell of said smoke-box, and adapted to be connected at one end to the feed-pump, and at the other to the check-valve, substantially as and for the purposes described.

Executed at Dennison, Ohio, on this 4th day of March, A. D. 1878.

THOMPSON H. IRWIN.

Witnesses:

J. W. RUSK,
JAMES NELSON.