(No Model.)

T. CLIFFORD.

WATER HEATER FOR BOILERS.

No. 347,772. Patented Aug. 24, 1886.

Fig. 1.

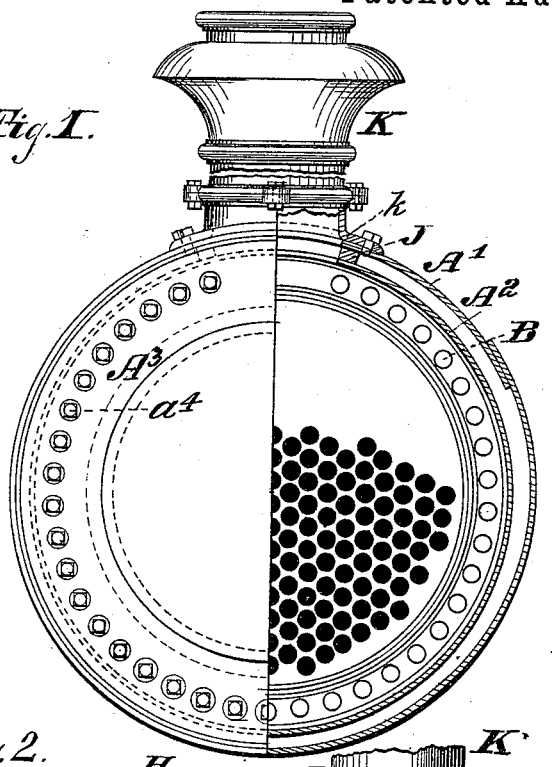
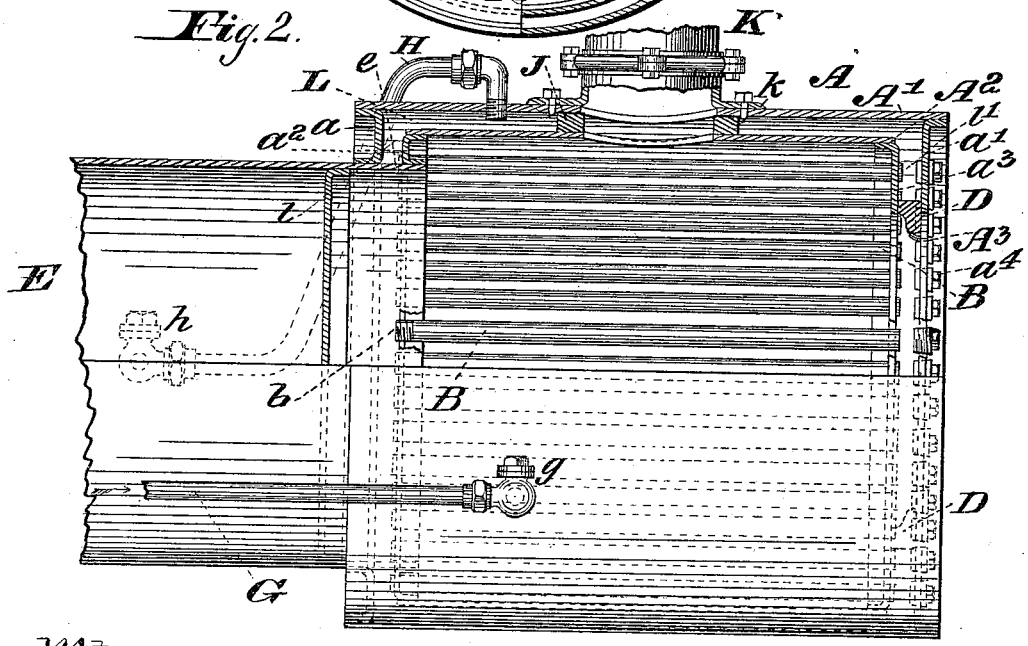


Fig. 2.



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UNITED STATES PATENT OFFICE.

THOMAS CLIFFORD, OF MOUNT SAVAGE, MARYLAND.

WATER-HEATER FOR BOILERS.

SPECIFICATION forming part of Letters Patent No. 347,772, dated August 24, 1886.

Application filed May 13, 1886. Serial No. 202,114. (No model.)

To all whom it may concern:

Be it known that I, THOMAS CLIFFORD, a citizen of the United States, residing in Mount Savage, in the county of Alleghany and State of Maryland, have invented certain new and useful Improvements in Water-Heaters for Locomotive-Boilers, of which the following is a description.

The invention consists in certain novel parts and combinations of parts, in connection with a steam-boiler and its smoke-box, whereby the heat contained in the escaping volatile products of combustion is effectively utilized in heating water preparatory to the discharge of the same into the boiler.

In the drawings, Figure 1 is partly a perspective and partly a transverse sectional view of a locomotive-engine boiler in which my improvements are applied. Fig. 2 is a longitudinal central section on the line *x x* of Fig. 1.

Within the shell A′ of the smoke-box A are fitted the annular heads *a* and *a′*, the head *a* encircling the prolongation *e* of the boiler E, and the head *a′* abutting against the ring D. Concentric with the shell A′ is the inner cylinder, A^2, which is provided with the annular head a^2, which closes the space between the body of the cylinder and the exterior face of the prolongation *e* of the boiler, and which is provided also with the interior annular flange, a^3, which is joined at its outer periphery to the cylinder and at its inner edge to the rear face of the ring D. The head a^2 is provided with a series of tapped openings to receive the inner threaded end, *b*, of the water-tubes B, the opposite extremities of such tubes being received within a corresponding series of openings formed in the head or flange a^3. The head or outer plate, A^3, of the smoke-box is provided with tapped openings for the insertion or removal of the water-tubes B, and for the insertion of a flue-cleaner when it becomes necessary to remove accumulations of sedimentary matter, such openings being normally closed by screw-nuts a^4. A ring, J, at the base *k* of the smoke-stack K, and between such base and the cylinder A^2, constitutes an extension downward of the smoke-stack, and completes the jacket or water-heater L.

At a suitable point near the base of the jacket or water-chamber L, a cold-water-induction pipe, G, is introduced, the inflow through such pipe being controlled by a check-valve, *g*. Water being supplied by means of this pipe G, circulates rapidly through the water-tubes B and through the flange-like pockets *l* and *l′* of the water-chamber or jacket L, and being quickly heated by the escaping products of combustion, which, entering from the boiler-flues, thoroughly envelop the water-tubes and the interior surface of the water-jacket, is discharged at the top of the water-jacket through the hot-water pipe H, into the interior of the boiler E, such discharge being regulated by the check-valve *h*.

In some cases it may be desirable not to extend the jacket entirely across the bottom of the smoke-box, that portion of the same being much less highly heated than the upper and side portions. I prefer, however, the construction which I have shown and described, as presenting an effective means for utilizing the waste heat of the products of combustion.

Having described my invention, I claim—

1. The combination, with a smoke-box, of an encircling water-jacket provided with inwardly-extending pockets, and with longitudinal water-tubes extending through the smoke-space, and connecting the inwardly-extending pockets, substantially as and for the purposes described.

2. A smoke-box which is provided with an exterior longitudinal water-chamber which encircles the sides and partially incloses the ends of such smoke-box, and which has longitudinal water-tubes which extend across the path of the escaping products of combustion, and which connect the oppositely-placed inclosing end portions of the water-chamber.

3. The combination, with a smoke-box, of an encircling water-chamber which has inwardly-extending oppositely-placed end portions, and water-tubes which connect such end portions, and an end plate or head which is provided with orifices which are coincident with the water-tubes, and with screw-nuts for closing such orifices.

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