

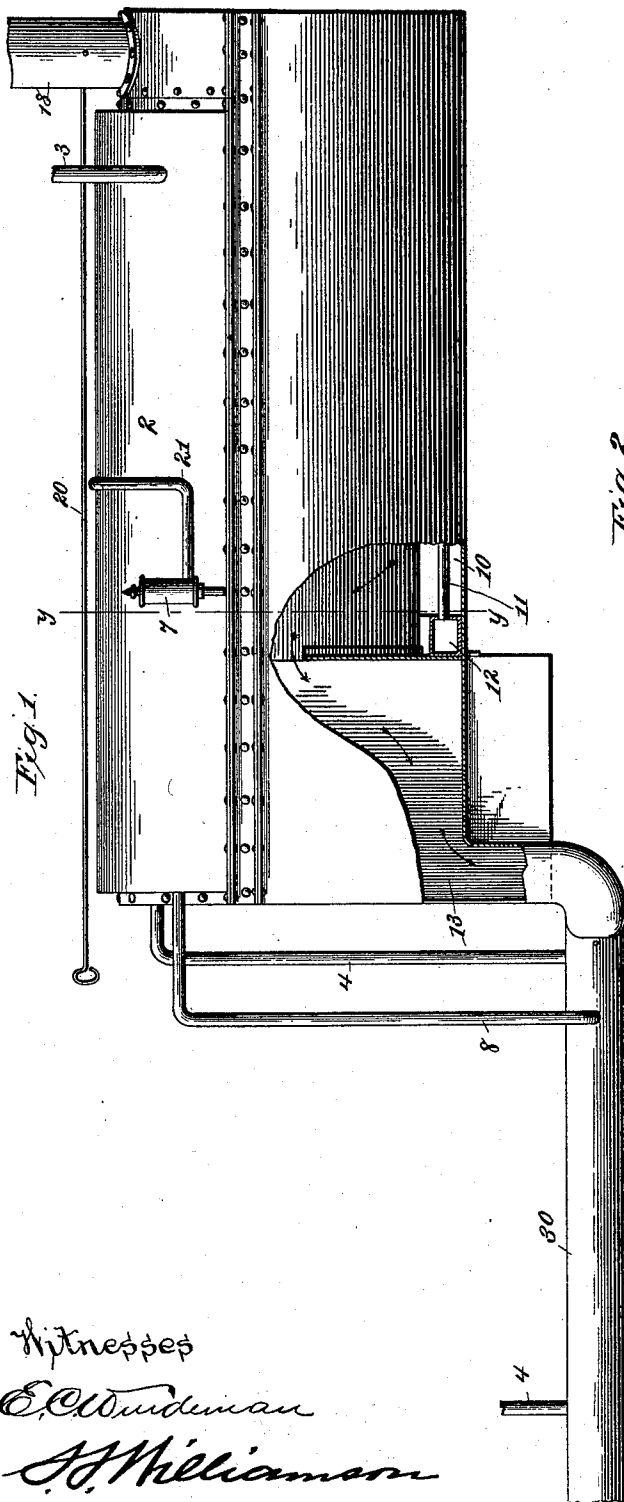
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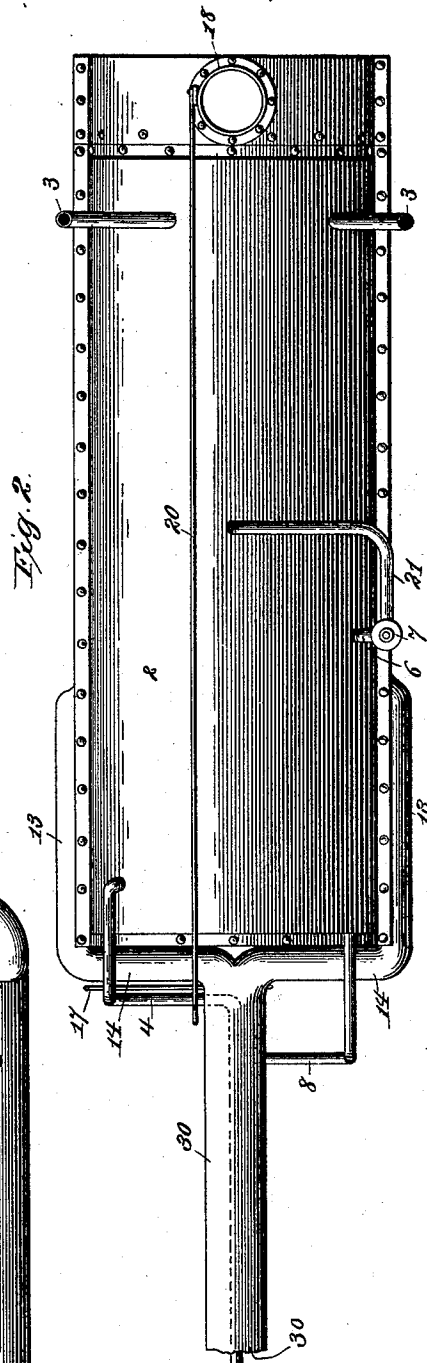
E. INGRAHAM.
LOCOMOTIVE OR OTHER BOILER.

No. 578,674.

Patented Mar. 9, 1897.



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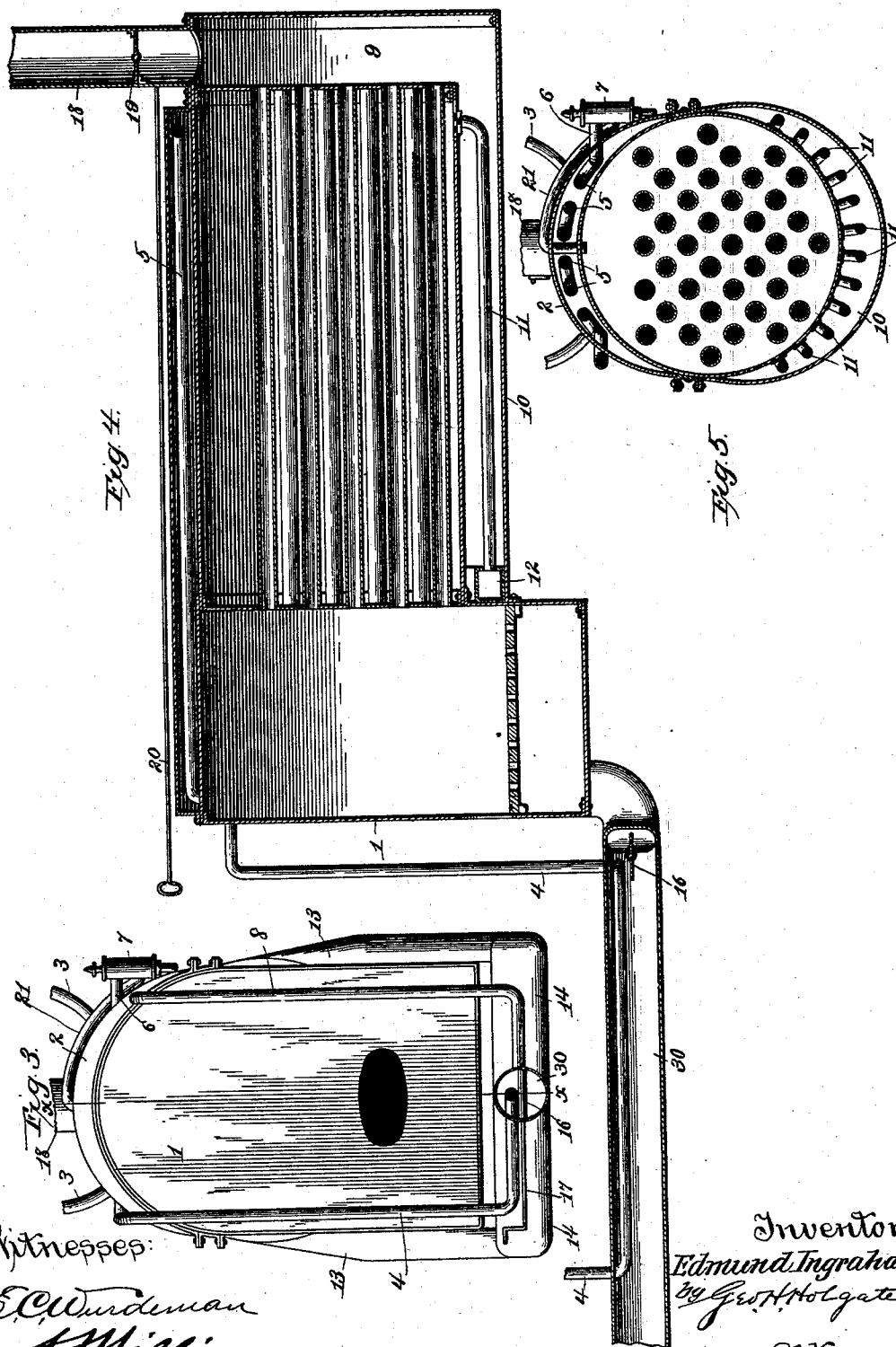
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UNITED STATES PATENT OFFICE.

EDMUND INGRAHAM, OF PHILADELPHIA, PENNSYLVANIA.

LOCOMOTIVE OR OTHER BOILER.

SPECIFICATION forming part of Letters Patent No. 578,674, dated March 9, 1897.

Application filed June 22, 1896. Serial No. 596,441. (No model.)

To all whom it may concern:

Be it known that I, EDMUND INGRAHAM, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Locomotive or other Boilers, of which the following is a specification.

This invention relates to a new and useful improvement in locomotive and other boilers, and has for its object to provide devices for such boilers whereby the feeding-water will be heated in its passage from the tender to the injector or pump, and also to increase the surface exposed to the heating products of combustion before the latter are expelled to the air without in any way interfering with the draft or increasing the combustion of fuel.

With these ends in view this invention consists in the details of construction and combination of elements hereinafter set forth, and then specifically designated by the claims.

In order that those skilled in the art to which this invention appertains may understand how to make and use the same, its construction and operation will now be described in detail, referring to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a side elevation of a boiler built in accordance with this improvement; Fig. 2, a plan view of the same; Fig. 3, a rear view; Fig. 4, a section at the line *x x* of Fig. 3, and Fig. 5 a section at the line *y y* of Fig. 1.

Referring to the drawings in detail, 1 represents the boiler proper, which may be of the usual construction used for locomotives, and the upper portion thereof is inclosed by a casing 2, which forms a jacket, into which the exhaust-steam may be admitted when leaving the cylinders by means of the pipes 3. To this jacket is led the pipe 4, which is then connected to the coil of pipe 5, running back and forth within the jacket, thereby exposing a large amount of surface to the interior thereof, and the opposite end of this coil is connected by the pipe 6 to the injector or pump 7, by means of which the feed-water is forced within the boiler in the usual manner, so that it will be seen that when the exhaust is admitted to the coil-chamber formed by the jacket 2 the heat therein will be absorbed by the coil and in turn transmitted to the feed-

water within said coil, thus raising the temperature of said water, and, as is well understood, this will greatly increase the steam capacity of a boiler consuming a given amount of fuel. The exhaust after gaining access to the interior of the jacket 2 is led therefrom by the pipe 8, which latter may thereafter pass rearward through the pipe 30 to the water-tank within the tender, thereby imparting a certain amount of heat to the water within said tank and from thence to the several cars of the train and be utilized for heating purposes in the well-known manner.

The advantage gained by the exhausting of the steam within a coil and leading it through the water-tank and to the cars for heating purposes is that a large amount of heat is absorbed therefrom by which the steam is condensed, thus relieving the pistons working within the cylinders of the back pressure, which is incident to the exhausting of the steam from said cylinders to the atmosphere, as it will be readily understood that the coil and pipes leading therefrom will act as a partial condenser; and another advantage is that the exhaust having no direct communication with the draft the latter may be better regulated and caused to act more uniformly upon the fire than would otherwise be the case; also, since the exhaust is projecting horizontally from the cylinders instead of vertically within the smoke chamber and stack less wear and tear is had upon these parts of the locomotive.

The smoke-chamber 9 is connected with the interior of the jacket 10, which latter surrounds the lower portion of the boiler from the front end thereof to the fire-box, and within this jacket is located a series of pipes 11, having upturned ends, which are connected with the lower portion of the boiler, their opposite ends being connected to the receiving-tank 12, said tank being placed against the forward wall of the fire-box, as clearly shown in Fig. 4. A passage-way 13 is located upon each side of the fire-box and passing rearward from the jacket 10 connects with the pipes 14, the latter merging into the pipe 30, and this pipe extends rearward beneath the tender, after which it may open to the atmosphere or connect with a series of pipes for heating the train. A damper

16 is located in the pipe 30, so as to regulate the passage therethrough, and is under the control of the hand-rod 17, which extends within easy reach of the locomotive-driver. The smoke-stack 18 is also provided with a damper 19, having a hand-rod 20 leading therefrom, so that either the draft may be forced through the smoke-stack or through the jacket 10 and pipe 30, from which it will be seen that after the fire has gained proper headway and the locomotive is in motion the damper 19 may be closed and the damper 16 opened, which will cause the heated products of combustion from the tubes to pass through the jacket 10, thereby heating the water which may be contained within the tubes 11, which will bring about a circulation within said tubes and the receiving-tank 12, causing said water to flow upward within the boiler, where it will be further heated in the generation of steam.

In order that a further circulation may be had within the receiving-tank 12 and the tubes 11, the pipe 21, which leads from the injector or pump, may pass to this tank, in which case the feed-water will be still further heated by the action of the heated products of combustion upon the tubes 11 and tank 12 before reaching the boiler, and when my improvement is properly proportioned relative to the capacity of the boiler the water before reaching said boiler will be raised above the steaming-point.

When the locomotive is in motion or upon the starting of the fire in the fire-box, the damper 19 is opened and the damper 16 closed in order that the proper draft may be had.

By leading the smoke and cinders from the smoke-chamber rearward beneath the cars it is obvious that the discomfort which has heretofore been imposed upon the passengers will be obviated, and it will therefore be possible to use double-deck cars for surface traffic, and also the liability of forest fires will be reduced, since the cinders will be compelled to pass through a considerable length of pipe, causing them to be cooled below a point where they could ignite surrounding objects before being admitted to the atmosphere, and this will also decrease the liability of a train be-

coming fired should it be derailed or meet with other accident.

Having thus fully described my invention, what I claim as new and useful is—

1. In combination with a boiler, a jacket inclosing the upper portion thereof, a coil of pipe arranged within the jacket, a feed-water pipe leading to the coil, a pipe leading from the coil to the injector or pump, a jacket inclosing the lower portion of the boiler, a series of pipes connected with the lower portion thereof, and a receiving-tank to which the opposite ends of the pipes are connected, substantially as described.

2. In combination with a boiler, jackets inclosing the upper and lower portions thereof, a series of pipes connected to the lower part of the boiler, a tank lying on the lower jacket to which the pipes are connected, a coil of pipes arranged within the jacket, a feed-water pipe, a pipe connection between the coil and injection-pump, and pipe connections for carrying the exhaust from the jacket, substantially as described.

3. The herein-described combination of a boiler, a jacket inclosing the upper portion thereof, a jacket inclosing the lower portion thereof, a coil of pipe arranged within the first-named jacket, a feed-water pipe leading to said coil, a pipe leading from said coil to the injector or pump, a series of pipes arranged within the lower jacket, said pipes being connected with the boiler, a tank also located within said jacket with which the opposite ends of the pipes 11 are connected, passage-ways 13 leading from the lower jacket, pipes 14 leading from said passage-ways, and a pipe 15 with which the last-named pipes are connected and through which the feed-water pipe passes, substantially as and for the purposes set forth.

In testimony whereof I have hereunto affixed my signature in the presence of two subscribing witnesses.

EDMUND INGRAHAM.

Witnesses:

F. MATTNER,
MARK BUFORD.