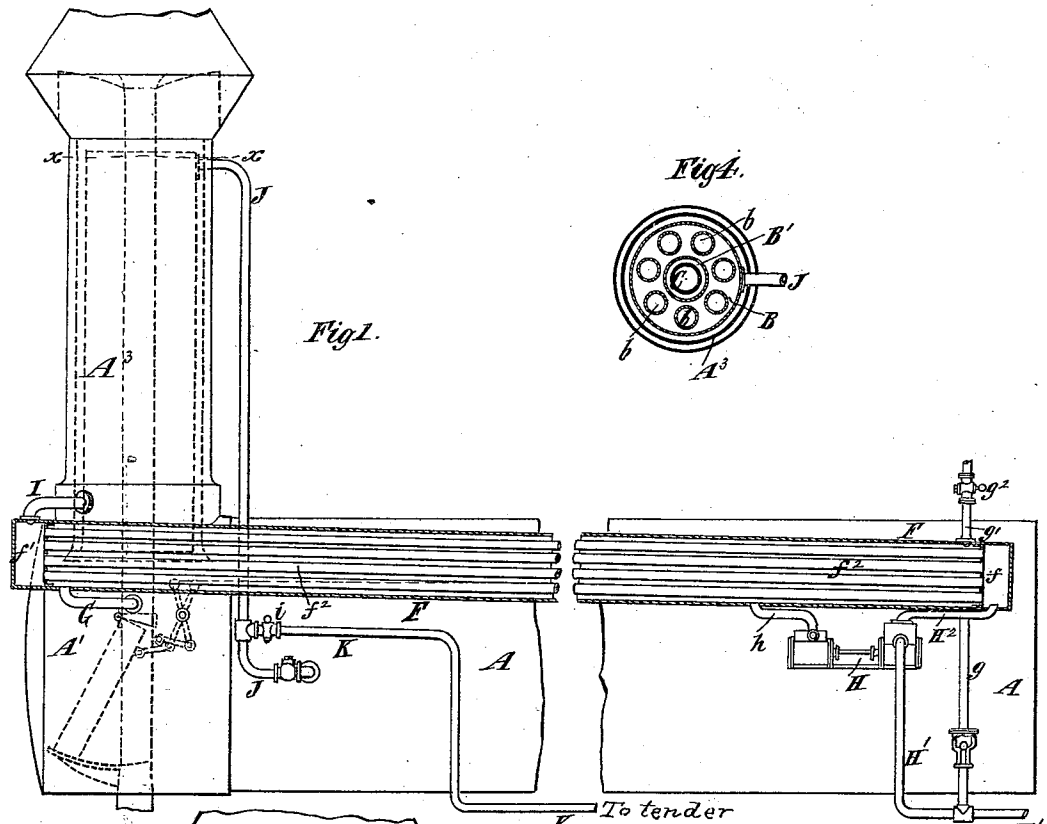
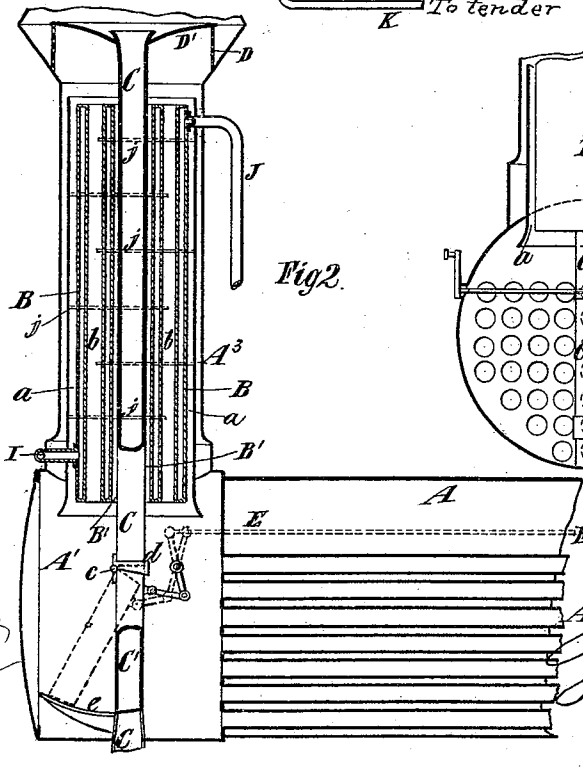
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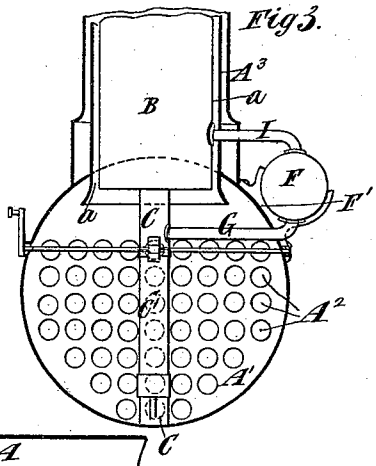
J. L. KRAUSER.

FEED WATER HEATER.

No. 265,425. Patented Oct. 3, 1882.







Witnesses
Jno Haynes
Ed. Moran

Inventor
John L. Krauser
by his Attorneys
Brown & Brown

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

JOHN L. KRAUSER, OF TYLERSBURG, PENNSYLVANIA.

FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 265,425, dated October 3, 1882.

Application filed March 17, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOHN L. KRAUSER, of Tylersburg, in the county of Clarion and State of Pennsylvania, have invented certain new and useful Improvements in Feed-Water Heaters for Locomotives, of which the following is a specification.

An important object of my invention is to provide a more desirable arrangement for heating the feed-water for locomotives by the heat of the escaping products of combustion as they pass through the smoke-stack; also, to prevent the exhaust-steam, which is employed to produce a draft, and which is of a lower temperature than the escaping products of combustion, from coming in contact with the heater, which is in the smoke-stack, and thereby retarding the heating of the water by the products of combustion.

A further object of my invention is to provide for primarily heating the feed-water by a portion of the exhaust-steam from a locomotive, and for subsequently still further heating the water by the escaping products of combustion unmingled with steam as they pass through the smoke-stack.

To this end the invention consists in the combination, with a locomotive-boiler and a heater arranged in the smoke-stack thereof, of a blast-pipe extending upward through or past the heater for preventing the exhaust-steam from coming in contact with the heater.

The invention also consists in the combination, with the above, of a valve in the blast-pipe in the smoke-box of the boiler, which may be opened by the engineer to deliver the exhaust-steam into the smoke-box, from which it may pass through the heater temporarily when it is desired to clean the surfaces thereof. This valve may consist of a section of the blast-pipe hinged at one end, so that its opposite end may be swung out of line with the portion of the pipe against which it abuts in use, whereby the continuity of the pipe is broken and the exhaust-steam delivered directly into the smoke-box.

The invention also consists in a combination, with a locomotive-boiler and a feed-water heater therefor, of pipes for delivering water to and delivering the heated water from said heater, and a pipe connected with said delivery-pipe and provided with a valve, whereby provision is afforded for delivering the heated water into the tender-tank when not required for the boiler, and freezing in severe weather is prevented.

The invention also consists in the combination, with a locomotive-boiler, of a heater and pipes for supplying exhaust-steam and cold water thereto, a second heater arranged in the smoke-stack, and a pipe for conducting feed-water after it has been preliminarily heated in the steam-heater to the heater in the smoke-stack, where it is finally heated by the products of combustion, whereby it is raised nearly to the temperature of the water in the boiler. A portion of the exhaust is used for the steam-heater and the remainder for creating a blast.

In the accompanying drawings, Figure 1 represents a side elevation of the principal portion of a locomotive-boiler and sectional view of a heater combined therewith according to my invention. Fig. 2 represents a longitudinal section of the smoke-box and smoke-stack and adjacent parts of the boiler. Fig. 3 represents an end view thereof, partly in section; and Fig. 4 represents a horizontal section through the smoke-stack and heater on the dotted line *x x*, Fig. 2.

Similar letters of reference designate corresponding parts in all the figures.

A designates a locomotive-boiler, which may be of any ordinary construction, and the front or fire-box portion of which is omitted, as no part of my invention relates thereto.

A′ designates the smoke-box of the boiler, A^2 designates the fire-tubes, and A^3 designates the smoke-stack, all of which parts are the same as in other locomotive-boilers.

B designates a cylindric heater, which is arranged in the smoke-stack A^3, and which is enough smaller in diameter than said stack to leave an annular space, *a*, between the two. The heater is provided with a number of tubes, *b*, extending from end to end, and ample provision is afforded for the escape of the waste products of combustion from the smoke-box A′ through the annular space *a* and tubes *b*. The arrangement of the tubes *b* is shown in Fig. 3.

C designates the blast-pipe, which extends upward through the smoke-box A′, and the

heater B is provided with a central passage, B′, through which the blast-pipe C passes, whereby the exhaust-steam is prevented from coming in contact with the heater. In the top of the smoke-stack A^3, and above the heater B, is a circular screen, D, which, with the deflector D′, forms the ordinary spark-arrester, and the blast-pipe C terminates above the deflector D′, as shown clearly in Fig. 1. A section, C′, of the pipe C in the smoke-box A′ is hinged at *c* at its upper end, and is free at the lower end, so that it may be swung out of line with the abutting section of the pipe when desirable. The continuity of the pipe is thereby broken, and the exhaust-steam is delivered into the smoke-box and passes upward through the annular space *a* and tubes *b* of the heater B. By this means I provide for cleaning the exposed surfaces of the heater when desired. The section C′ of pipe may be swung out into the position shown in dotted lines in Fig. 2 by means of a rod, E, which may be operated by the engineer in the cab, and I may provide a shield or guard-plate, *d*, at the hinged joint *c*, which partly closes the open joint. I also provide a curved plate, *e*, adjacent to the lower end of the section C′, and when the section is swung out its lower end moves upon said plate and is partially closed. I consider the hinged section C′ as one form of valve, and the pipe C might be provided with a valve of any other suitable form in lieu thereof.

F designates a cylindric tubular heater supported by brackets F′ on the outside of the boiler, and constructed with water-chambers *f f′* at the ends connected by tubes f^2.

G designates a branch pipe, leading from the blast-pipe C, and serving to conduct a part of the exhaust-steam to the body of the heater F. The heater is represented as inclined slightly toward the front end of the boiler, and all the water of condensation is delivered through a pipe, *g*, while any steam remaining uncondensed may escape from the heater through a pipe, *g′*, under control of a valve, g^2.

Water may be forced through the heater F by means of the ordinary feed-pump worked from the cross-head of the engine; but I have here represented a steam-pump, H, which may be of any suitable construction.

H′ designates the suction-pipe leading from the tender-tank, and H^2 designates the discharge-pipe through which the cold water is delivered to the water-chamber *f* of the heater F. The exhaust-steam from the pump may be delivered through an exhaust-pipe, *h*, into the body of the heater F to aid in heating the water, and the water of condensation may be delivered through the pipe *g* into the suction-pipe H′ of the pump, as shown in Fig. 1. The feed-water, after being subjected to a preliminary heating in the heater F, is conducted from the water-chamber *f′* through a pipe, I, to the lower end of the heater B, and in rising to the top thereof is gradually heated to a still higher temperature, and as the temperature of the escaping products of combustion is probably as high or higher than that of the water in the boiler the feed-water is raised to a temperature nearly or quite equal to that of the water in the boiler. The heated water escapes from the top of the heater B through a pipe, J, through which water is delivered to the boiler, and I may connect the said delivery-pipe with the tender-tank by a pipe, K, under control of a valve, *i*. When the locomotive is standing still and but little feed-water is required the valve *i* may be opened and the heated water delivered directly into the tender-tank, whereby the water therein is prevented from freezing in severe weather.

The efficiency of the heater B may be increased by dividing the body by means of transverse diaphragms *j*, extending alternately from opposite sides nearly across, as shown by dotted lines in Fig. 2.

In lieu of the two heaters B F being cylindric and tubular, they may be of any other desirable construction.

By my invention I provide for raising the feed-water to a high temperature before it enters the boiler, and thereby effect an economy of fuel, and I also provide for preventing the freezing of the water in the tender, which is a source of difficulty in cold weather.

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

1. The combination, with a locomotive-boiler and a feed-water heater arranged in the smoke-stack thereof, of a blast-pipe extending upward through or past said heater for preventing exhaust-steam from coming in contact with the heater, substantially as specified.

2. The combination, with a locomotive-boiler and a feed-water heater arranged in the smoke-stack thereof, of a blast-pipe extending through the smoke-box upward through or past the heater, and a valve in said pipe for admitting exhaust-steam to the smoke-box when it is desired to pass it through the heater, substantially as specified.

3. The combination, with the smoke-box A′ and smoke-stack A^3 of a locomotive-boiler, of the heater B and the pipe C, comprising the hinged section C′, substantially as specified.

4. The combination, with the boiler, of a heater arranged in the smoke-stack, a blast-pipe extending through or past the heater and receiving a portion of the exhaust-steam, a steam-heater through which water may be passed before it enters the heater in the smoke-stack, and a branch pipe for conducting a portion of the exhaust-steam to said steam-heater, substantially as specified.

5. The combination, with the smoke-box A′ and smoke-stack A^3 of a locomotive-boiler, of the heater B, the pipe C, comprising the hinged section C′, and the plate *e* for closing the end of said section, substantially as specified.

6. The combination, with a locomotive-boiler, of a feed-water heater arranged in the smoke-stack thereof, a delivery-pipe for conducting

heated water therefrom, and a pipe connecting the delivery-pipe with the tender-tank to provide for discharging the heated water into said tank, substantially as specified.

7. The combination, with a locomotive-boiler, of a heater and pipes for supplying exhaust-steam and cold water thereto, a second heater arranged in the smoke-stack, and a pipe for conducting water after passing through the steam-heater to the heater in the smoke-stack, substantially as specified.

JOHN L. KRAUSER.

Witnesses:
J. C. FRITZ,
CYRUS KRAUSER.