

No. 606,958.

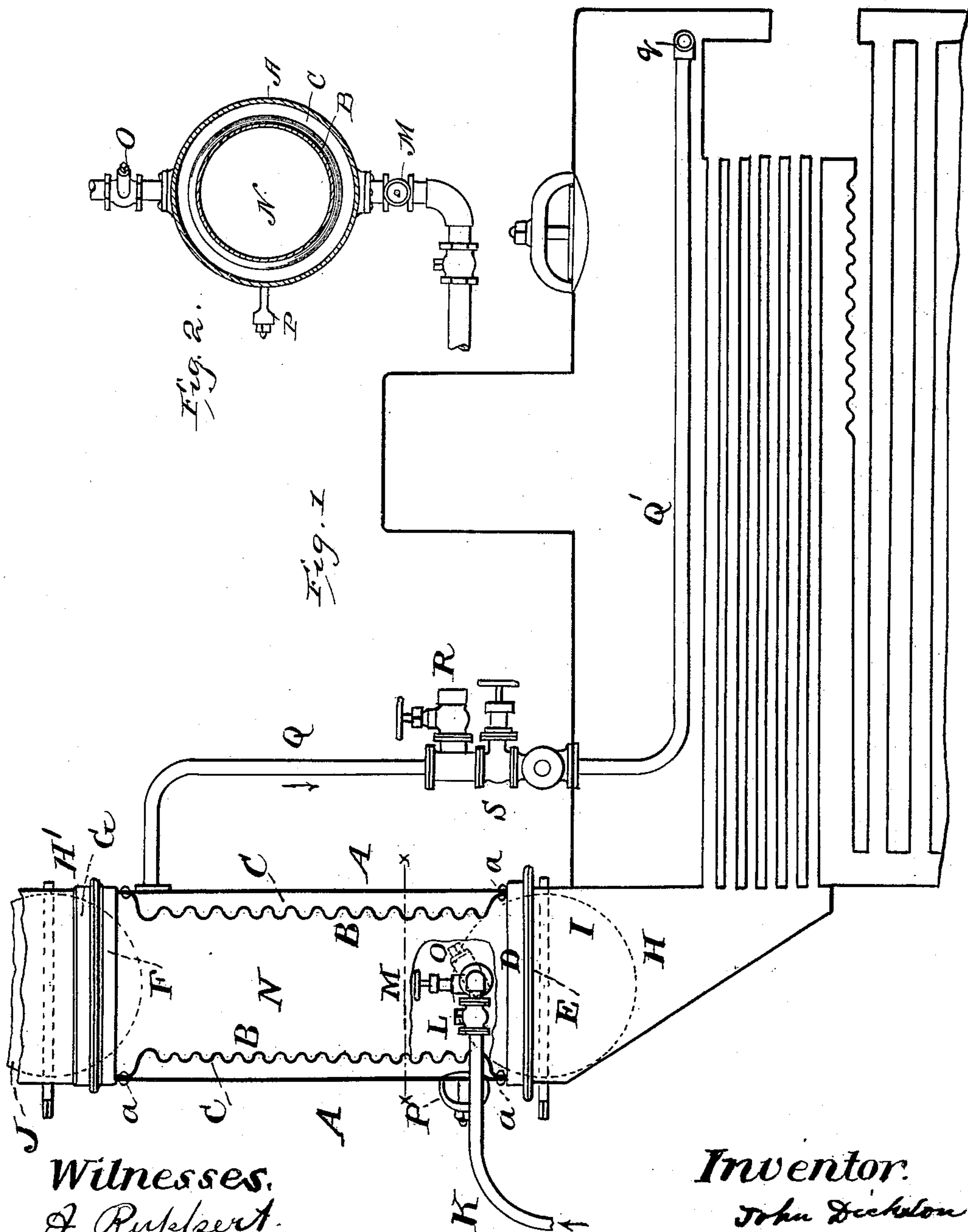
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J. DICKSON.

FEED WATER HEATER FOR STEAM BOILERS.

(Application filed Apr. 16, 1896.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

JOHN DICKSON, OF NEW YORK, N. Y.

## FEED-WATER HEATER FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 606,958, dated July 5, 1898.

Application filed April 16, 1896. Serial No. 587,826. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN DICKSON, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Feed-Water Heaters for Steam-Boilers; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in feed-water heaters for steam-boilers of that class known as "direct" heaters, arranged to be exposed or subjected to the escaping heat and products of combustion from the boiler to the smoke-stack, as distinguished from heaters of that kind which utilize the exhaust-steam from an engine.

It is well established that in feed-water heaters equipped with appliances for heating by exhaust-steam the water cannot be raised to a temperature exceeding 212° Fahrenheit; but with the other class of heaters, which utilize the direct application of waste heat and gases from a furnace, the temperature of the feed-water can be raised economically to a much higher degree of heat than is the case with exhaust-steam heaters.

The object of my invention is the provision of a direct-acting feed-water heater in which the parts are of simple construction and of compact disposition to maintain the feed-water in a thin sheet around the smoke-exit flue or passage.

A further object of the invention is to provide in a feed-water heater a shell which serves the twofold purpose of the smoke-flue and one of the walls of the feed-water heater, which shell is constructed in a novel way to provide for expansion and contraction under the influence of the hot gases and smoke which escape from the furnace, said shell being united to the outside shell of the feed-water heater to secure thoroughly tight joints and reduce to a minimum the liability of leakage between the elements of the feed-water heater.

A further object of my invention is to pro-

vide means for readily cleansing the water-chamber from mud and sediment which may accumulate therein, as well as to allow access to the interior of said chamber for scraping the scale from the walls of the heater.

To the accomplishment of these ends my invention consists in the novel combination of devices and in the construction and arrangement of parts, which will be hereinafter fully described and claimed.

To enable others to understand my invention, I have illustrated the preferred embodiment of the same in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a longitudinal sectional elevation through a boiler with my improved feed-water heater applied thereto. Fig. 2 is a transverse horizontal sectional view on the plane indicated by the dotted line *xx* of Fig. 1, looking in the direction indicated by the arrow.

Referring by letter to the drawings, H indicates the smoke-box or uptake which receives the products of combustion from the flues of the steam-boiler, and H' is the stack.

Between the smoke-box or uptake and the stack I apply my feed-water heater, which, as shown, consists of the shells A B and the appliances for supplying water to the heater and from the heater to the boiler, and for removing the sediment from the heater, and for controlling the draft through the stack.

The shell B is arranged within the shell A, substantially concentric therewith, to provide the water-chamber C for my feed-water heater, and the inner shell B is open at top and bottom and arranged in alinement with the smoke box and stack, so as to constitute the smoke-flue N, through which the products of combustion pass from the uptake H to the stack H'. This inner shell B thus serves a twofold purpose. First, it forms one of the walls of the feed-heater, and, second, it is a part of the smoke-conduit. As the products of combustion, including smoke, waste heat, and gases, escaping directly from a furnace are of high temperature and as the inner shell is exposed directly to the action of such hot waste heat and products of combustion, as well as of the cold water admitted to the chamber C of the heater, it is subject to



expansion and contraction to a great extent. To reduce to a minimum the influences of these elements on the inner shell, as well as to overcome the tendency of the inner shell to warp and produce leaky joints at the lines where the two shells are united, I construct this inner shell with a series of transverse circumferential corrugations, as shown by the drawings. The upper and lower ends of the corrugated inner shell are flanged, as at *b*, and they are extended or carried toward the shell A, the two shells being united together directly in a substantial manner to secure tight joints between said parts—as, for instance, by riveting the shells, as indicated at *a* in the drawings.

The outer shell A is of cylindrical form preferably, and it is united to the smoke-box or uptake and to the stack by means of the coupling-rings E F. These couplings may be of any preferred construction, and they are united to the heater-shell A, the smoke-box, and the stack in a secure manner.

The cold feed-water is supplied to the chamber C of the heater by an inlet-pipe K, connected to the feed-pump, and this pipe has the check-valve L and the controlling-cock M, said inlet-pipe entering the chamber C near or at its lower end. The hot water from the heater is conducted to the boiler through an outlet-pipe Q, one end of which is attached to the heater-shell A near the upper part thereof. The outlet-pipe is connected to a discharge-pipe Q', which is arranged in a horizontal position within the boiler, and it carries a sprayer *q* at its free end for distributing the hot water in the form of a spray into the boiler. The hot-water pipe has the controlling-valve S and a blow-off valve R; but it does not contain an intermediate check-valve between the heater and boiler, thus making the feed-water pipes and the boiler-spaces practically continuous, as there is free communication between them when the valve S is open, whereby the sudden injection of feed-water in large quantities is overcome.

The heater is equipped with a blow-off pipe O, which is connected to the shell A on the plane of the valved end of the inlet-pipe, said pipe O arranged opposite to the valves L M, as shown by Fig. 2, for the purpose of forcing out of the heater the mud and sediment which may accumulate in the chamber C.

A hand-hole plate P is attached to the lower end of the heater-shell A to permit of access to the interior of the chamber C for the purpose of scraping off the scales and sedi-

ment which cannot be blown out of said chamber.

The heater C may be washed out by pressure from a water-main by opening the blow-off cock and valve R, the valve S being closed, and the pipe Q and cock R may also be used to charge water into the heater after it has been washed out.

I J designate dampers fitted in the smoke-box and in the stack, respectively, for the purpose of controlling the draft through the heater and stack, and consequently through the boiler-furnace. The lower damper is to be closed when the furnace fires are banked; but when the boiler is in service both dampers should be opened.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with the smoke-stack of a boiler, and a shell arranged within said stack and forming therewith an annular heating-chamber, a cold-water feed-pipe having a valved discharge end coupled to the stack to communicate with the annular chamber thereof, a valved blow-off pipe coupled to the stack at a point opposite to the connection thereto of the feed-pipe, and an off-bearing pipe connected to the upper part of the annular heating-chamber and leading to a boiler, substantially as described.

2. The combination with a smoke-stack of a boiler, of a corrugated shell situated within said stack to form therein an inner smoke-flue and having flanges at its ends which are united directly to said stack to form therewith an annular chamber, the valved inlet-pipe coupled to the stack at the lower part of the chamber, a valved blow-off pipe also coupled to the stack and communicating with the annular chamber at a point opposite to the inlet-pipe, smoke-dampers situated in the stack on opposite sides of the inner shell, and a feed-pipe coupled to the stack to communicate with the annular chamber near its upper end and leading in the steam-space of the boiler, said feed-pipe being unvalved and serving to establish full communication between the annular chamber and the boiler, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN DICKSON.

Witnesses:

JOS. B. CORWIN,  
JOHN WALLACE.