

(No Model.)

3 Sheets—Sheet 1.

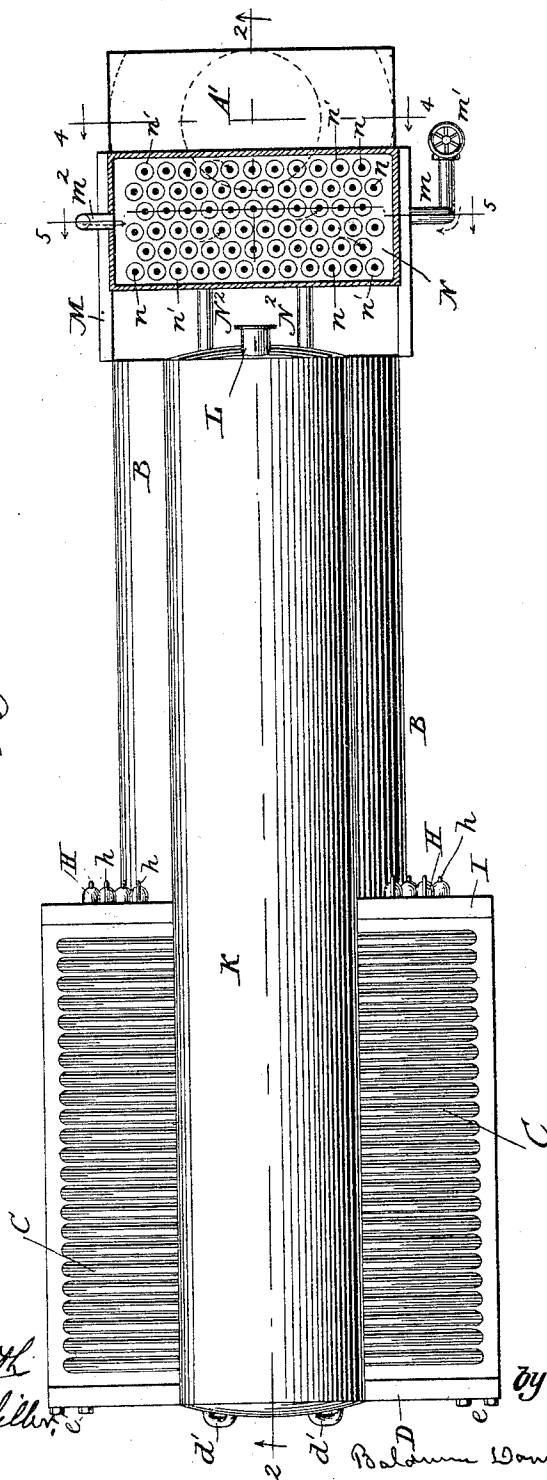
J. BAIRD.

FEED WATER HEATER FOR STEAM BOILERS.

No. 460,839.

Patented Oct. 6, 1891.

Fig. 1.



Witnesses

Samuel P. Huntington
R. Washington Miller

Inventor

JOHN BAIRD
by his attorneys

Baldwin, Bondson & Wright

(No Model.)

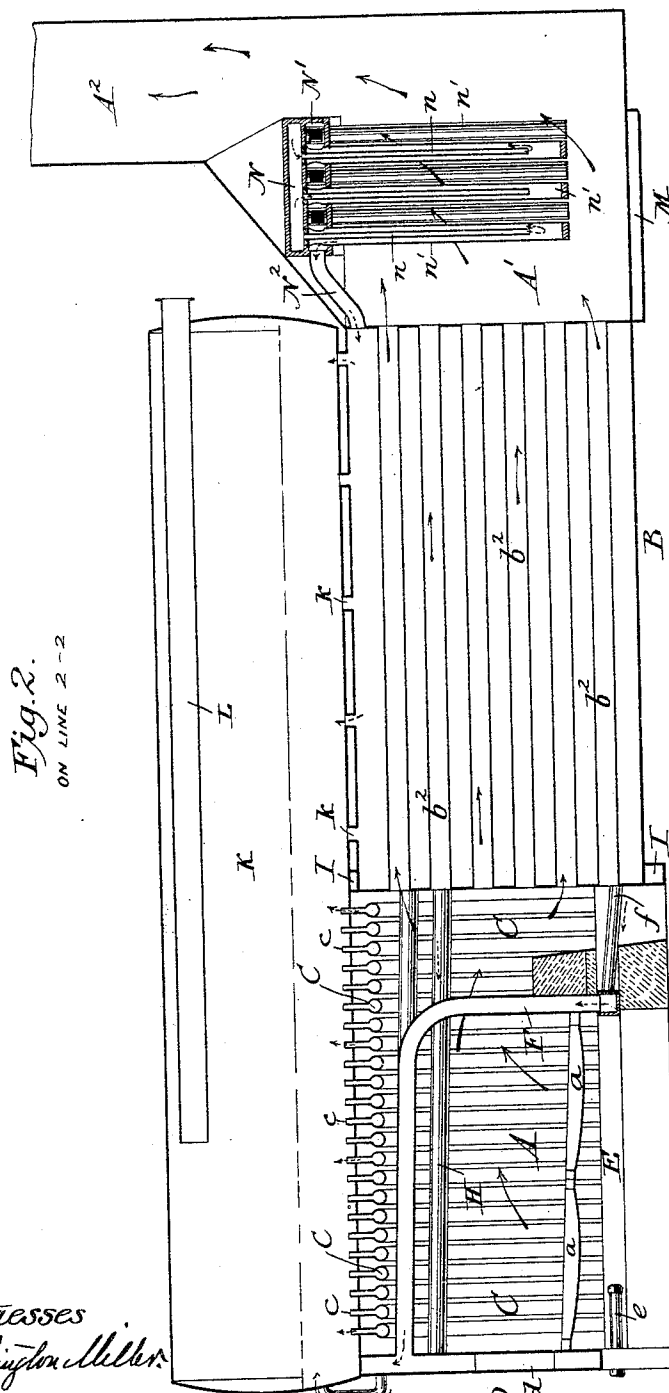
3 Sheets—Sheet 2.

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FEED WATER HEATER FOR STEAM BOILERS.

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Patented Oct. 6, 1891.



Witnesses
B. Washington Miller

Sidney P. Hollingsworth

Inventor
JOHN BAIRD
by his attorneys

Baldwin Davidson & Wright.

J. BAIRD.

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Fig. 5.
ON LINE 5-5

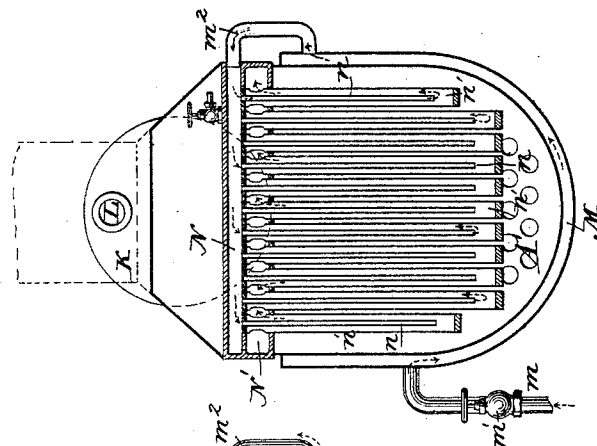


Fig. 4.
ON LINE 4-4

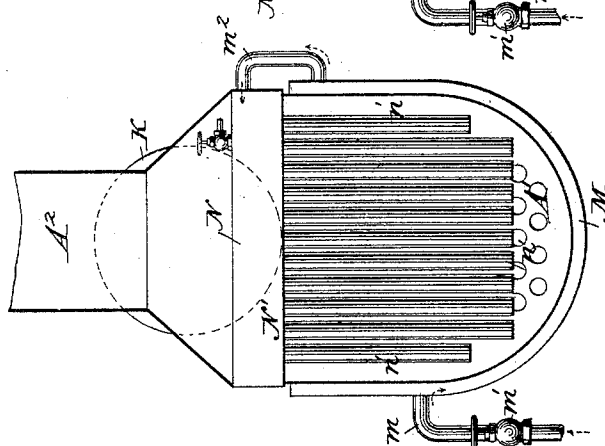
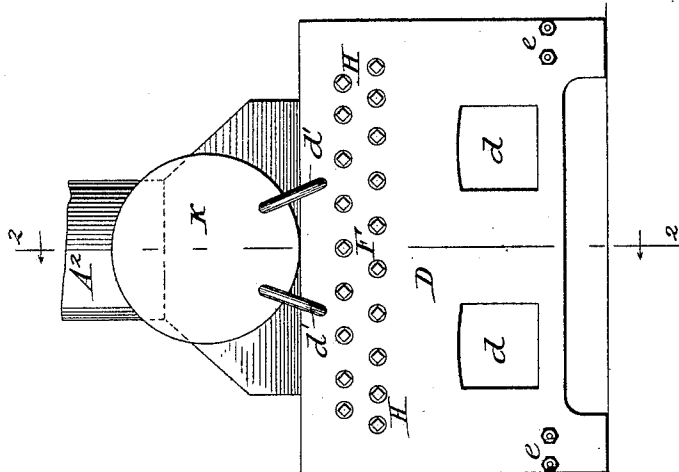


Fig. 3.



Witnesses

Sidney P. Hollingsworth
B. Washington Miller

Inventor

JOHN BAIRD

by his attorneys

Baldwin Davidson & Wright

UNITED STATES PATENT OFFICE.

JOHN BAIRD, OF NEW YORK, N. Y.

FEED-WATER HEATER FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 460,839, dated October 6, 1891.

Application filed April 13, 1891. Serial No. 388,658. (No model.)

To all whom it may concern:

Be it known that I, JOHN BAIRD, mechanical engineer, a citizen of the United States, residing at No. 324 Lexington avenue, in the city, county, and State of New York, have invented certain new and useful Improvements in Feed-Water Heaters for Steam-Boilers, of which the following is a specification.

My invention more especially relates to feed-water heaters for steam-boilers of the class having horizontal or slightly-inclined flues. Its object is to secure a compact and efficient boiler adapted to make ample steam of high pressure in a comparatively small space, which ends I attain by certain novel organizations of instrumentalities hereinafter specified.

The accompanying drawings show my improvements adapted to a locomotive-boiler exemplified in United States Letters Patent No. 434,973, granted to me August 26, 1890, representing, however, so much only of the apparatus as is necessary to illustrate the subject-matter claimed. Unless otherwise indicated the parts are of usual approved construction and ordinary operation.

Figure 1 is a plan, and Fig. 2 a vertical central longitudinal section on the line 2 2 of Figs. 1 and 3. Fig. 3 is a front elevation; Fig. 4, a vertical transverse section on the line 4 4 of Fig. 1, and Fig. 5 a similar view on the line 5 5 thereof.

Short unfeathered darts indicate the directions in which the sections are shown, dotted arrows show the direction of the water-circulation, and solid arrows the course of the products of combustion.

The fire-box end of the boiler I term the "front;" the opposite, the back or rear end. That side on the left of a person facing the fire-box I call the "left;" the opposite, the "right."

A fire-box A, provided with grate-bars *a*, is shown as connected by a back head I with the front tube-sheet of the lower shell B, through the fire-tubes *b*² of which the products of combustion pass into the uptake A' and chimney A³. The front or feed-door end of the boiler is composed of two parallel sheets of metal constituting a front head or water-space D, provided with fire-doors *d*.

The sides and top of the fire-box consist of a series of transverse arched water-tubes C, placed close together side by side and extending from the front to the back head, their lower ends being united to longitudinal side tubes or water-boxes E connecting the front head with the lower shell. A series of longitudinal water-tubes F are arranged centrally in the fire-box, being connected at their upper ends with the front head and extending backward to a point, say, about three-fourths of the distance between the front and back heads, where they are bent downward, reaching to the bottom of the fire-box, their lower ends being connected by small pipes *f* to the water-leg at the bottom of the tube-sheet. These tubes are arranged centrally in the fire-box, so as to afford access at each side to the front connection of the tube-sheet. These tubes preferably lie in front of the fire-tubes.

The fire-box, it will be observed, is wider than the lower shell of the boiler, and the upper portion of the space obtained by this increased width is utilized by arranging therein longitudinal water-tubes H, connecting the front head with the tube-sheet or back head I, they being preferably connected to the inner sheet of the front head and passing through packed water-tight sleeves in the back head with which they are connected by small tubes *h*, as shown in United States Letters Patent No. 425,970, granted to me April 22, 1890. An upper shell K is shown as extending over the fire-box and lower shell. It is connected with the front head by pipes *d'*, for the passage of mingled steam and water with the transverse arched tubes C by small pipes *c*, and with the lower shell by tubes *k*. This upper shell, it will be observed, has no fire-tubes. A perforated pipe L conducts the steam from the top of the shell to the point where it is to be utilized. As shown by the dotted line in Fig. 2, the upper shell is normally only about one-third full of water; but as this covers all the pipes *d'*, *c*, and *k*, above mentioned, the steam rises through the water in the upper shell to its steam-space in the upper part thereof. The front head D and water-boxes E are connected by suitable stay-bolts *e* to resist longitudinal strains.

The organization above described is substantially that of my Patent No. 434,973 above mentioned.

In order to carry out my present invention, I lengthen the uptake or smoke-box A' and surround it with a double shell, constituting a water-space M, into the left-hand side of which the feed-water is shown as flowing through a pipe *m*, provided with a check-valve *m'*. A pipe *m*² connects the upper part of the opposite side of this water-space with a water-box N, extending transversely across the uptake about or above the normal water-line of the upper shell. A series of pendent open-ended tubes *n* are shown as arranged in two parallel rows across the uptake and is inclosed in larger concentric tubes *n'*, closed at their lower ends but connected at their upper ends with lower channels N', connected with the upper part of the lower shell by the water-inlet pipes N², which enter opposite sides of the boiler. The products of combustion, it will be observed, in passing through the back connection or uptake impinge against the inner walls of the water-space M and circulate freely among the pendent water-tubes before escaping up the chimney, thus thoroughly heating the feed-water.

The boiler is of course to be supplied with the most approved appliances, including safety-valves, steam, water, and air passages, and valves for filling, working, and emptying the boiler.

I do not broadly claim herein the combination, with boiler-flues, of pendent water-tubes, as similar devices are described and claimed in sundry pending applications heretofore filed by me, as follows: Serial No. 383,096, filed February 27, 1891; Serial No. 383,854, filed March 5, 1891; Serial No. 384,736, filed March 12, 1891; Serial No. 386,335, filed March 25, 1891, and Serial No. 387,747, filed April 6, 1891.

I claim as of my own invention—

1. The combination, substantially as hereinbefore set forth, of a boiler-shell, its fire-tubes, its back connection or uptake, a water-space inclosing it through which the feed-water flows, an upper channel, a lower channel, feed-water-circulation pipes pendent therefrom in the uptake, a water-passage connecting the water-space and channels, and feed-water pipes connecting the channels and boiler.

2. The combination, substantially as hereinbefore set forth, of a fire-box, a boiler-shell directly in rear thereof, its fire-tubes, an uptake or back connection into which they open, a feed-water space surrounding the uptake, channels extending transversely over the uptake at or above the normal water-line of the boiler, pendent concentric water-circulating pipes connecting the channels, and water-passages connecting the water-space and channels with the boiler.

3. The combination, substantially as hereinbefore set forth, of a fire-box, a lower shell in rear thereof, its fire-tubes, an uptake or back connection in rear thereof, an upper shell overlying both the fire-box and lower shell, pipes connecting the upper shell with the front head, the water-tubes, and the lower shell of the boiler, a water-space surrounding the back connection, water-channels extending across the back connection, concentric pendent feed-water-circulation tubes in the uptake or back connection connecting said channels, and water-passages connecting the water-space and channels with the lower boiler-shell.

In testimony whereof I have hereunto subscribed my name.

JOHN BAIRD.

Witnesses:

ADDISON W. BAIRD,
THOMAS BAIRD.