

(No Model.)

2 Sheets—Sheet 1.

J. BAIRD.
STEAM BOILER.

No. 460,838.

Patented Oct. 6, 1891.

Fig. 2

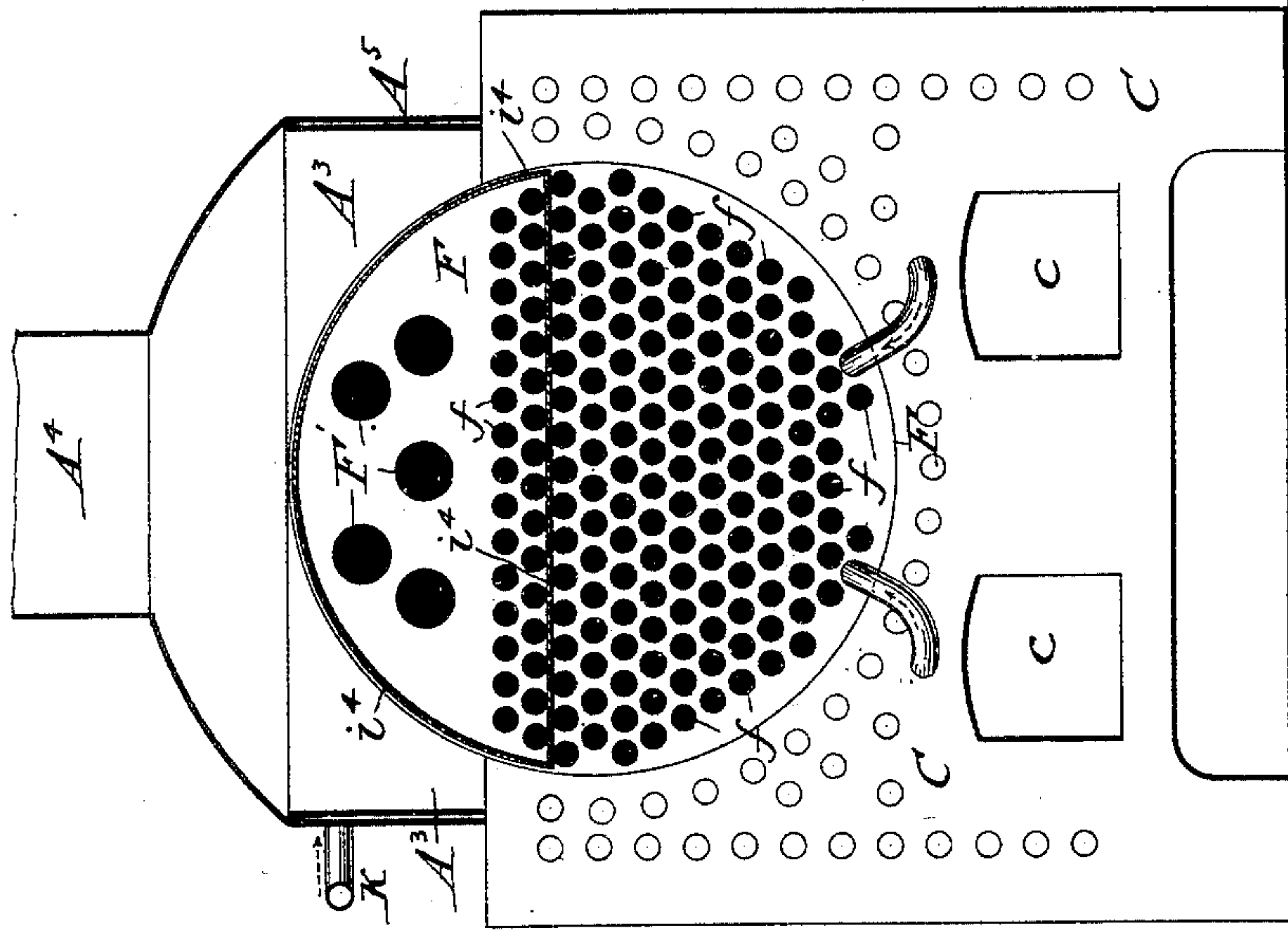
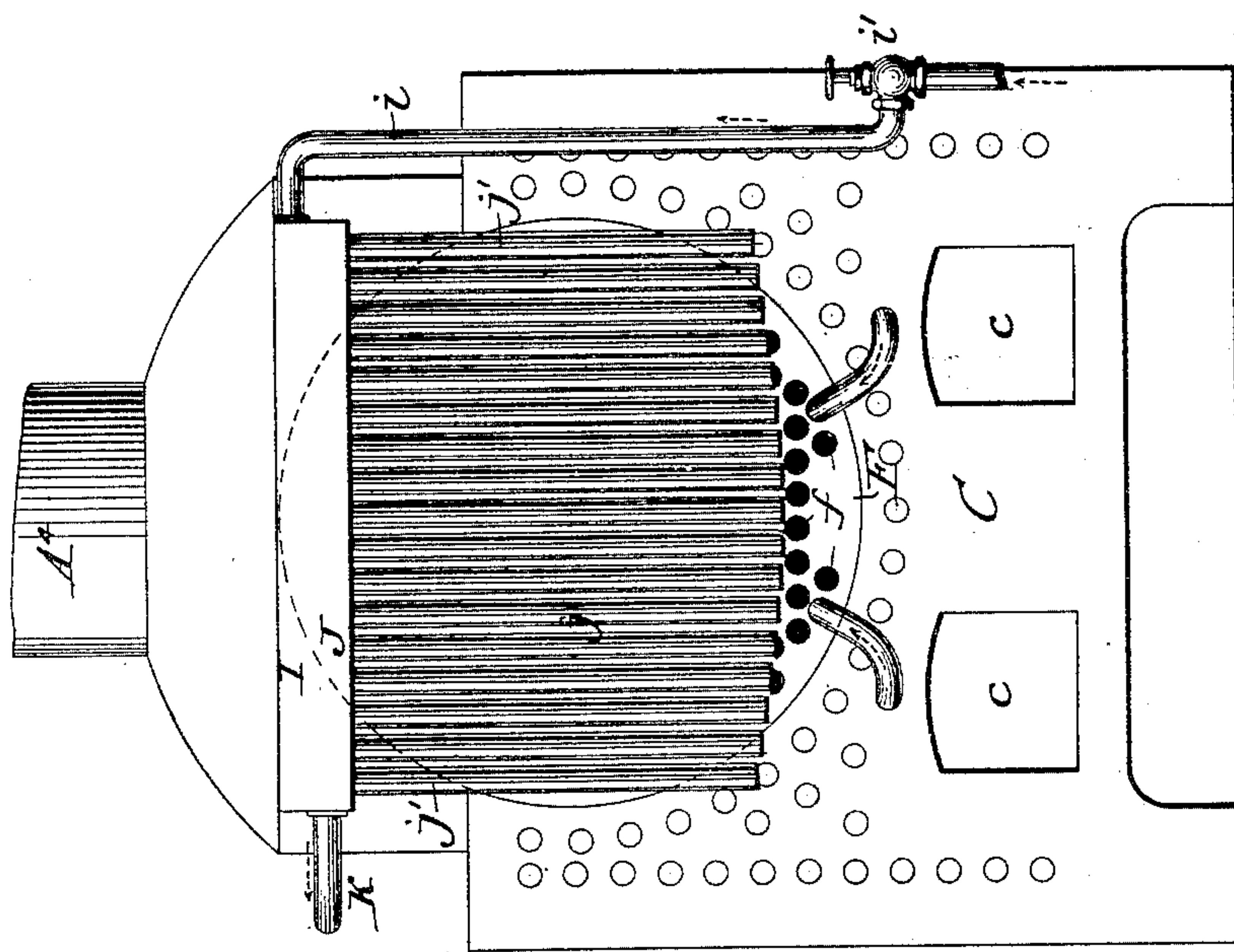


Fig. 1.



Witnesses

Sidney P. Hollingworth
B. Hastings Miller

Inventor

JOHN BAIRD
by his attorneys

Baldwin Davidson & Wright

(No Model.)

2 Sheets—Sheet 2.

J. BAIRD.
STEAM BOILER.

No. 460,838.

Patented Oct. 6, 1891.

Fig. 3.
ON LINE 3-3

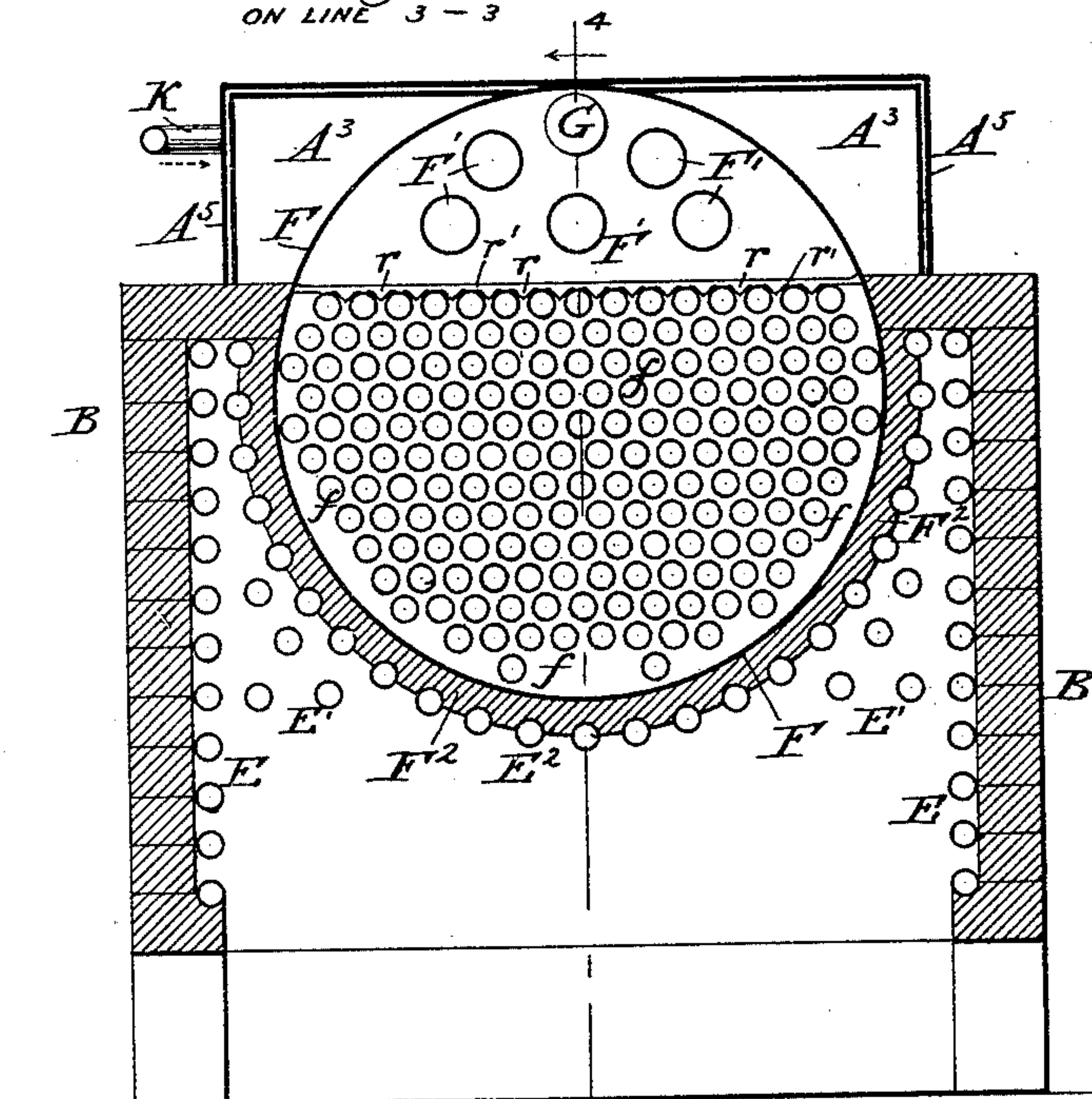
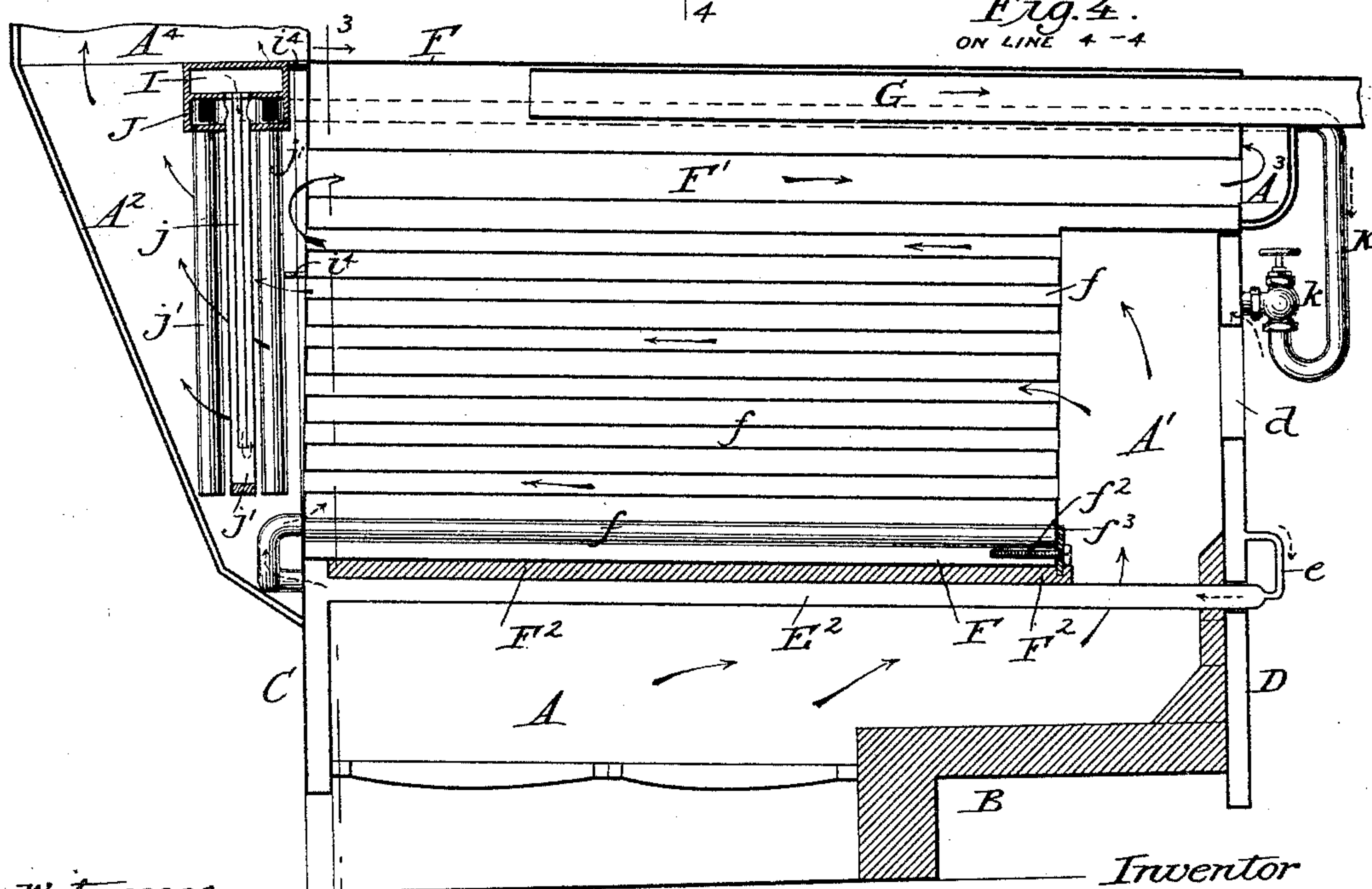


Fig. 4.
ON LINE 4-4



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.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 460,838, dated October 6, 1891.

Application filed April 6, 1891. Serial No. 387,747. (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 Steam-Boilers, of which the following is a specification.

My invention more especially relates to marine and stationary steam-boilers of the class having horizontal or slightly-inclined flues. Its objects are to heat the feed-water and to dry or superheat the steam by the products of combustion passing through the upper flues or fire-tubes, which ends I attain by certain novel organizations of instrumentalities hereinafter specified.

The accompanying drawings show my improvements adapted to a single-shell boiler of the type exemplified in United States Letters Patent No. 411,882, granted to me October 1, 1889, representing, however, so much apparatus only as is necessary to illustrate the subject-matter claimed, which apparatus, unless otherwise indicated, is of the usual approved construction. The main shell of the boiler of this patent contains fire-tubes in its lower portion only, the back head only extending to the top of these tubes, and, although provided with an uptake, it has no smoke-box surrounding the upper portion of the boiler. I term the fire door end the "front" and the opposite end the "rear." Short unfeathered darts indicate the direction of view of the sections, solid feathered arrows the course of the hot gases, and dotted ones that of the water.

Figure 1 shows a front elevation with the front hood or casing removed; Fig. 2, a similar view with the water-boxes and their circulation-tubes removed; Fig. 3, a vertical transverse section, looking backward, on the line 3 3 of Fig. 4; and Fig. 4, a vertical longitudinal central section on the line 4 4 of Fig. 3.

The products of combustion pass from the fire-box A around and through the various water and fire tubes by way of the back connection A' and front hood or uptake A², smoke-box A³, and chimney or smoke-stack A⁴. A casing A⁵ incloses the upper part of the boiler, the space between the two on each side of the boiler constituting a smoke-box. The fire-box and water-tubes, as well as the

boiler-shell, are incased in suitable brick-work B, the top of which about coincides with the water-line of the boiler. The front head C and back head D are made of parallel plates, with a water-space between them and provided with suitable fire-doors c and man-holes d. These heads are connected by three series of water-tubes E E' E², respectively arranged, as shown, alongside the side walls of the furnace, under and alongside the boiler-shell, and in the space between it and the side walls. They are preferably connected with the front head and pass, water-tight, through packed sleeves in the front head, being supplied with water therefrom by small pipes e.

The boiler-shell F rests on the back head and extends directly over the fire-box to the front end of the back connection, a space being left between the shell and back head to form this connection. About two-thirds of the shell is filled with fire-tubes f. The upper part of the shell extends over the back connection and rests upon the back head and is provided with flues F'. The top of the shell is occupied by a perforated longitudinal steam-pipe G. The normal water-line of the boiler comes just below the large tubes or flues F', which consequently occupy the steam-space of the boiler and serve to dry and superheat the steam. The bottom of the shell is covered with fire-brick F², which is prevented from slipping back by a bolt f² passing into the back tube-sheet through a plate f³, inserted in the brick-work.

The feed-water flows through a pipe i in front of the boiler, provided with a check-valve i', into a horizontal box or channel I, arranged in the uptake across the front of the boiler and at or above the level of its top. Thence it descends through a series of pendent tubes j, inside of larger tubes j', through which it rises into a channel J, (shown as parallel with and beneath the upper one.) From this lower channel the water flows through a longitudinal pipe K, preferably passing backward through the smoke-box A³ to the back of the boiler, where it is connected with the back head B. A stop-valve k controls the flow of the feed-water through this pipe at this point.

Under the organization shown the products of combustion as they pass from the lower

fire tubes *f* impinge upon and circulate among the pendent water-circulation tubes, a portion of the heat passing directly up the chimney. The products of combustion which pass through two or three of the upper rows of these fire-tubes are deflected by plates *i*⁴, interposed between the tube-sheet and fire-tubes, and by the fire-tubes themselves, so as to cause this portion of the hot gases first to traverse the upper flues *F'* from front to back and then to return through the smoke-box over the top of the boiler to the chimney, thus still further assisting in drying and superheating the steam.

Foaming may be alleviated by applying V-shaped troughs or deflectors *r*, Fig. 3, above the upper rows of fire-tubes, as indicated in my patent above mentioned. These deflectors are preferably composed of bars of angle-iron coinciding in direction with the length of the flues and supported at short intervals by short pieces *r'* of angle-iron, which lie upon the flues, leaving intervals between the flues and deflectors, through which steam and water—either or both—can pass, but in so doing are deflected diagonally, instead of passing directly up to the steam-pipe *G*.

The boiler is of course to be supplied with the most approved appurtenances, such as safety-valves, water, steam, 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 of mine, respectfully numbered and filed 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, and Serial No. 386,335, filed March 25, 1891.

What I claim herein as new and as of my own invention is—

1. The combination, substantially as here-

inbefore set forth, of a boiler-shell, fire-tubes therein below its normal water-line, flues in the steam-space thereof, a fire-box beneath the boiler, a back connection, a front hood or uptake, a smoke-box inclosing the top of the boiler-shell, feed-water-heater channels extending across the uptake above the water-line of the boiler, pendent feed-water-circulating tubes connecting these channels, and a feed-water-inlet pipe connecting said channels with the backhead of the boiler.

2. The combination, substantially as here-inbefore set forth, of a boiler-shell, fire-tubes therein below its normal water-line, flues in the steam-space thereof, a longitudinal steam-exit pipe in the upper part of the boiler-shell, a fire-box beneath the boiler, a back connection, a front hood or uptake, a smoke-box inclosing the top of the boiler, feed-water-heater channels extending across the uptake above the water-line of the boiler, pendent feed-water-circulation tubes connecting these channels, a feed-water-inlet pipe connecting said channels with the back head of the boiler, and deflecting-plates interposed between the front tube-sheet and pendent water-circulation pipes, so as to deflect the heat escaping from the upper fire-tubes through and around the steam-space of the boiler.

3. The feed-water-heating apparatus hereinbefore described, consisting of the combination of feed-water-heater channels extending across the uptake above the water-line of the boiler, pendent feed-water-circulating tubes connecting these channels, and a feed-water-inlet pipe connecting these channels with the back head of the boiler.

In testimony whereof I have hereunto subscribed my name.

JOHN BAIRD.

Witnesses:

A. J. BAIRD,
ADDISON W. BAIRD.