

(No Model.)

3 Sheets—Sheet 1.

J. BAIRD.
BOILER.

No. 411,882.

Patented Oct. 1, 1889.

Fig. 2.

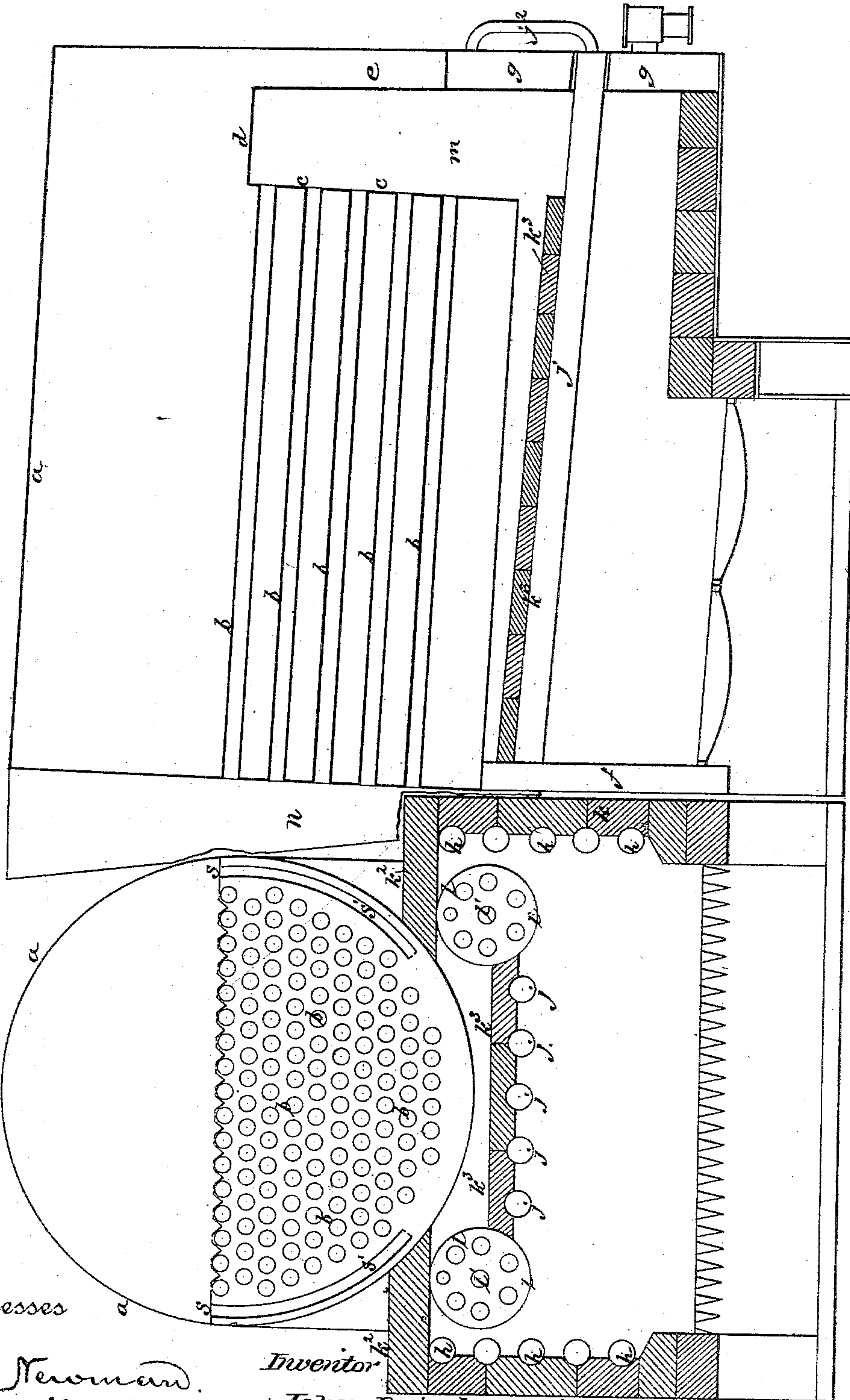


Fig. 1.

Witnesses

H. E. Newman

E. S. Newman

Inventor

John Baird

By his Attorneys

Baldwin, Bondson & Wright

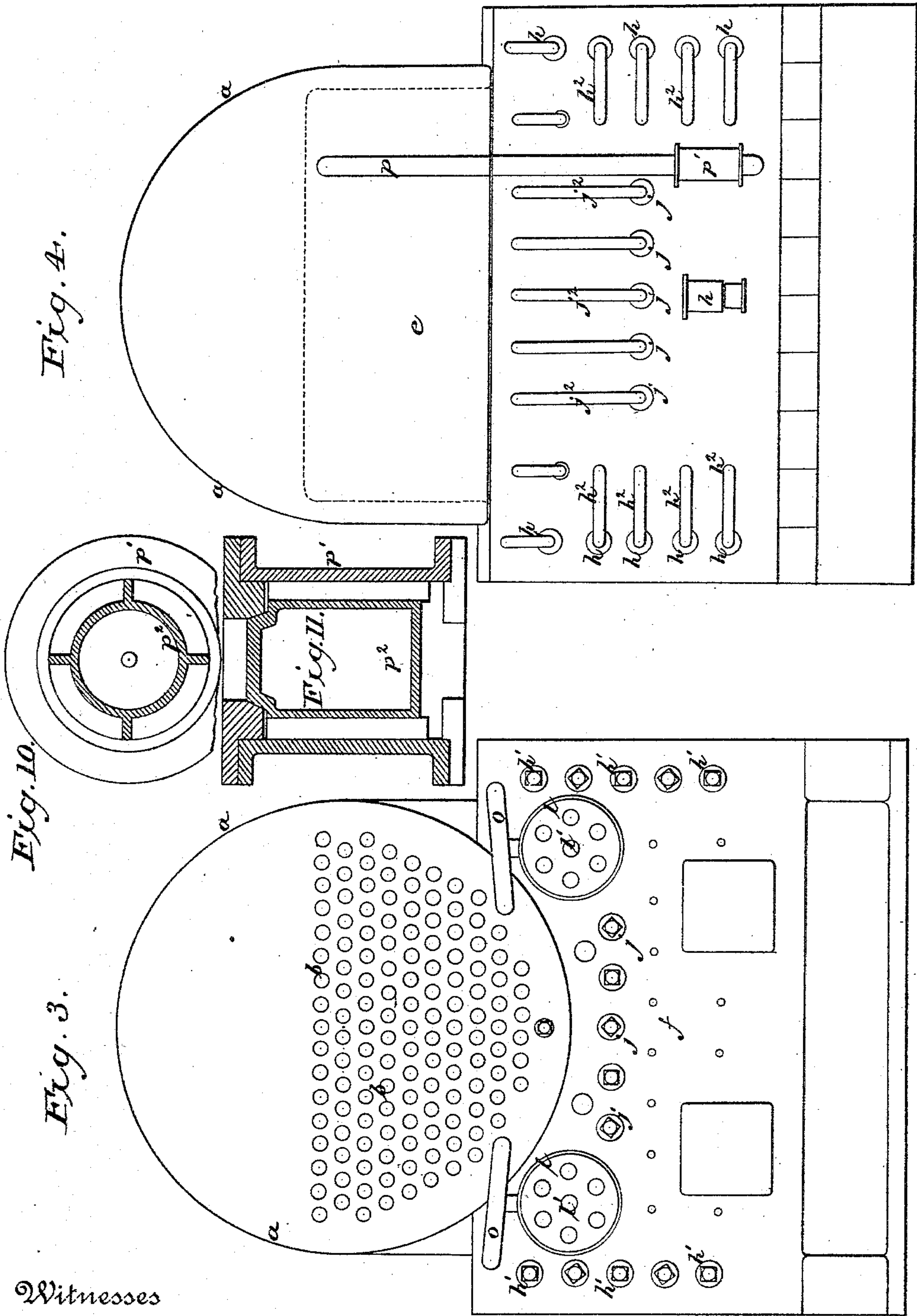
(No Model.)

3 Sheets—Sheet 2.

J. BAIRD.
BOILER.

No. 411,882.

Patented Oct. 1, 1889.



Witnesses

H. C. Newman.
O. S. Newman.

Inventor
John Baird,
By his Attorneys
Baldwin Davidson & Wright

(No Model.)

3 Sheets—Sheet 3.

J. BAIRD.
BOILER.

No. 411,882.

Patented Oct. 1, 1889.

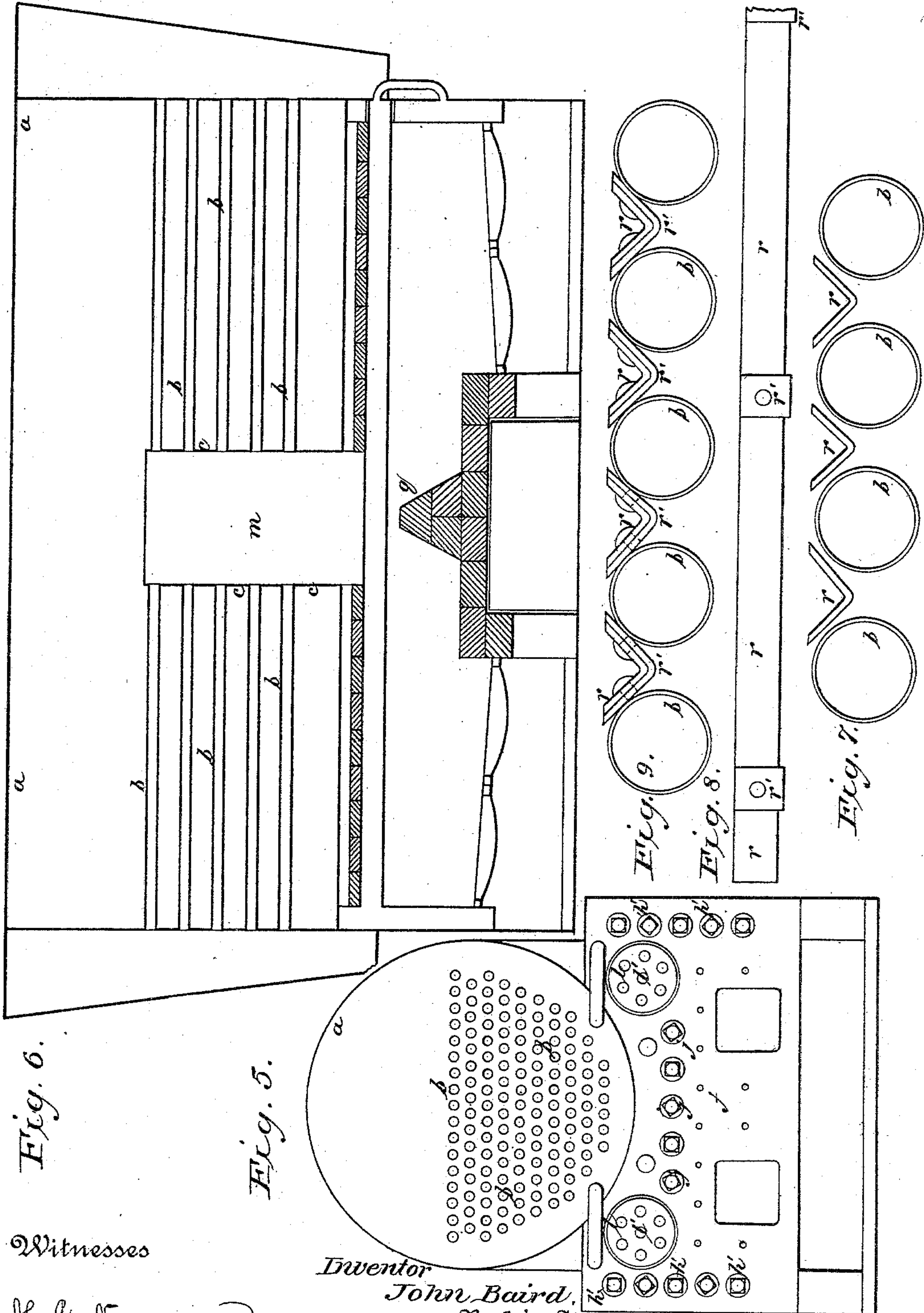


Fig. 6.

Fig. 5.

Fig. 9.

Fig. 8.

Fig. 7.

Witnesses

H. C. Newman,
E. S. Newman,

Inventor

John Baird,

By his Attorneys

Baldwin, Bondeson & Wright.

UNITED STATES PATENT OFFICE.

JOHN BAIRD, OF NEW YORK, N. Y.

BOILER.

SPECIFICATION forming part of Letters Patent No. 411,882, dated October 1, 1889.

Application filed June 13, 1889. Serial No. 314,090. No model.)

To all whom it may concern:

Be it known that I, JOHN BAIRD, mechanical engineer, of the city, county, and State of New York, have invented certain new and useful Improvements in Boilers for use either on Land or Shipboard; and I do hereby declare that the following, taken in connection with the drawings, is a full, clear, and exact description thereof.

These improvements relate to a fire-box composed as to its sides and top of horizontal or slightly-inclined water-tubes connected in a peculiar manner with water-spaces forming the front and rear of the fire-box, to peculiar means of preventing or diminishing foaming, to devices of a special kind for improving circulation, and to a construction tending to insure an efficient supply of water at all times to the tubes composing the fire-box, &c., all as hereinafter set forth and claimed.

The drawings are in three sheets.

Figure 1 is a vertical transverse section through a boiler and fire-box. Fig. 2 is a central longitudinal vertical section through the same. Fig. 3 is a front elevation of the same with the uptake removed. Fig. 4 is a rear elevation thereof; Fig. 5, an elevation of one end of a modification of the boiler and furnace with the uptake removed. Fig. 6 is a central longitudinal vertical section through the same with [the uptake in place. Figs. 7, 8, and 9 are details on a larger scale of the devices for restraining foaming; and Figs. 10 and 11 are details on a larger scale of the valve, which, in connection with a tube, tends to prevent the emptying of the fire-box tubes and keep them always filled with water.

In the drawings, the shell of the boiler is shown at *aa*, and the fire tubes or flues therein at *bb*. These tubes are secured to the front head of the boiler, as usual, and at their rear ends to a tube-sheet *C*, which forms one side of the back connection. This back connection has a top *d*, and the rearend of the boiler is a short water-leg *e*, flat at the bottom, so that it rests upon the rear of the fire-box. This water-leg may be circular or of other form, provided that the top of the fire-box corresponds in contour with it, or nearly so.

The front of the fire-box is a flat box set on edge, stayed, as usual, and containing water

when the boiler is in use. I prefer to make a circular depression in its top, in and upon which the front end of the shell rests. The rear *g* of the fire-box is a similar box or water-space, but in the preferred form flat on top, and upon it rests the rear end of the boiler. (See Figs. 2 and 4.) The boiler proper is supported by these ends of the fire-box.

Water-tubes *h h*, nearly horizontal, but preferably inclined upward at their front ends, have thin open ends secured to the inner sheet of the front end of the fire-box, so that they communicate directly with the water-space thereof. Holes are cut through the outer sheet of the front of the fire-box opposite these tubes, and these holes are to be closed with screw-plugs *h' h'*. These holes permit cleaning of the tubes. These tubes *h*, at their rear ends, pass through sleeves which extend water and steam tight from the inner to the outer sheet of the rear end of the fire-box, and are either bent or furnished with smaller bent tubes *h² h²*, which connect at one end with the tubes *h* and at the other with the water-space in the rear of the fire-box. There is therefore a free connection through these bends or small tubes and the tubes *h h* between the water-spaces in the front and rear of the fire-box; and, owing to the fact that the tubes *h* pass through sleeves and are connected at the rear by bent tubes, there is little danger of leakage arising from the expansion and contraction of the tubes. Other tubes *j j* are secured in the same way as the tubes *h* to the front and rear ends of the fire-box, being like them provided with bends or small bent tubes *j² j²*, and having opposite their open ends plugs *j' j'*. These tubes *j j* overlie the grate-bars and form the roof of the fire-box, and may be sufficiently numerous to extend from side to side thereof. I intend at times to reverse the connections of these tubes *h* and *j* with the front and rear of the fire-box, to furnish the front instead of the back with the sleeves and bends, and to connect the open ends of the tubes with the rear instead of the front of the fire-box. The sides and top of the fire-box are therefore composed of nearly horizontal tubes, and the front and rear thereof are formed of inclosed water-spaces, the

tubes being directly connected with these spaces at one end thereof, and at the other passing through sleeves in the space and provided with bent connections. As fire and heat could pass out between the tubes, I cover them exteriorly with a wall k , of brick or tiles, and bridge the space between the tops of these walls and the shell of the boiler with tiles k^2 k^2 . I prefer, also, to cover the horizontal tubes j j with tiles k^3 k^3 as far rearward as the passage to the back connection, (see Figs. 1 and 2,) thus protecting more effectually the lower part of the shell from intense heat and permitting the use of a thick shell in boilers made for carrying high steam.

I do not limit myself to any special size of the tubes h and j , and they may be arranged nearer together or farther apart than shown in the drawings. The series of tubes j j , as before said, may extend from side to side of the fire-box, but I prefer to extend the series about as far as in the drawings and to substitute for the small tubes j j larger tubes l l in some cases, as shown in the drawings, provided with internal flues or fire-tubes l' l' . These larger tubes l l project through the front of the fire-box, passing through suitable water-tight sleeves as the tubes h and j pass through the rear heads, and they are to be supported at their rear ends in any suitable way by hangers or brick pillars, the rear ends extending about as far as a vertical plane passing transversely through the back connection m . The water-space in these tubes is to be connected by suitable curved pipes with either the water-space in the front or rear of the fire-box, or both, and I prefer to furnish them also with connections to the boiler itself. Flame and products of combustion will partially or wholly surround these tubes l l and will pass through the flues l' l' in them, if used, into the chimney through the hood or uptake n .

The water-space in the front of the fire-box is to be connected with the boiler by bent tubes, such as are shown at o o , arranged in some suitable manner. Feed-water is to be pumped into the rear of the fire-box, as through the check-valve p , or, if the connections of the tubes h and j be reversed, into the front of the fire-box, and it will circulate through the tubes from one end of the fire-box to the other and be finally discharged into the boiler. Owing to the intense heat to which the tubes h and j are exposed, it may happen that steam will be formed in them or some of them to such extent as to drive out the water and the usual supply of feed-water may then be insufficient to fill the vacancy. I have therefore connected the rear of the fire-box or the front, if the tubes open into it, with the body of water in the upper shell by means of a pipe, such as p . This pipe has in it a valve-box p' , and this box contains a floating valve p^2 seating upward. (See Fig. 11.) As long as the back of the fire-box is full of water this valve will re-

main shut, floated up against its seat; but if water leaves the rear of the fire-box to supply a want of water in the tubes then the valve will fall and water will flow downward from the boiler into the rear of the fire-box.

I sometimes intend to make the boiler cylindrical throughout, as seen in Figs. 5 and 6, with a connection in the center thereof, two sets of flues b b , and two sets of grate-bars. In this arrangement the water-tubes h and j will extend over both sets of grate-bars and the large tubes l l from both ends of the fire-box through sleeves therein nearly to the bridge-wall.

Two or more boilers like those shown in Figs. 1, 2, 3, and 4 may be set side by side, and have no tubes h h between the fire-boxes thereof, or only one set of such tubes between adjoining fire-boxes. In this case the front and rear ends of the fire-boxes may be of the full width of the battery and common to all the fire-boxes.

In order to alleviate foaming, I apply deflectors above the upper row of flues or fire-tubes in the boiler proper, as indicated in Fig. 1. These deflectors are bars of angle-iron r , (see Figs. 7, 8, and 9,) with their length coinciding with the length of the flues. In order to support them, I rivet upon them at intervals short pieces of angle-iron r' . These pieces lie upon the flues and leave intervals between the angle-iron and the flues through which steam and water, or both, can pass; but in passing they all deflect diagonally and foaming is thus obviated.

As a means for providing better circulation in the boiler, I extend longitudinally from end to end of the boiler and at the level of the upper or some lower tier of flues metal plates, as indicated at S , Fig. 1. These plates are to be supported in any efficient manner. They bridge the space between the flues and the shell, and are provided with holes or apertures in which are inserted the upper open ends of tubes s s . These latter extend downward, and are open at their lower ends. As they occupy a comparatively cool part of the boiler, it is probable that water will rise among and between the flues and descend through the circulating-tubes s .

I do not claim, broadly, horizontal tubes extending over grate-bars in a fire-box, nor horizontal tubes by themselves located at the sides of a fire-box, nor partitions or tubes within a boiler which are intended to make a better circulation, nor broadly deflectors for the purpose of diminishing foaming.

I claim as of my own invention—

1. A fire-box composed of front and rear water-spaces and tubes horizontal, or nearly so, forming the sides and top thereof when said tubes pass through sleeves at one of said ends and are connected to the front and rear water-spaces, all substantially as described.

2. In combination with a fire-box composed of front and rear ends and of sides, and a top formed of tubes, all made and connected as

described, large tubes provided with flues, such as *l' l'*, combined therewith, as described.

5 3. In combination with the end of a fire-box such as is described, and with water-tubes connected therewith and a boiler, a pipe, such as *p*, with a floating valve therein, whereby a connection may be at times established between said tubes and the boiler proper, in the
10 manner and for the purposes set forth.

4. In combination with horizontal flues or tubes inclosed in a shell, as described, deflectors above the upper tier thereof, said deflectors being bars of angle-iron supported as
15 described.

5. In combination with a shell inclosing horizontal tubes or flues, as described, plates of metal extending over the space between the outer flues and the shell of the boiler and provided with depending tubes, which latter 20 descend in the comparatively cool space between the shell and the flues, whereby circulation is improved, substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

JOHN BAIRD.

Witnesses:

GEO. F. DANIELS,
ADDISON W. BAIRD.