

No. 680,696.

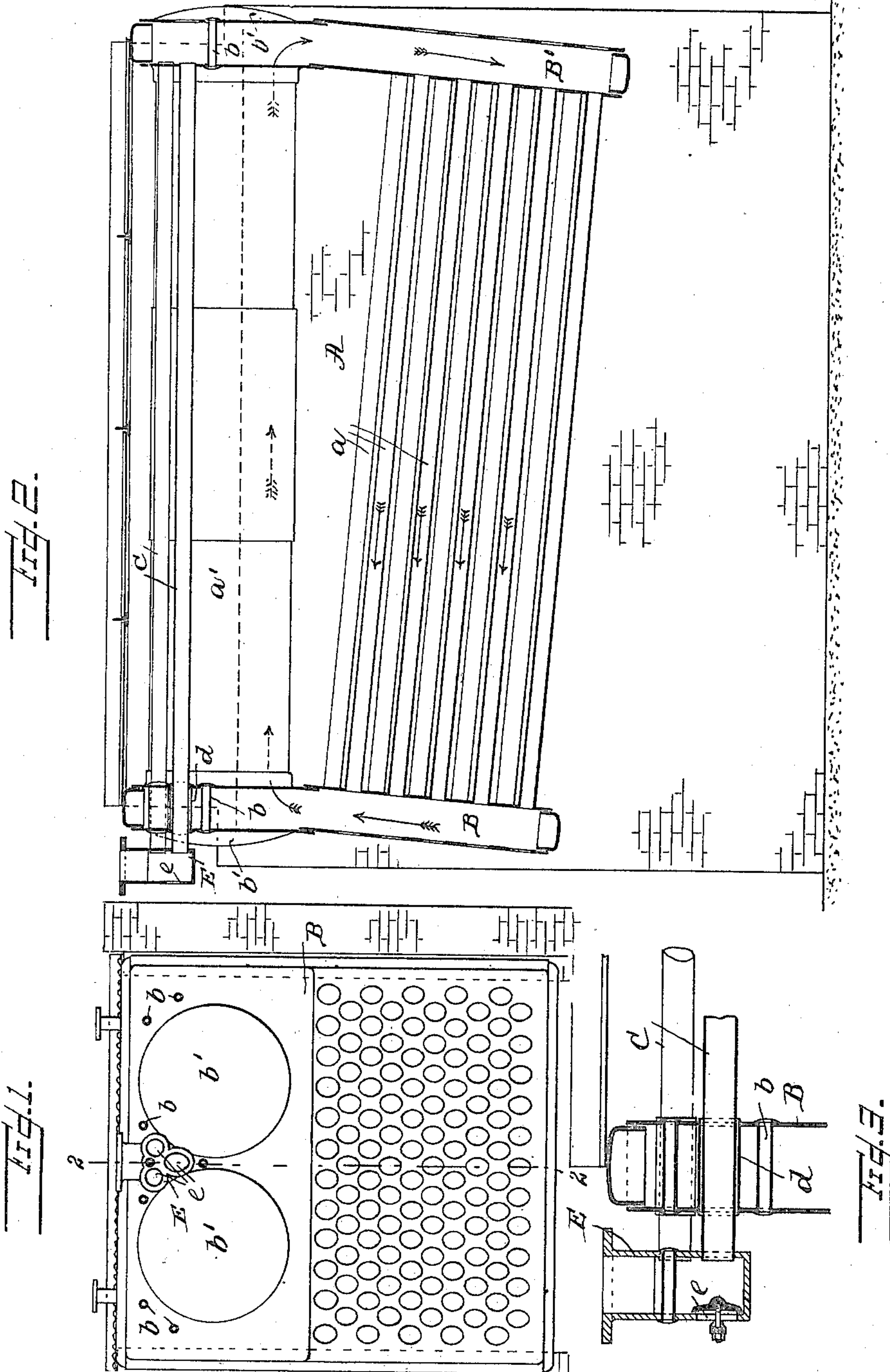
Patented Aug. 20, 1901.

B. D. COPPAGE.  
BOILER.

(Application filed Jan. 21, 1901.)

(No Model.)

3 Sheets—Sheet 1.



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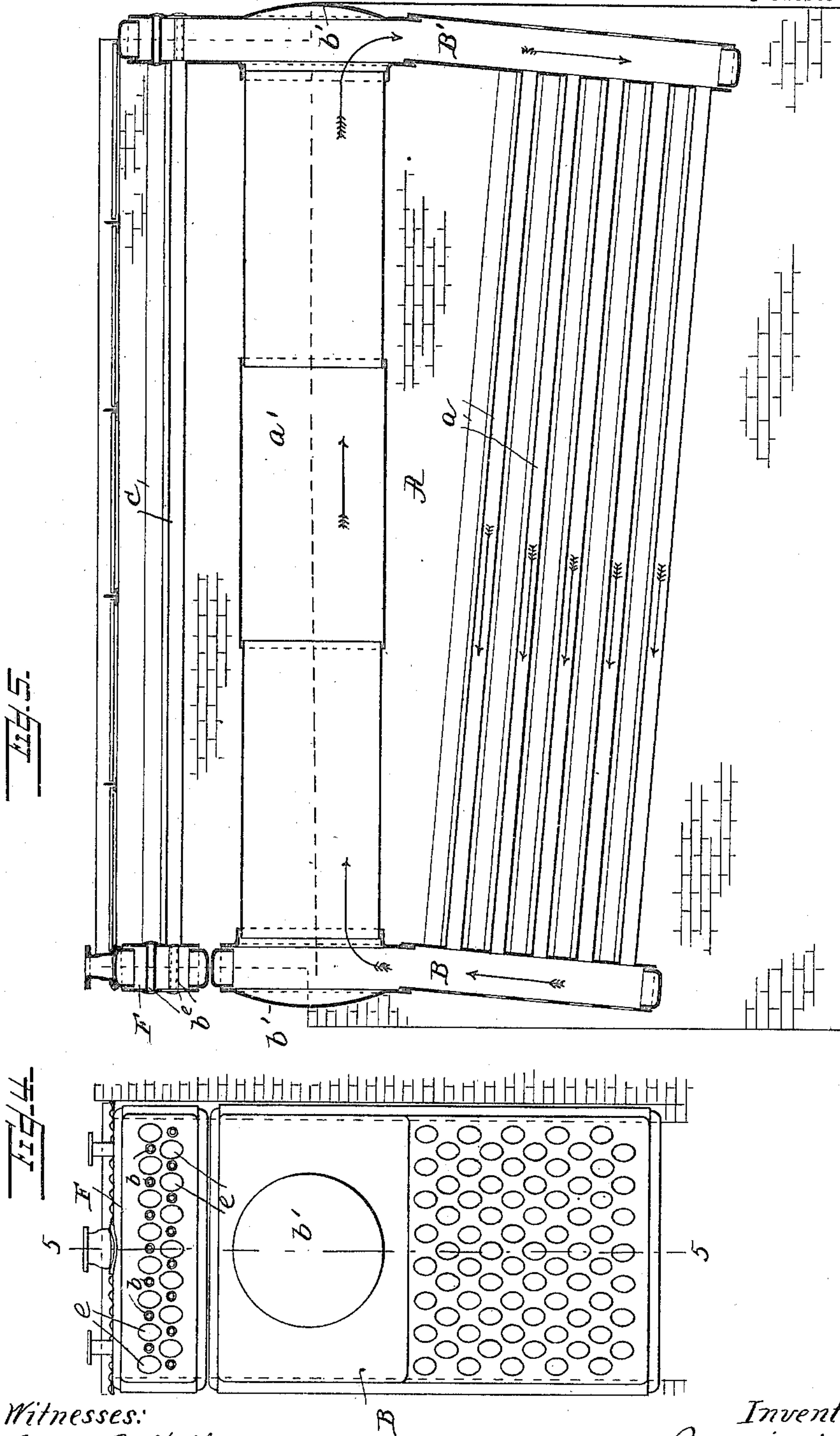
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3 Sheets—Sheet 2.



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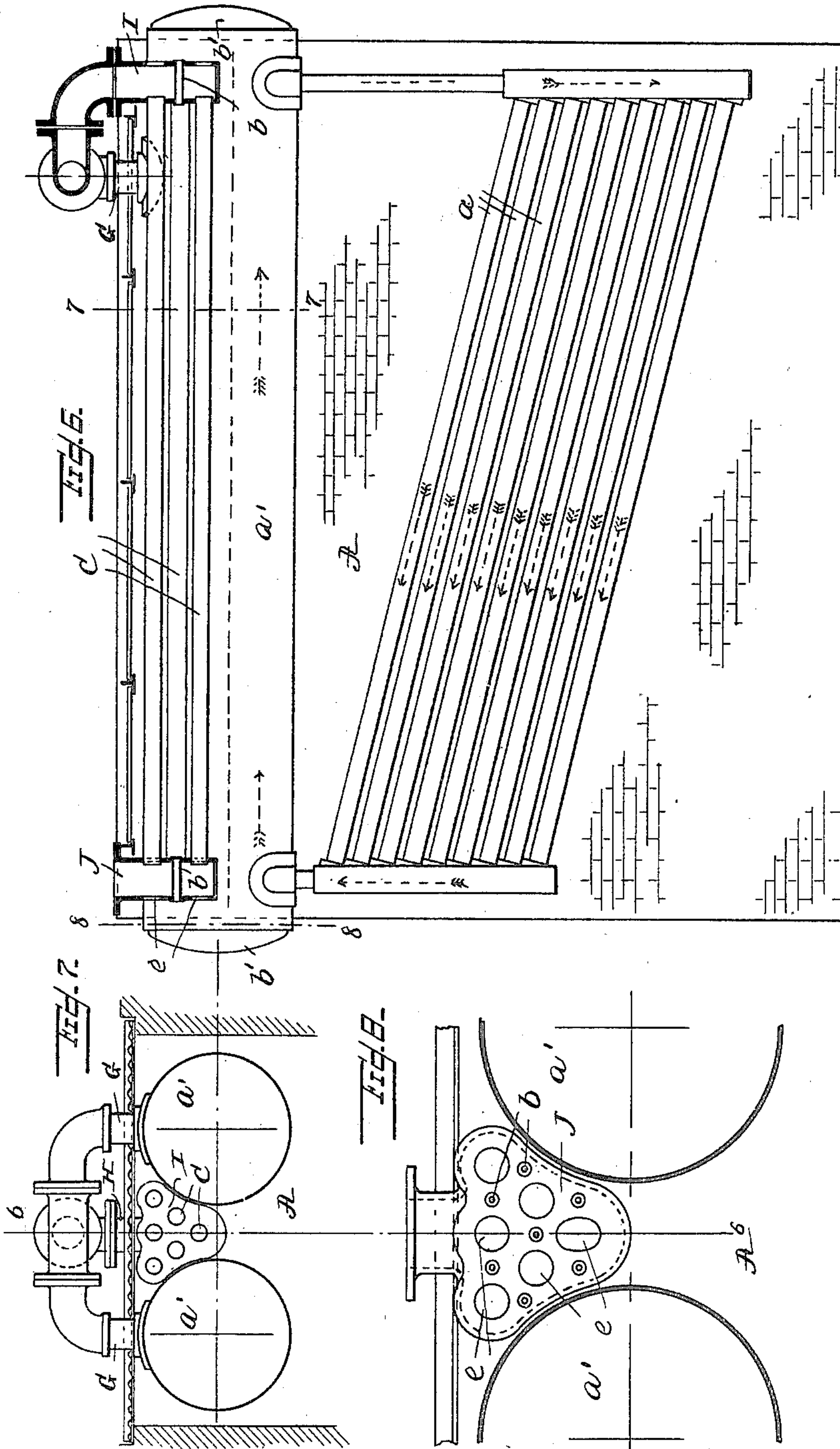
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# UNITED STATES PATENT OFFICE.

BENJAMIN DENVER COPPAGE, OF WILMINGTON, DELAWARE, ASSIGNOR TO  
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## BOILER.

SPECIFICATION forming part of Letters Patent No. 680,696, dated August 20, 1901.

Application filed January 21, 1901. Serial No. 44,051. (No model.)

*To all whom it may concern:*

Be it known that I, BENJAMIN DENVER COPPAGE, a citizen of the United States, residing at Wilmington, county of Newcastle, and State of Delaware, have invented a new and useful Improvement in Boilers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention has for its object certain improvements in construction by means of which the steam may be dried or superheated before leaving the boiler-chamber. Broadly considered, I accomplish this by providing within the furnace-chamber and above the water-level a series of tubes which are in connection with the steam portion of the furnace. These tubes traverse the furnace. The tubes at their inlet end are fixed, while at their discharge end they are movably connected, so that they may contract and expand.

I will now describe the embodiment of my invention illustrated in the accompanying drawings, in which—

Figure 1 is an end view of my improved boiler. Fig. 2 is a section on line 2 2, Fig. 1. Fig. 3 is an enlarged detail view of the upper portion of header B. Fig. 4 is an end view of a modified form of my improved boiler. Fig. 5 is a section on line 5 5, Fig. 4. Fig. 6 is a section on the line 6 6 of Figs. 7 and 8, showing a modified form of my improved boiler. Fig. 7 is a section on the line 7 7, Fig. 6. Fig. 8 is a section on the line 8 8, Fig. 6.

Speaking first of Figs. 1 to 3, A is the furnace-chamber, having the longitudinal water-tubes *a* extending between the headers B B', and *a'* represents the drums, extending between and communicating with the headers B B'. *b* represents hollow stays connecting the two faces of headers B B', which are to facilitate the removal of soot from the heating-surfaces by a steam or air jet. The outer plate of the headers B B' at the drums *a'* are bulged out, as shown, to stiffen at those points. The water-level in the boiler is as indicated by dotted lines. When the heat is applied, the water circulates through the tubes, drums, and headers, as indicated by the ar-

rows. The steam generated fills the drums above the water-level. Passing from the rear to the front of the furnace-chamber between the drums *a'* and above the water-level are a plurality of tubes C. The ends of these tubes at the rear end of the furnace enter orifices in the header B' and are expanded therein, so as to make a tight joint, in the opposite wall of which are hand-holes *e* with removable covers. In the front header B at points corresponding to these tubes C short tubular sections D of internal diameter greater than the external diameter of the tubes C are passed through orifices in the walls of the header B and expanded therein, so as to make a tight joint. Through these tubular sections D the tubes C loosely pass and at their outer ends terminate in the steam-discharge chamber E, which chamber E is provided with hand-holes *e* with removable covers opposite each tube C. As may be seen, the steam generated passes from the steam-space through the header B' and tubes C. The steam is thus caused to traverse from one end to the other of the furnace constantly under the action of the products of combustion. The tubes C being high up in the boiler, there is no danger of their being subjected to a too high heat. The tubes being rigidly secured at one end only, they can expand or contract.

The construction shown in Figs. 4 and 5 differs from the construction shown in Figs. 1 and 3 in that the furnace-chamber is increased in height, the header B' extended vertically, the tubes C extending the length of the furnace above the drums *a'*. In this construction an independent header F receives the other end of the tubes C. This header rests upon and is capable of sliding upon the top of header B. The expansion and contraction of tubes C will be taken by the sliding of the header F upon the header B.

In Figs. 6, 7, and 8 I have shown my invention applied to a slightly-different form of boiler. In this construction pipes G G lead from the steam-space in the drums *a'* to the branch pipe H, which connects with a header I at the rear of boiler-chamber. From this header I to a header J at the front of the furnace-chamber the tubes C extend through the furnace-chamber, the headers I being ca-



pable of movement to allow the tubes C to expand and contract.

In all of these cases, as may be seen, the tubes C are within the furnace-chamber A, 5 traverse the whole length of the same, are above the water-level, and in communication with the steam-space. These tubes are fixed at one end and movably secured at the other end to allow for expansion and contraction.

10 Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. In a steam-boiler of the character described, a plurality of tubes within the furnace-chamber, above the water-level and traversing the furnace-chamber, the interior of one end of said tubes being in connection with the steam-space in the furnace, the other end in connection with the discharge and 20 means to compensate for expansion and contraction of said tubes.

2. In a steam-boiler of the character described, a plurality of tubes within the furnace-chamber above the water-level and traversing the furnace-chamber, the inlet ends 25 of said tubes being in connection with the

steam-space in the furnace, the discharge end of said tubes terminating in a movable chamber.

3. In a steam-boiler of the character described, a header in communication with the steam-space in said furnace, a plurality of tubes opening into said header, above the water-level, said tubes traversing the furnace-chamber, and a movable chamber into which 35 said tubes discharge.

4. In a steam-boiler of the character described, headers in communication with the steam-space, a plurality of tubes opening into one of the headers above the water-line, said 40 tubes traversing the length of said boiler, and conduits through the opposite header through which said tubes pass, and a discharge-chamber with which the outlet end of said tubes are connected. 45

In testimony of which invention I have hereunto set my hand, at Philadelphia, on this 19th day of January, 1901.

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Witnesses:

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M. M. HAMILTON.