

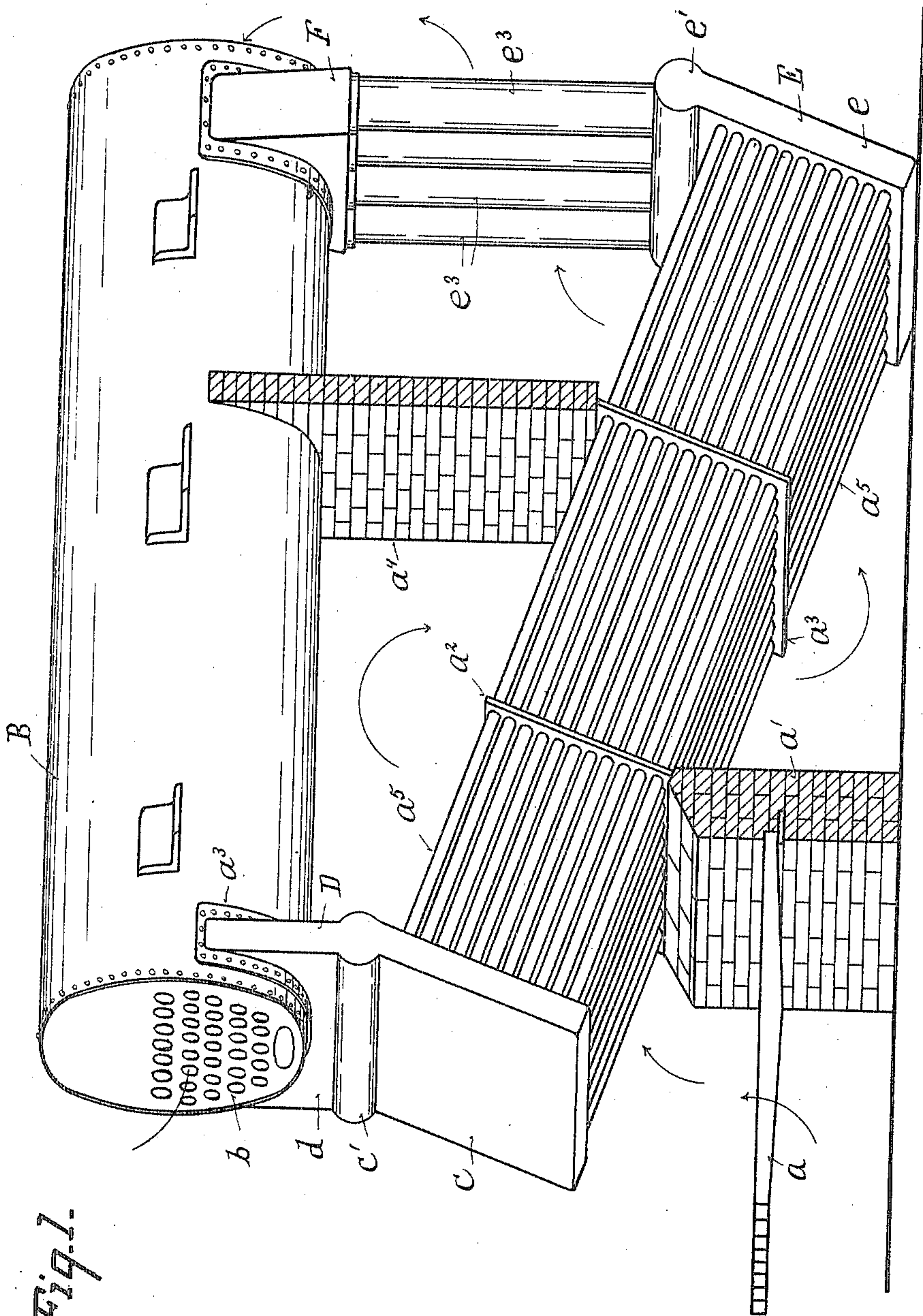
No. 811,547.

PATENTED FEB. 6, 1906.

F. P. COOPER.
TUBULAR BOILER.

APPLICATION FILED DEC. 22, 1904.

2 SHEETS—SHEET 1.



Witnesses
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2 SHEETS—SHEET 2.

Fig. 2.

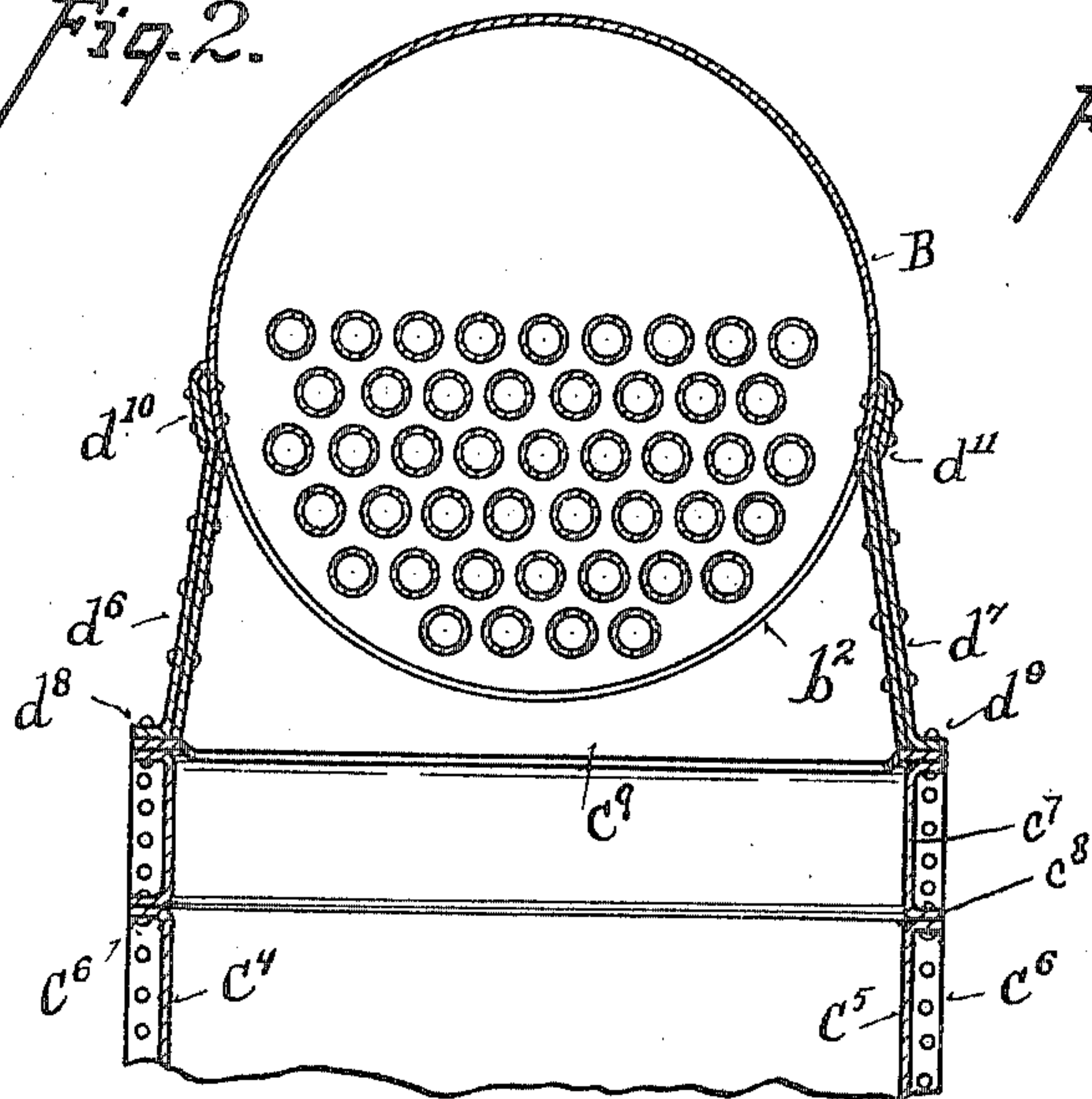


Fig. 3.

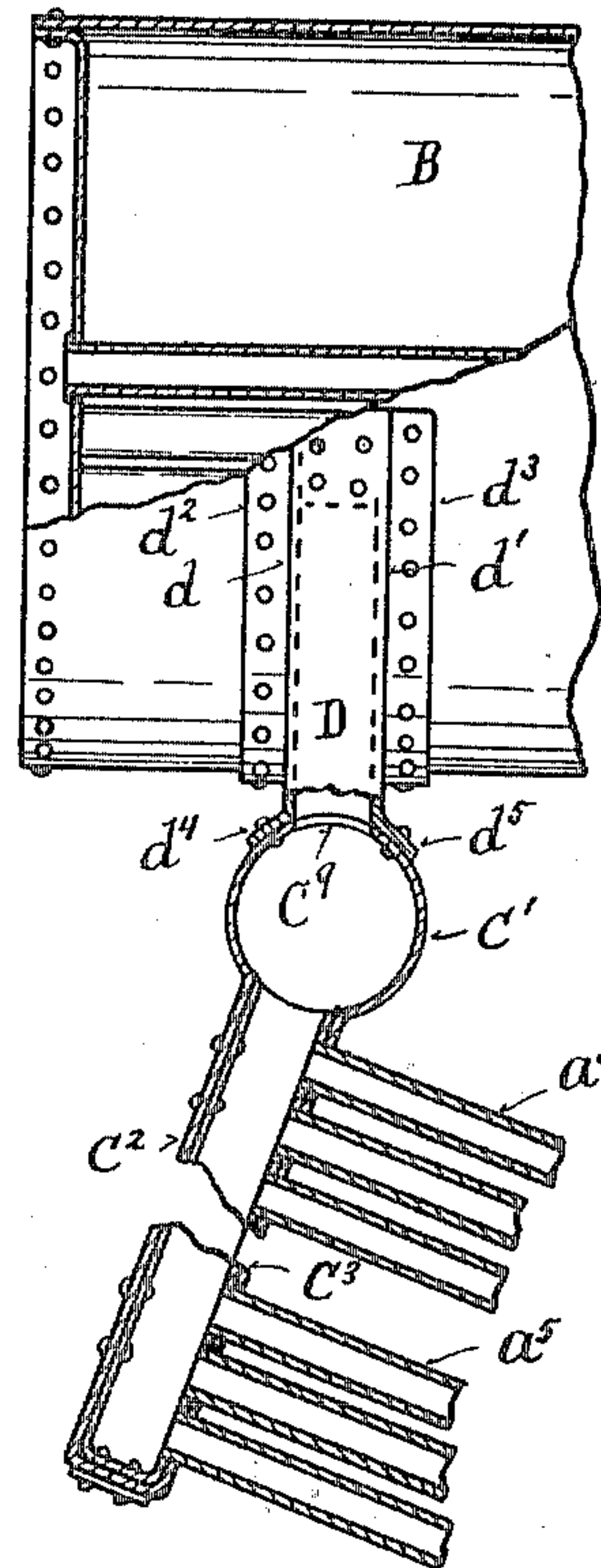


Fig. 4.

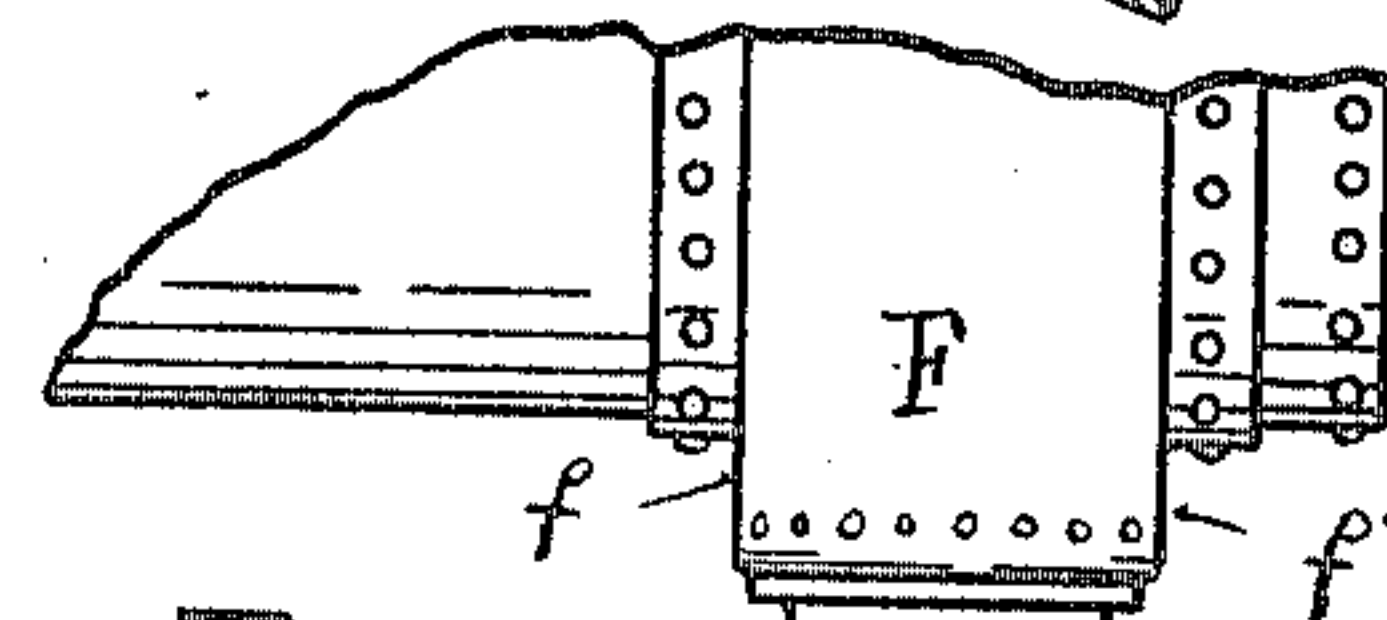
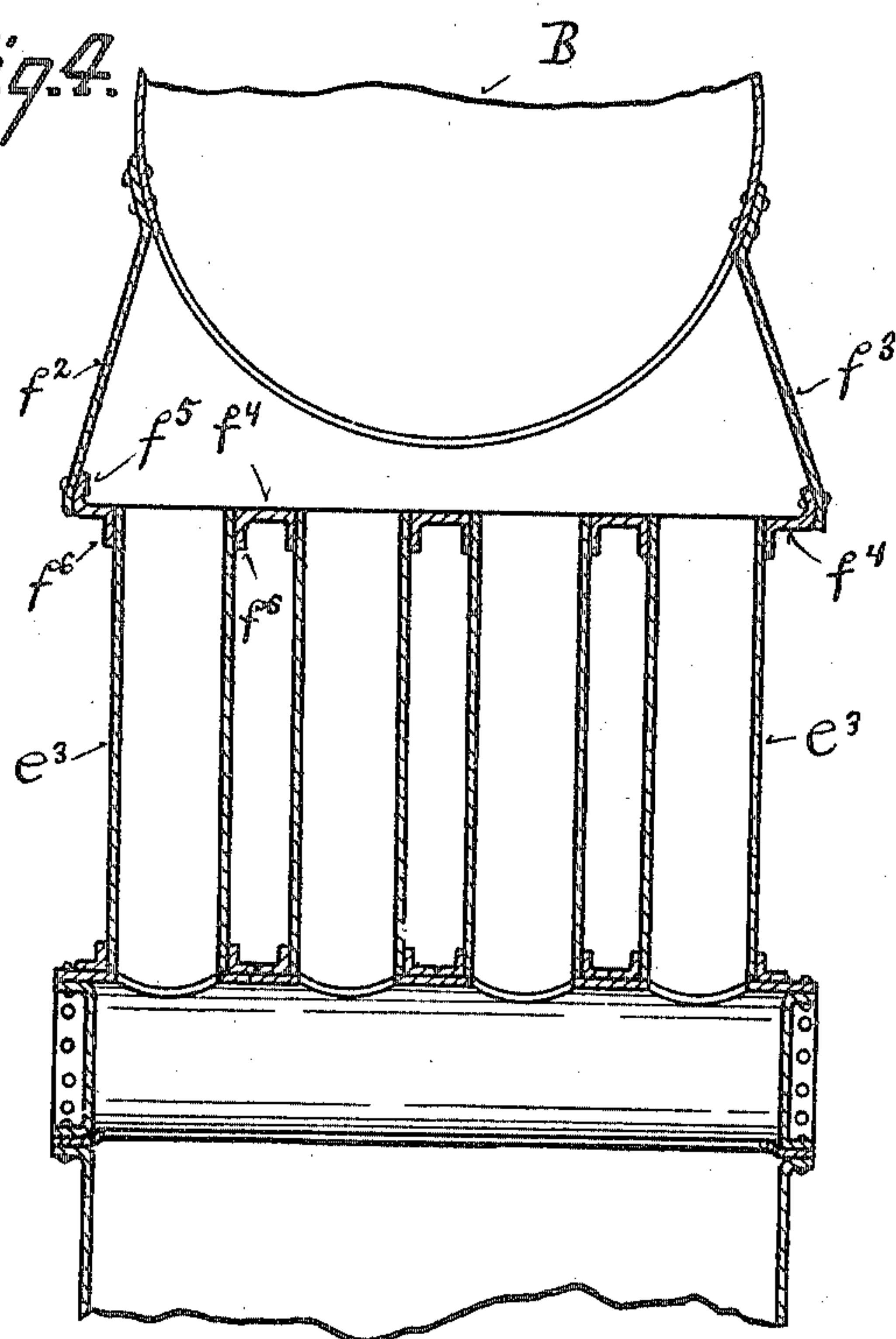
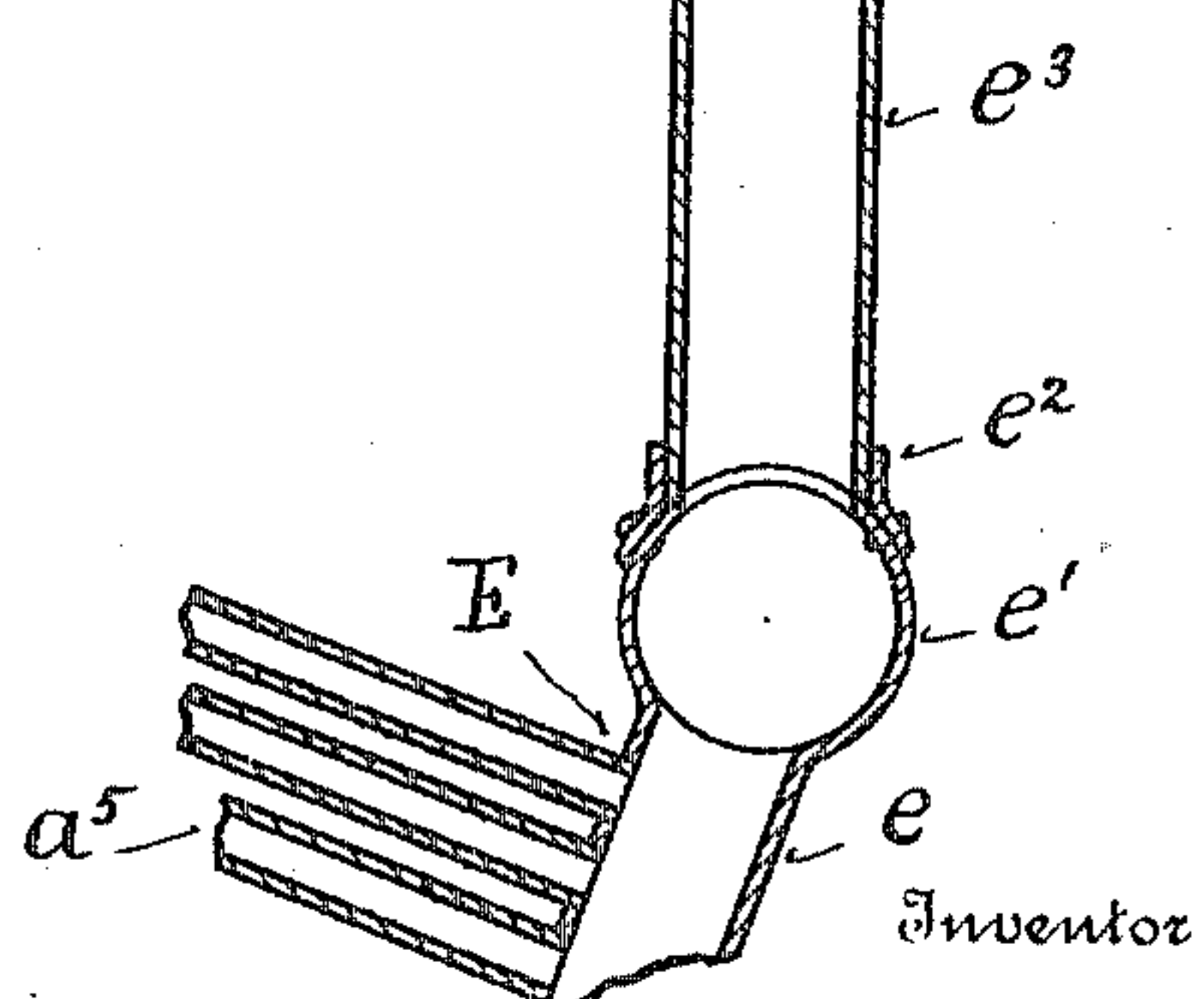


Fig. 5.



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UNITED STATES PATENT OFFICE.

FRANK P. COOPER, OF CINCINNATI, OHIO.

TUBULAR BOILER.

No. 811,547.

Specification of Letters Patent.

Patented Feb. 6, 1906.

Application filed December 22, 1904. Serial No. 237,886.

To all whom it may concern:

Be it known that I, FRANK P. COOPER, a citizen of the United States of America, and a resident of Cincinnati, county of Hamilton, State of Ohio, have invented certain new and useful Improvements in Tubular Boilers, of which the following is a specification.

The object of my invention is to increase the freedom of circulation and the heating-surface in tubular boilers. This object is attained by the means described in the specification, set forth in the claim, and illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of the interior view of a furnace, showing the tubular boiler embodying my invention. Fig. 2 is a detail view showing the cylindrical shell in front elevation, the front cross-box, and the top of the front header in cross-section. Fig. 3 is a detail view showing the front of the shell in partial side elevation and cross-section, the front cross-box in side elevation, and the front header in longitudinal section. Fig. 4 is a detail view showing the cylinder in rear elevation, the rear cross-box, the vertical pipes, and the top of the rear header in cross-section. Fig. 5 is a detail view showing the cross-box in side elevation and the vertical pipes and the rear header in longitudinal section.

Referring to the parts, the grate-bars a , bridge-wall a' , baffle-plates a^2 a^3 , baffle-wall a^4 , the series of inclined tubes a^5 , cylindrical shell B, with lugs for supporting it upon the side walls of the furnace and with its series of horizontal flues b , whereby the current of hot gases is compelled to follow the circuitous path up through tubes a^5 in front of baffle-plate a^2 , down through the tubes between baffle-plates a^2 a^3 , and up through the tubes back of baffle-plate a^3 , through flues b , and thence to the chimney, are of ordinary construction, and therefore need not be more specifically described.

At the forward end tubes a^5 are connected to the front header C, which is formed integral with the front cross-box C' , which is connected to the front of shell B. Header C consists of a rectangular chamber c , surmounted by a cylindrical chamber c' . The front and rear sides c^2 and c^3 of chambers c are made from two thicknesses of plate, the outer one being curved to form the walls of chamber c' and being slotted to form passage c^9 . The ends of chamber c are formed by rectangular plates c^4 c^5 , having outwardly-projecting

flanges c^6 , to be secured to sides c^2 c^3 . The ends of chamber c' are formed by circular disks c^7 , having flanges c^8 , to be secured to sides c^2 c^3 .

To the walls of chamber c' is secured cross-box D, which consists of front and rear plates d d' , having upper flanges d^2 d^3 , to be secured to shell B, and lower flanges d^4 d^5 , to be secured to the walls of cylindrical chamber c' . Between plates d d' are divided plates d^6 d^7 , having flanges d^8 d^9 at their lower ends to be secured to chamber c' , and flanges d^{10} d^{11} , to be secured to shell B. Shell B and chamber c' have openings b^2 and c^9 , registering with upper and lower open ends of cross-box D, so that the circulation of water between the front header, the cross-box, and the front of the cylindrical shell B is unimpeded.

At their rear ends tubes a^5 are secured to a header E, which consists of a rectangular chamber e and a cylindrical chamber e' , both of which are formed in a manner similar to that of header C. Cylindrical shell e' , however, has a series of annular flanges e^2 struck up from its upper surface, which receive and are riveted to the lower ends of vertical pipes e^3 . Between each of pipes e^3 a space sufficient for a free passage of the heated gases from the grate-bars is left. At their upper ends pipes e^3 are secured to the rear cross-box F, which consists of front and rear plates f f' , having flanges to be secured to shell B, end plates f^2 f^3 , and a lower plate f^4 , which has around its edges upturned flange f^5 , to be secured to plates f f' f^2 f^3 , and has struck down from it annular flange f^6 , to be secured to the upper end of pipes e^3 .

It is seen that the capacity of header C, cross-box D, and the openings between them and shell B are large, as likewise is that of box F, pipes e^3 , and header E. Therefore in operation heated water from pipes a^5 rises unimpeded into the header and thence into shell B, and likewise the circulation from shell B into header E is free. It is seen, likewise, that the construction of vertical pipes e^3 increases the heating-surface materially, while at the same time enabling me to secure as large an inclination to tubes a^5 as desired to get the proper circulation, while at the same time keeping the shell B in a horizontal position to prevent the danger of burning out flues b .

What I claim is—

In a tubular boiler the combination of a horizontal cylindrical shell with tubes extend-

ing therethrough and slots in its ends, a series of inclined tubes, headers at the upper and lower ends of the tubes each consisting of a rectangular chamber surmounted by
5 a cylindrical chamber, the front cylindrical chamber having a slot in its upper surface and the rear cylindrical chamber having a series of openings in its upper surface, a front cross-box secured over the forward slot in
10 the shell, and over the slot in the cylin-

dricai chamber, the rear cross-box secured over the rear slot in the shell and having a series of openings in its lower wall, and a series of vertical pipes secured in the openings of the rear cross-box and the rear cylindrical chamber.

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Witnesses:

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