

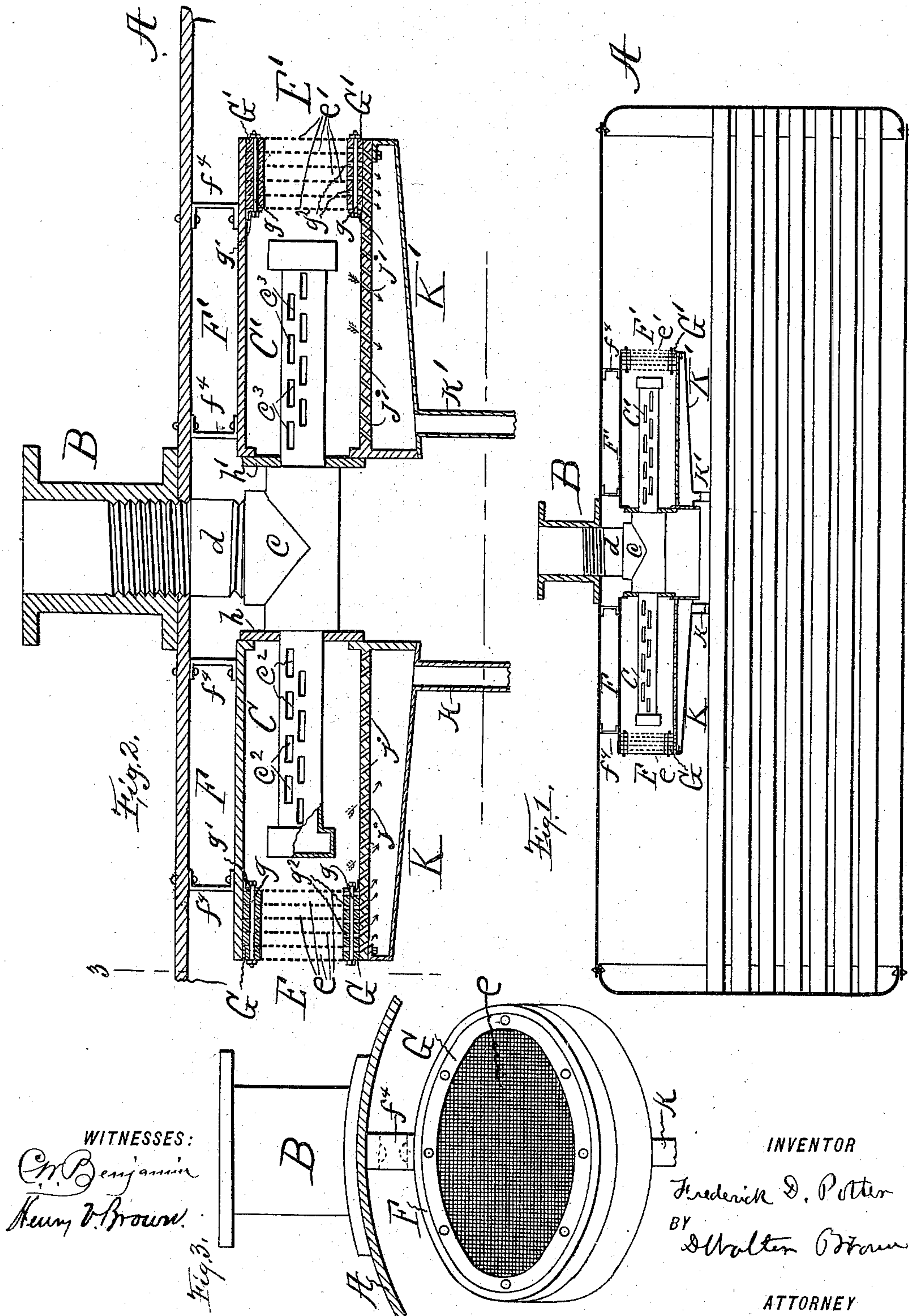
(No Model.)

3 Sheets—Sheet 1.

F. D. POTTER.  
STEAM AND WATER SEPARATOR.

No. 558,984.

Patented Apr. 28, 1896.



WITNESSES:  
*C. P. Benjamin*  
*Henry D. Brown*

INVENTOR

*Frederick D. Potter*  
BY *Walter Brown*

ATTORNEY

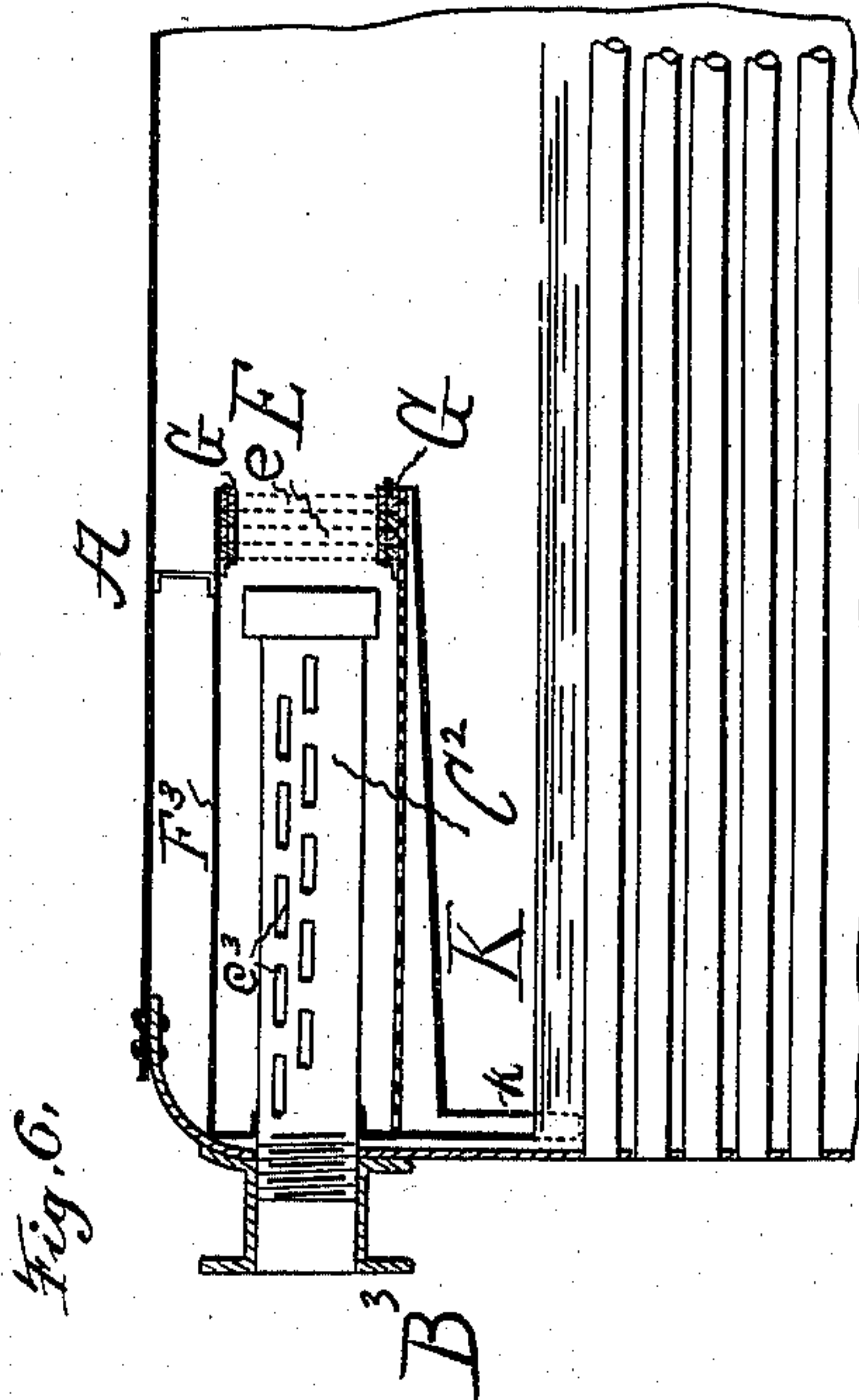
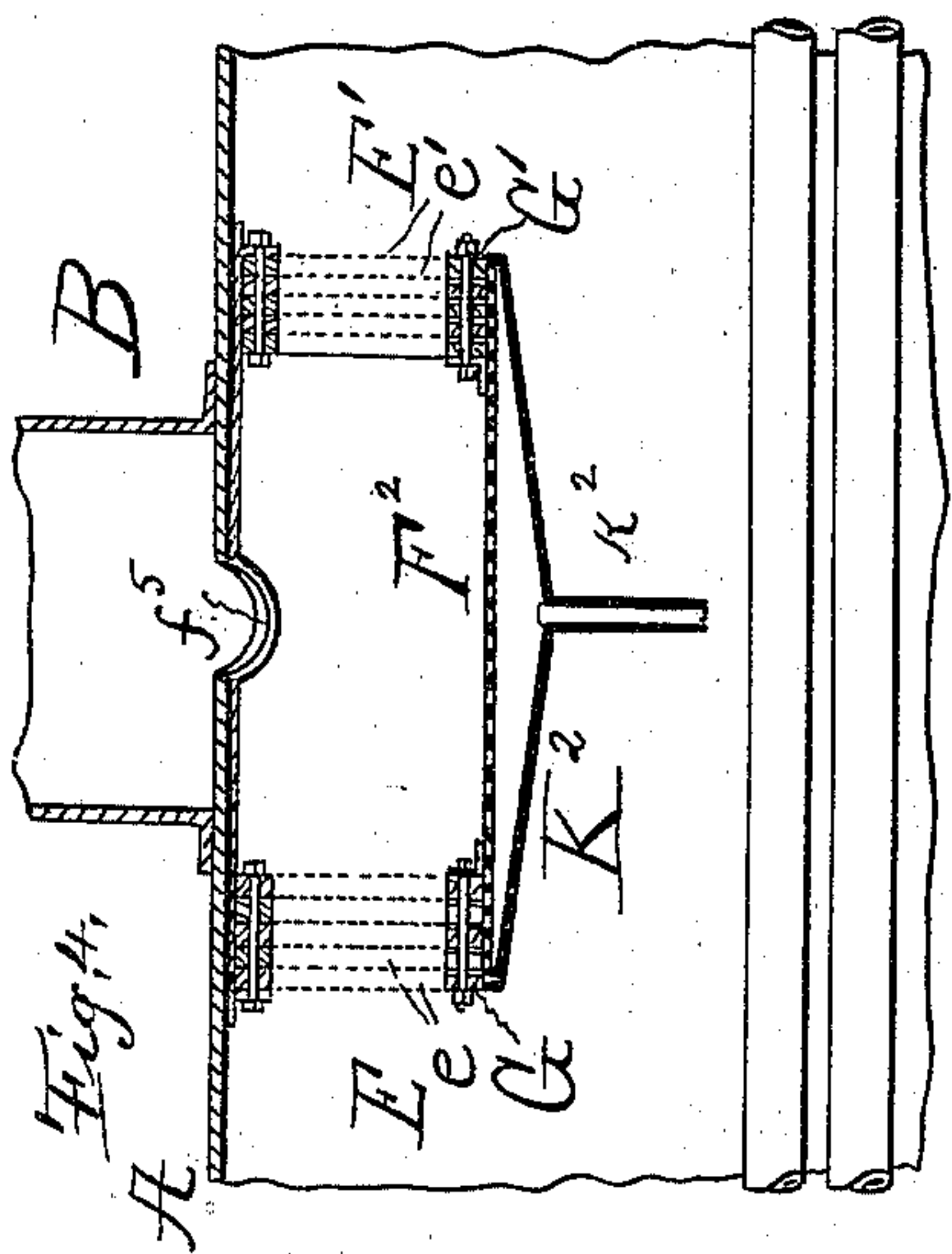
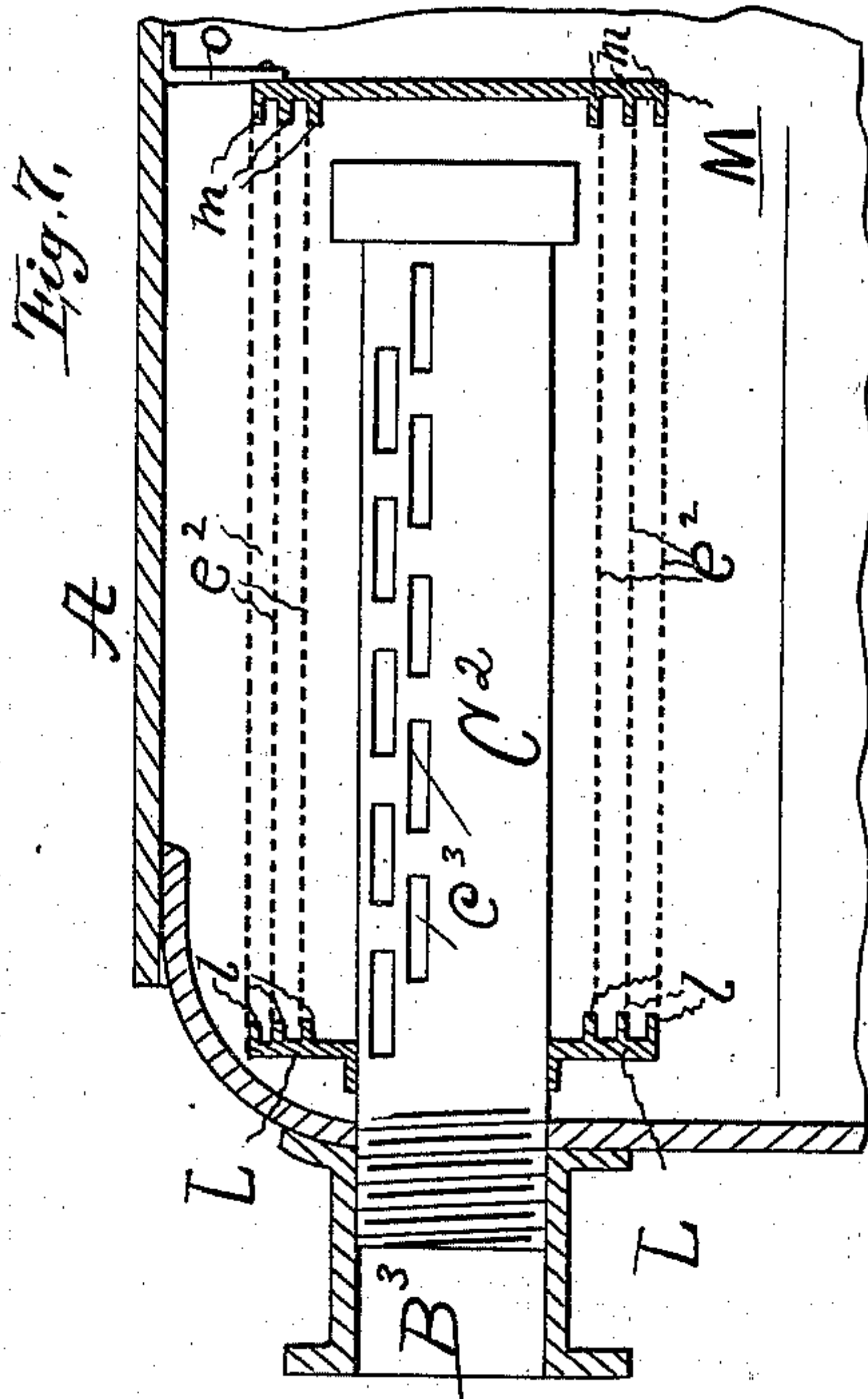
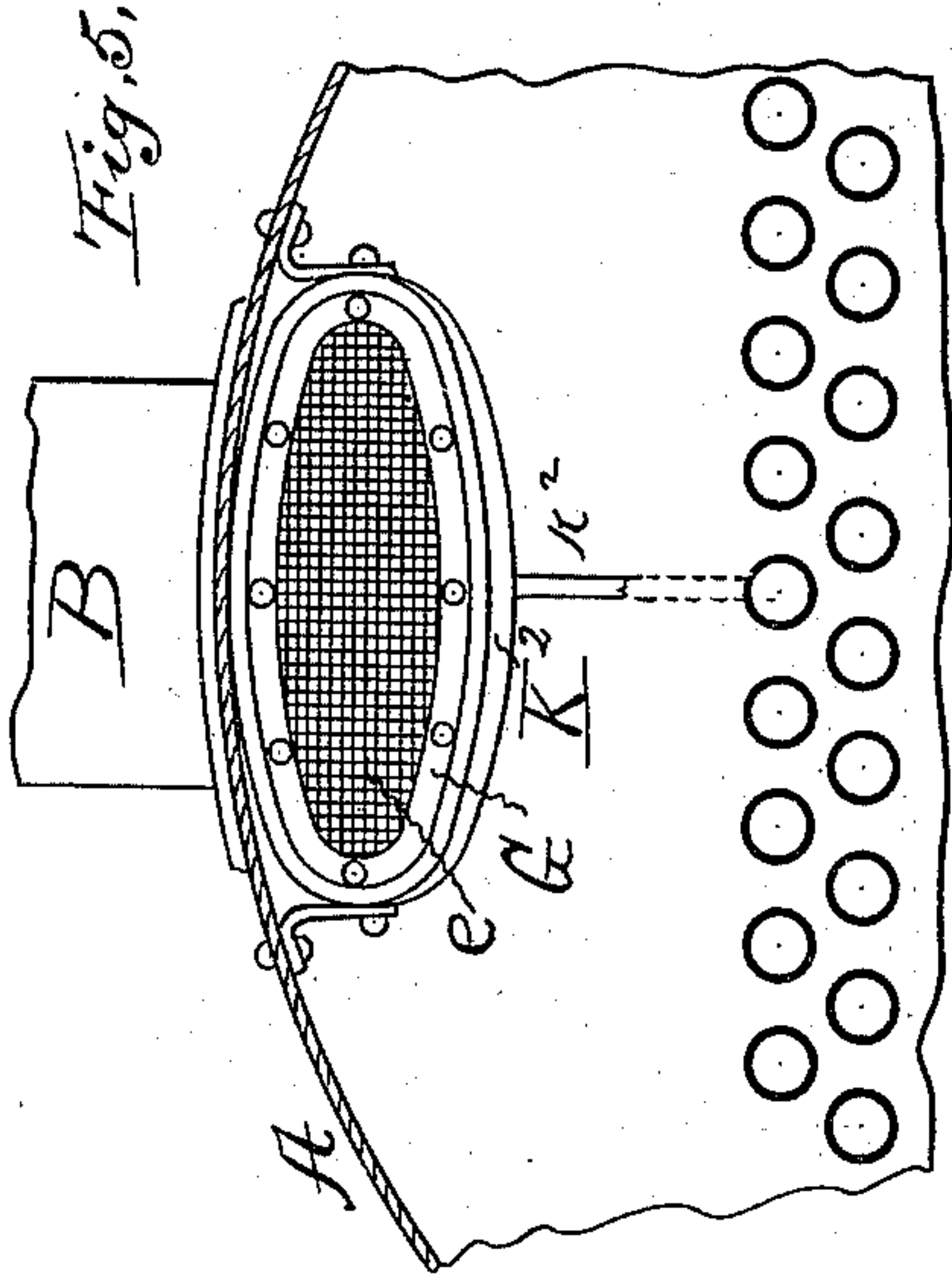
(No Model.)

3 Sheets—Sheet 2.

F. D. POTTER.  
STEAM AND WATER SEPARATOR.

No. 558,984.

Patented Apr. 28, 1896.



WITNESSES:  
*C. N. Benjamin*  
*Henry V. Brown.*

INVENTOR  
*Frederick D. Potter*  
BY  
*Walter Brown*  
ATTORNEY

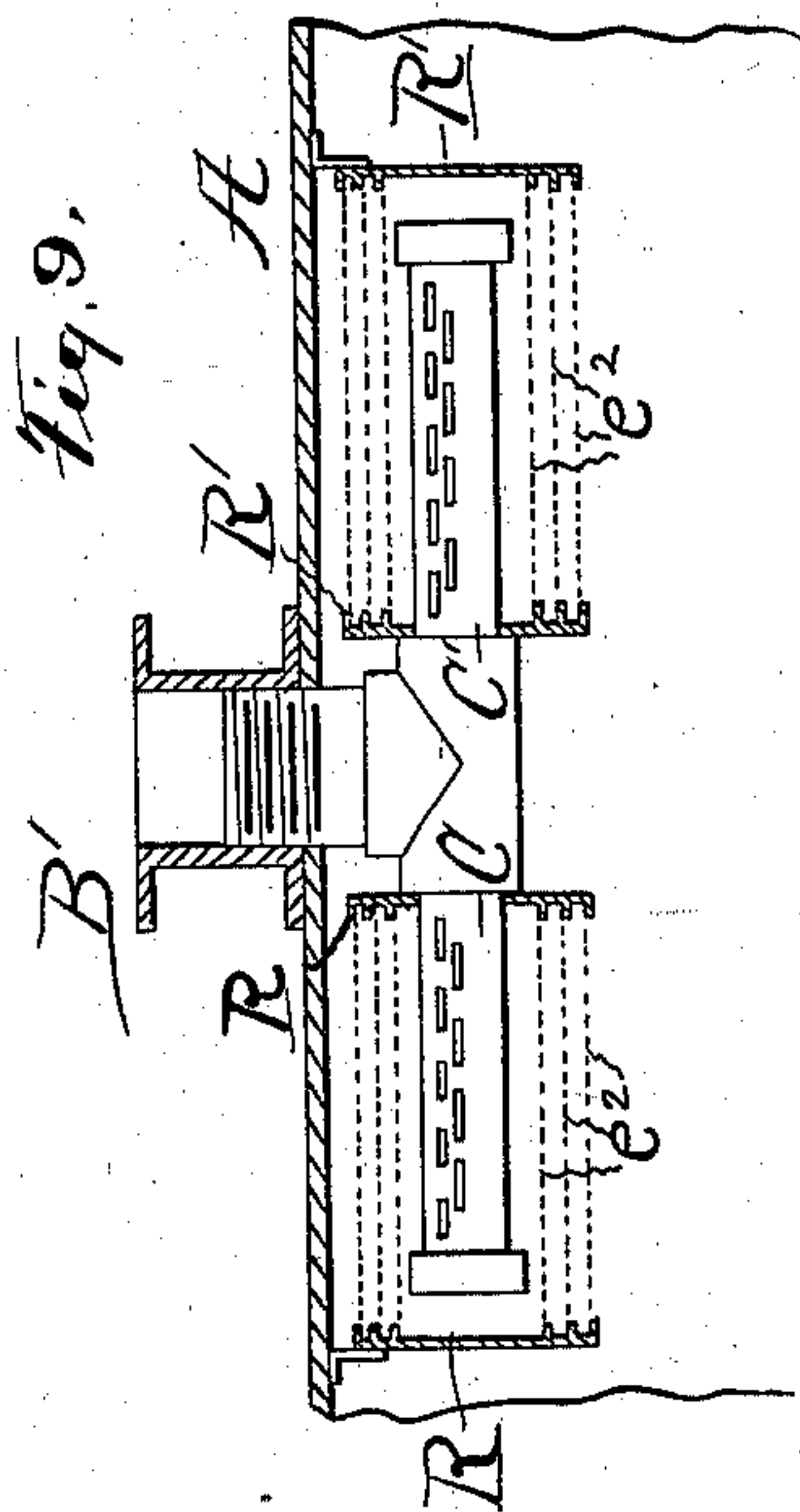
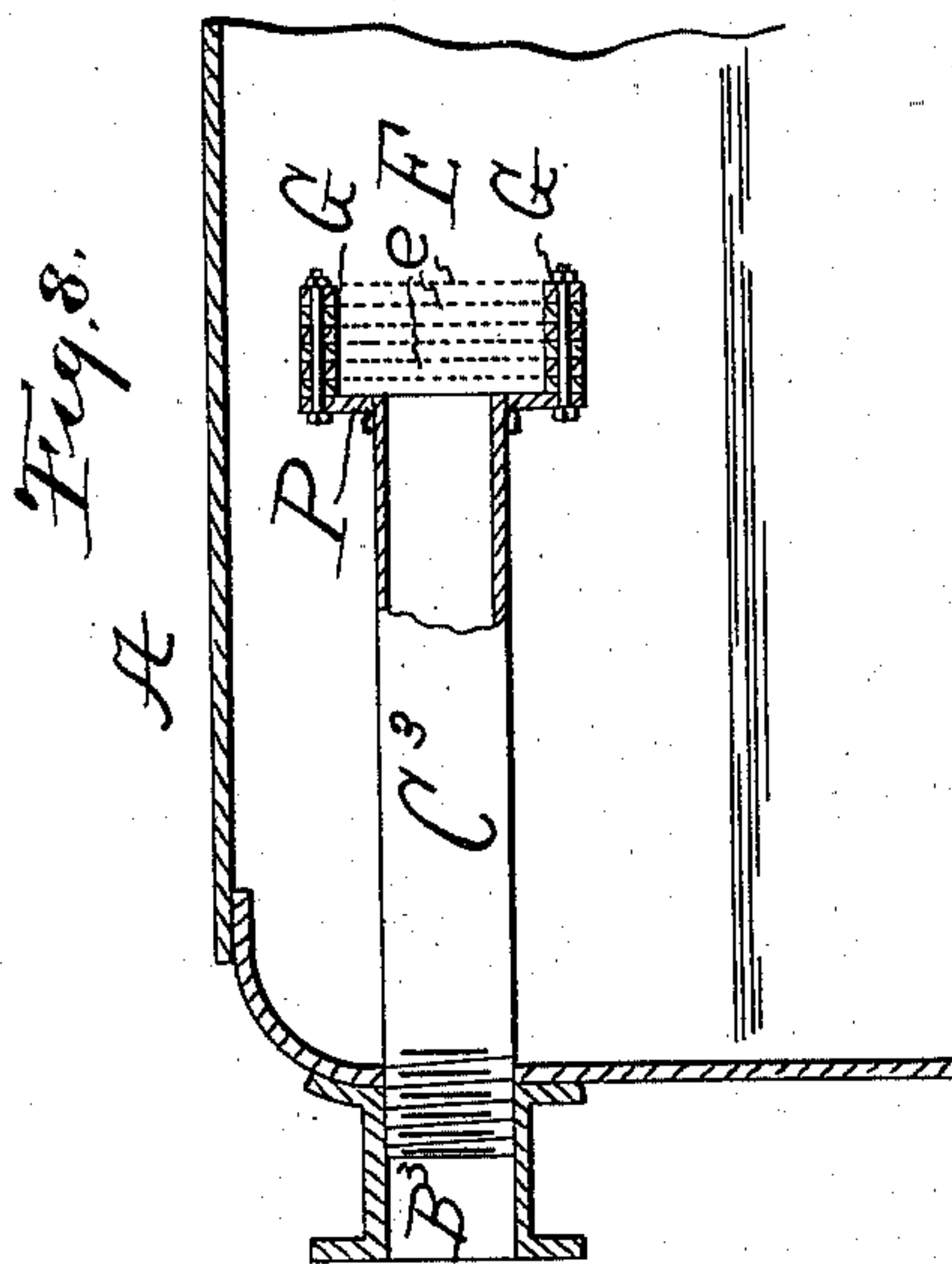
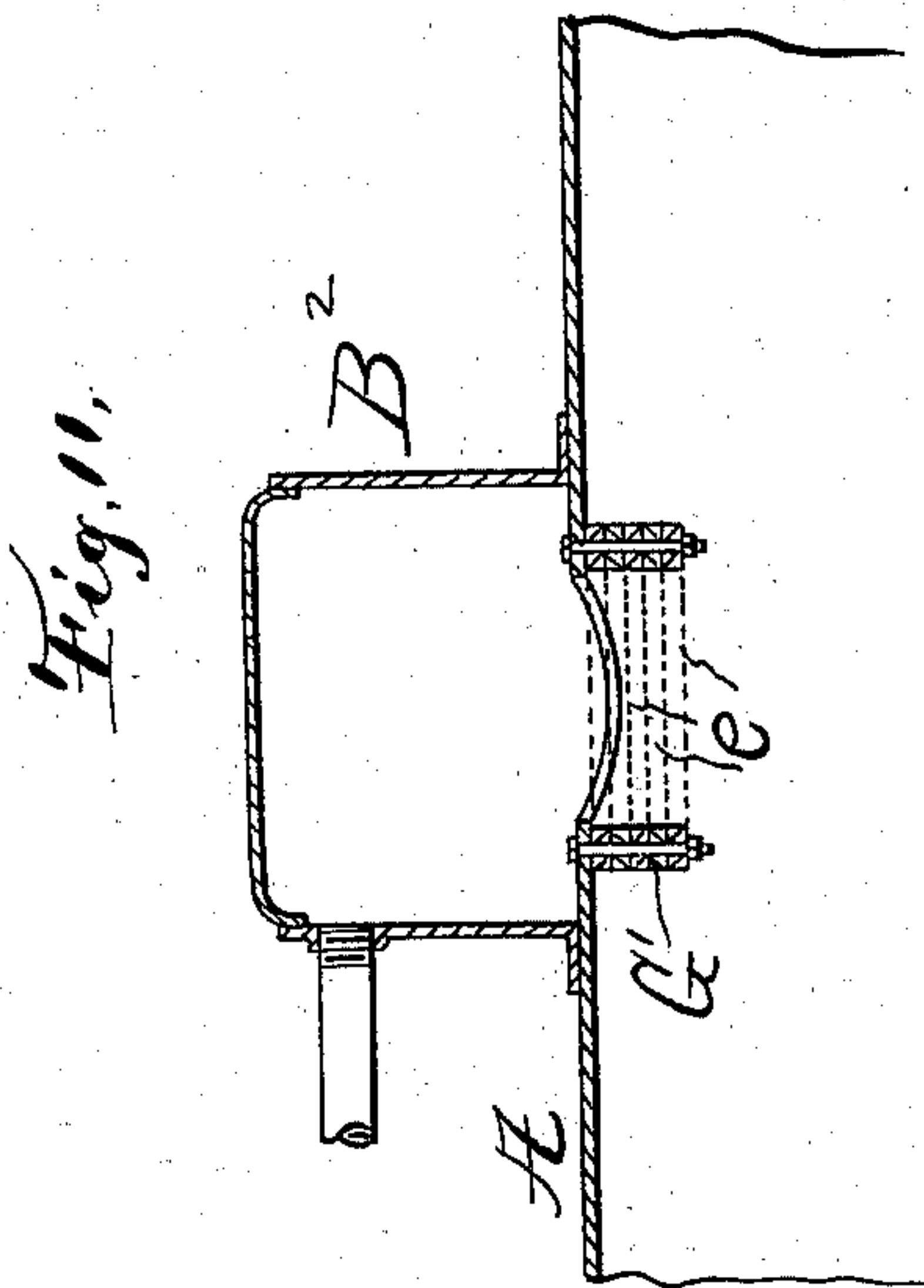
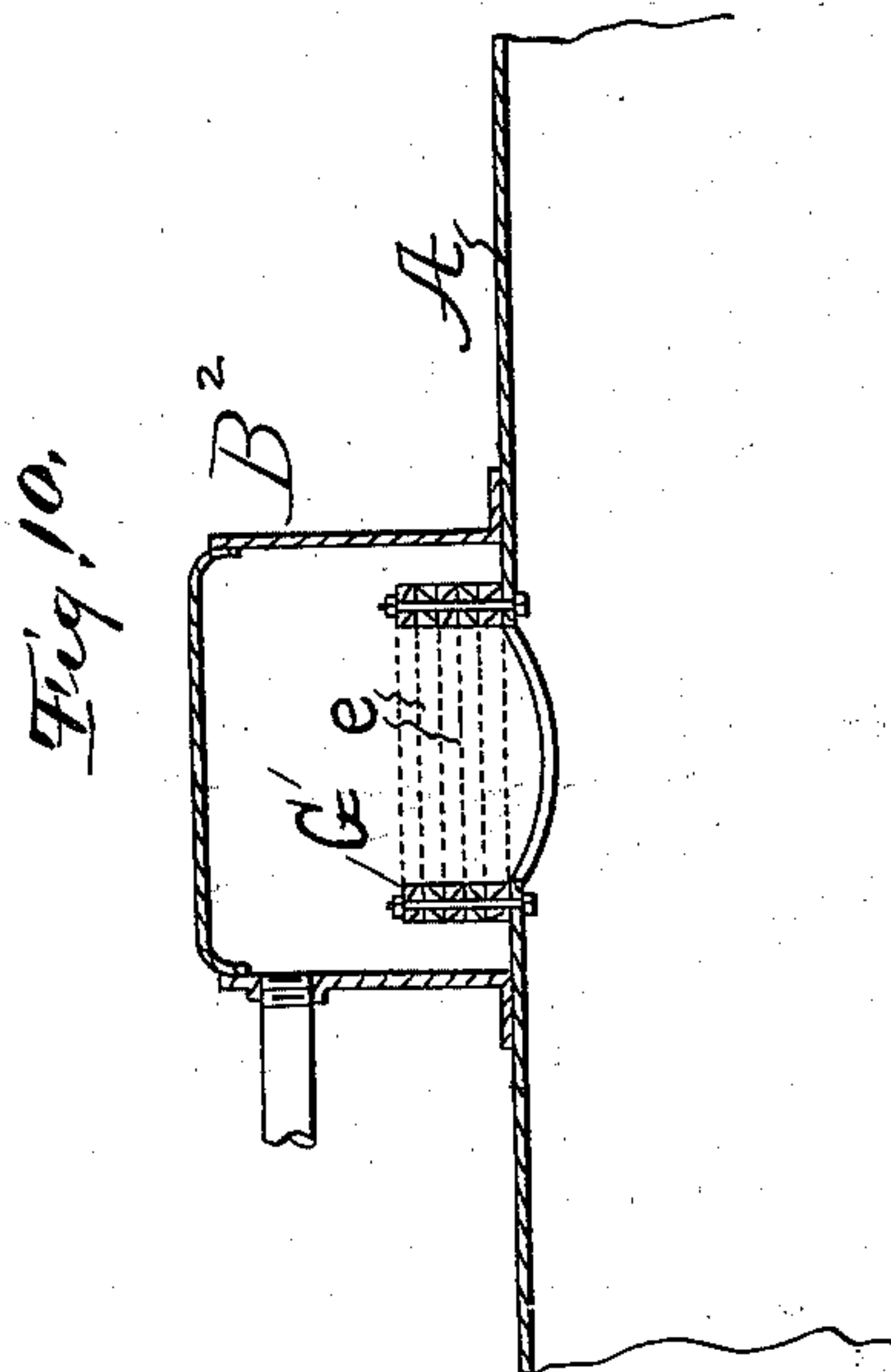
(No Model.)

3 Sheets—Sheet 3.

F. D. POTTER.  
STEAM AND WATER SEPARATOR.

No. 558,984.

Patented Apr. 28, 1896.



WITNESSES:

C. W. Benjamin  
Henry V. Brown.

INVENTOR  
Frederick D. Potter

BY  
Walter Brown

ATTORNEY



# UNITED STATES PATENT OFFICE.

FREDERICK D. POTTER, OF LINDEN, NEW JERSEY.

## STEAM AND WATER SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 558,984, dated April 28, 1896.

Application filed January 4, 1896. Serial No. 574,396. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERICK D. POTTER, a citizen of the United States, and a resident of Linden, Union county, New Jersey, have  
5 invented a certain new and useful Improvement in Steam and Water Separators, of which the following is a specification.

My invention relates to improvements in steam and water separators whereby dry  
10 steam is furnished to engines and other apparatus using steam.

The essence of my invention consists in interposing between the chamber where the steam is generated and the apparatus where  
15 it is used a chamber or shell having a plurality of layers of relatively fine wire mesh. By thus interposing the mesh, all the steam consumed is required to pass through the mesh before reaching the apparatus consum-  
20 ing it. Now the layers of the mesh produce in effect intricate channels, through which only the dry steam is able to flow, while the entrained water particles are arrested by the wires of the mesh and trickle back into the  
25 body of water from which the steam is generated. Practically speaking, the entrained water remains on the outside of the mesh, only the dry steam reaching the inside thereof.

In arrangement and mode of operation, my  
30 invention is exactly the opposite of the separators heretofore used, so far as I am acquainted with them. In them the steam and entrained water are on the inside of the separator and between that and the pipe that  
35 leads to the apparatus where the steam is consumed, and it is supposed that the motion of the steam will project the entrained water against points and through orifices in the separator to the outside thereof, leaving  
40 only the steam in its original position on the inside; but such separators are very imperfect in their action. It is not necessary, and it is not intended in them, that the steam and water shall pass through the wall of the sep-  
45 arator, and consequently a certain portion of the steam with the entrained water never comes into contact with the separator, but goes directly to the apparatus; also, when the consumption of steam is great, the rapid flow  
50 of the steam sweeps a certain portion of the entrained water past the orifices of the sepa-

rator, which with small steam-consumption would have passed out through the orifices.

The experiments of some months with my invention show that it obviates both the  
55 above defects and delivers practically perfectly dry steam to the apparatus.

In my invention the steam and entrained water are required to pass through fine open-  
60 ings of meshes or other diaphragms, which are set in the live-steam space of the boiler, the openings being approximately the size of the globules of the entrained water, in this manner developing relatively great friction, by which, first, the steam and entrained wa-  
65 ter are superheated to above the temperature at which the steam was originally formed in the boiler, and, second, the pressure between the meshes is somewhat reduced below that in the boiler. Under these circumstances  
70 any globules of water that pass through the meshes flash immediately into steam, and only dry steam is delivered to the apparatus. The friction also raises the temperature of the meshes, and when the minute globules of  
75 water contained in the steam strike the first layers of the mesh they are broken into still more minute globules, and these on coming into contact with the meshes of a higher temperature are flashed into steam.  
80

In the accompanying drawings I show my invention applied in a variety of ways ac-  
85 cording to common practice with steam-boilers; but in all cases the essential idea of the invention remains the same.

Referring to the said drawings, Figure 1 is a sectional elevation of the invention applied at the ends of a chamber which incloses the dry-pipe. Fig. 2 is a sectional elevation of the same parts, on a much larger scale, the  
90 shell of the boiler being broken; and Fig. 3 is an end elevation of the separator. Fig. 4 is a section of the separator applied immediately under the dome of a boiler without a dry-pipe, and Fig. 5 is an end elevation of the  
95 same. Fig. 6 is a section of the separator applied at the end of a chamber which surrounds the dry-pipe when the dry-pipe is arranged at the head of a boiler. Fig. 7 is a section showing the separator arranged around  
100 the periphery of the chamber. The dry-pipe has the same position as in Fig. 6. Fig. 8 is



a section showing the separator arranged directly on the end of the dry-pipe. Fig. 9 is a section showing the separator arranged on the periphery of the chamber which incloses the dry-pipe, said dry-pipe being arranged as in Fig. 1. Fig. 10 is a section showing the separator arranged on the outside of the boiler-shell and within the dome. Fig. 11 is a section showing the separator arranged on the inside of the boiler-shell below the dome. In Figs. 4 to 11, inclusive, the shell of the boiler is shown broken.

Referring to Figs. 1, 2, and 3, A is a boiler; B, the steam-nozzle; C C', branches of a dry-pipe; d, a nipple connecting the T c with the nozzle B. The separators E E' are arranged across the open ends of shells F F'. The said shells or chambers F F' are formed of sheet metal supported concentrically to the branches C C' by angle-irons  $f^4 f^4$ , as shown, or in any other suitable manner. At their inner ends said shells F F' are closed by washers  $h h'$  of any suitable material. Perforations  $j j'$ , preferably inclined, as shown, are made in the lower part of said shells F F' to permit water of condensation to drip into the pans K K', which are arranged under said shells. Said pans K K' are secured to the shells F F' in any suitable manner and are provided at their lowest part with drip-pipes  $k k'$ , which lead below the water-level of the boiler A. Said separators E E' are each composed of a plurality of layers  $e e'$  of fine iron wire mesh, the mesh being held between rings G G', which are held together by bolts  $g$  and are secured to their respective shells or chambers F or F' by angle-irons  $g'$  and bolts or rivets. The under sides of said rings G have through-and-through grooves  $g^2$ , which form holes, when the rings are assembled, for the escape of the entrained water from the interior of the rings (should any water get through the first layers of mesh) to the pans K K'. Said branches C C' of the dry-pipe are closed at the ends and have openings  $c^2 c^3$  for the entrance of the dry steam.

Referring to Figs. 4 and 5, the separators E E', constructed with rings G G' and mesh  $ee'$ , as described herein, are secured at the ends of a shell F<sup>2</sup>, which is fixed to the shell of the boiler below the nozzle or dome B, said shell F<sup>2</sup> having an opening  $f^5$ , leading to the dome. K<sup>2</sup> is a pan with drip-pipe  $k^2$ , each arranged substantially as described.

In Fig. 6 the separator E, constructed of rings and mesh, as before described, is placed at only one end of the shell F<sup>3</sup>, which is arranged around the dry-pipe C<sup>2</sup>, said dry-pipe now connecting with a flange-pipe B<sup>3</sup> on the end of the boiler. Said dry-pipe is closed at the inner end and has holes  $c^3$ , as before described. In this construction the aforesaid pan K may be omitted, as well as the grooves  $g$  through the lower part of the rings G, and the lower part of the shell F<sup>3</sup> may be formed with a slope. The drip-pipe  $k$  can then lead directly

from said shell F<sup>3</sup> to below the water-level of the boiler A, or a pan K may be used, as shown.

Referring to Fig. 7, the dry-pipe C<sup>2</sup> is constructed and arranged like that shown in Fig. 6, but the separator is now made with mesh  $e^2$ , arranged in concentric cylindrical layers around said dry-pipe. At one end said layers of mesh are secured to cylindrical ribs  $l$  of a plate L, that is fixed on the dry-pipe C<sup>2</sup> near the shell of the boiler A, and at the other end to similar ribs  $m^2$  on a plate M, which plate is supported in any suitable manner, as by angle-irons  $o$ . To facilitate securing said plate L to the pipe C<sup>2</sup> the said plate will be conveniently made in two semiannular parts bolted together after being placed on the pipe C<sup>2</sup>.

Referring to Fig. 8, the dry-pipe C<sup>3</sup> is open at the inner end and has no holes in its length. The rings G of the separator are now bolted to a plate P, that is fixed on the end of the said dry-pipe. The layers of mesh  $e$  are arranged between the rings G, as shown in Fig. 2, but the grooves in the lower part of said rings may be omitted.

Referring to Fig. 9, the dry-pipe C C' is arranged as shown in Figs. 1 and 2, but the separator is now made of cylinders of mesh arranged concentrically around the branches of said dry-pipe C C' and fastened to ribs of plates R R' in a manner similar to that shown in Fig. 7.

It will be perceived that in the arrangement of each, Figs. 7 and 9, the shells F F' and pans K K' are omitted.

Referring to Fig. 10, the rings G' of the mesh are built on the shell of the boiler within the dome, and, referring to Fig. 11, the said rings G' are arranged on the inside of the shell of the boiler. The operation is evident.

It will be seen that in all the arrangements of the invention the separator is arranged between the space where the steam is generated (the boiler, for example) and the mouth of the pipe which conveys the steam to the apparatus where it is used. Thus the whole body of steam consumed has to pass through the mesh of the separator before it can reach said pipe, and the entrained water is intercepted by the mesh of the separator and drips back to the boiler.

In place of making the shells F F' in one piece, I can make them in two halves, bolted together to facilitate introducing them into the manhole of a boiler.

In place of fine wire mesh, as described, I can use a plurality of partitions of thin sheets perforated with small holes, but I prefer the mesh.

It will be observed on inspection of the drawings that in each case the steam with the entrained water is obliged to pass through fine meshes before it comes to the steam-delivery pipe, and that the superheating effect hereinbefore described takes place, so that



only dry steam reaches the delivery-pipe and goes to the apparatus.

Now, having described my improvements, I claim as my invention—

5 1. The combination with a steam-generator and a steam-delivery pipe thereof, of a chamber situated in the steam-space of said generator, and having walls composed of a plurality of layers of wire mesh, and said layers  
10 interposed between the steam-space of the generator and said steam-delivery pipe, substantially as described.

15 2. The combination with a steam-generator of a separator inserted in the steam-space of the generator and provided with a plurality of rings and partitions of fine mesh held between the rings, and said separator being placed between the steam-outlet pipe and the

steam-space of the generator, substantially as described.

20 3. The combination with a steam-generator, of a separator inserted in the steam-space of the generator and between the same and the steam-outlet pipe, a plurality of rings in said chamber provided with drip-channels, and  
25 a finely-perforated partition between said rings, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 28th day of October, 30 1895.

FREDERICK D. POTTER.

Witnesses:

HENRY V. BROWN,  
BERNARD J. ISECKE.