

No. 786,764.

G. R. HISLOP.

PATENTED APR. 4, 1905.

STEAM BOILER OR LIKE FURNACE.

APPLICATION FILED JAN. 26, 1904.

3 SHEETS—SHEET 1.

Fig. 1.

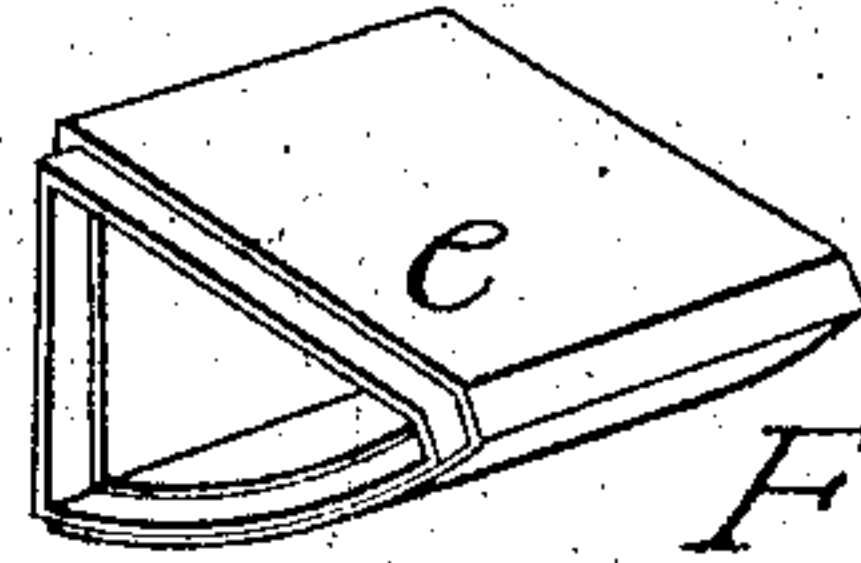
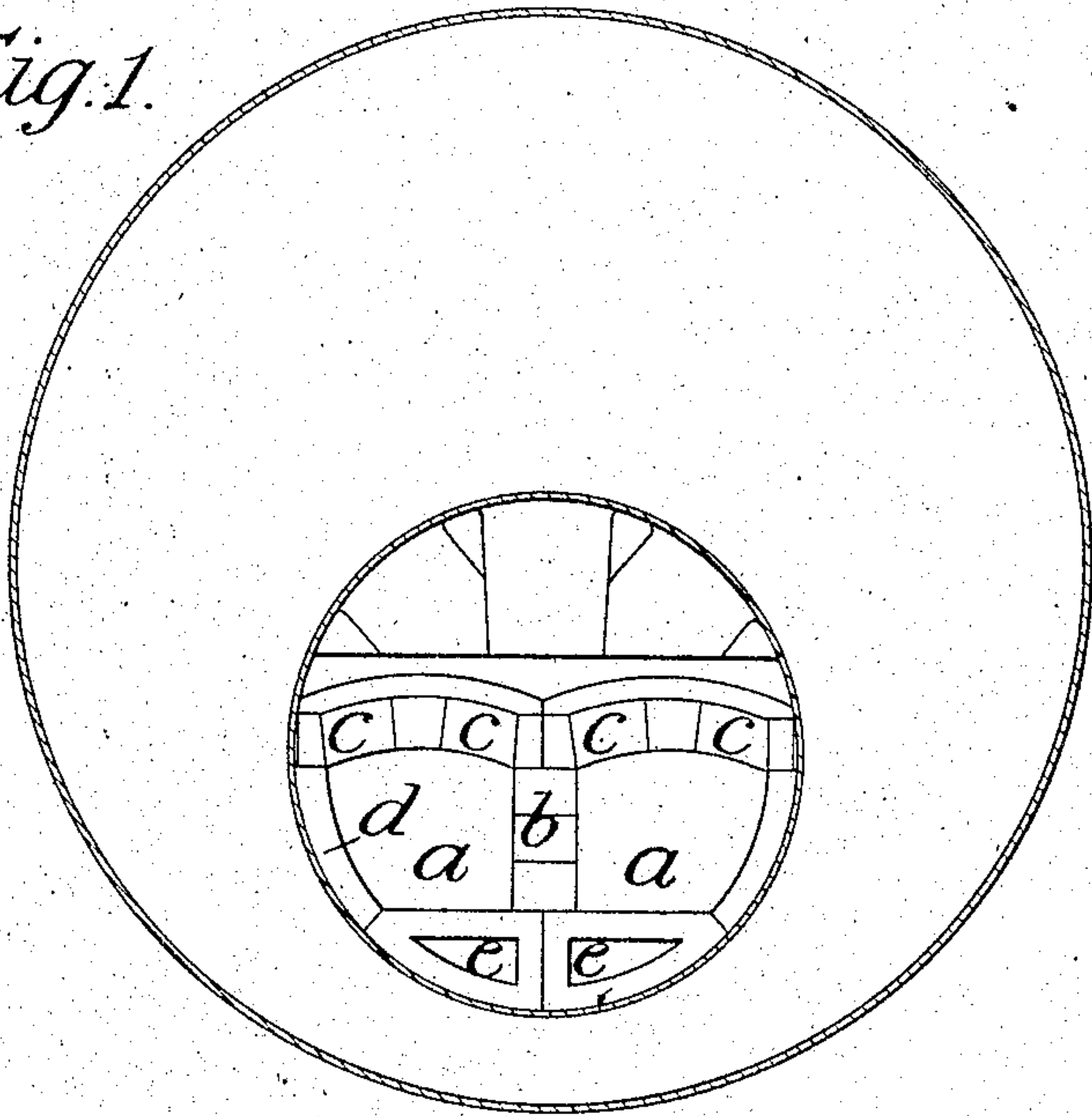


Fig. 9.

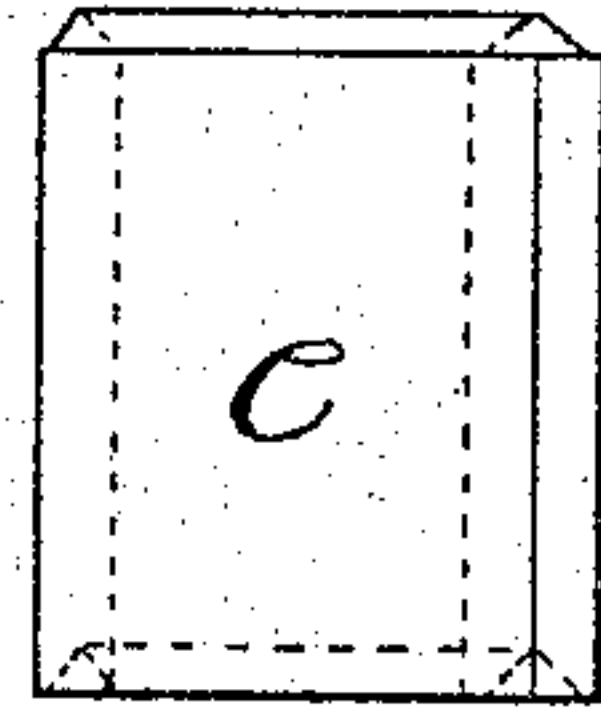


Fig. 10.

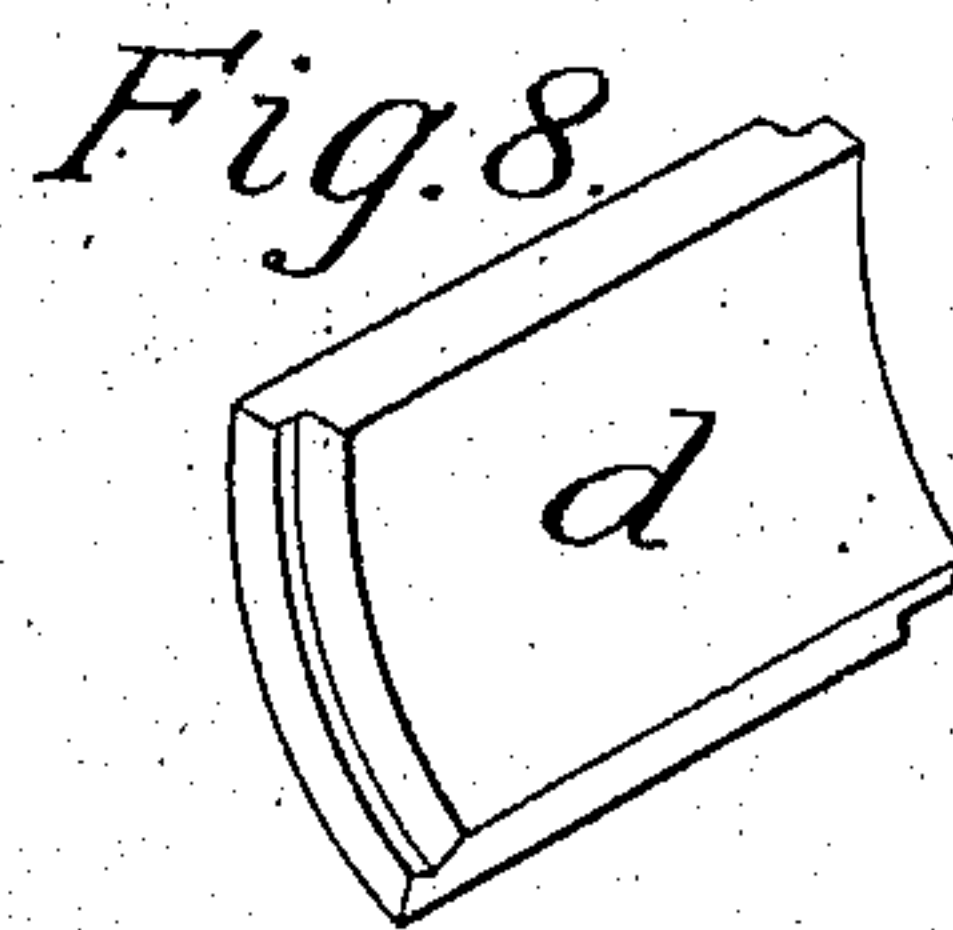


Fig. 8.

Fig. 4.

Fig. 2.

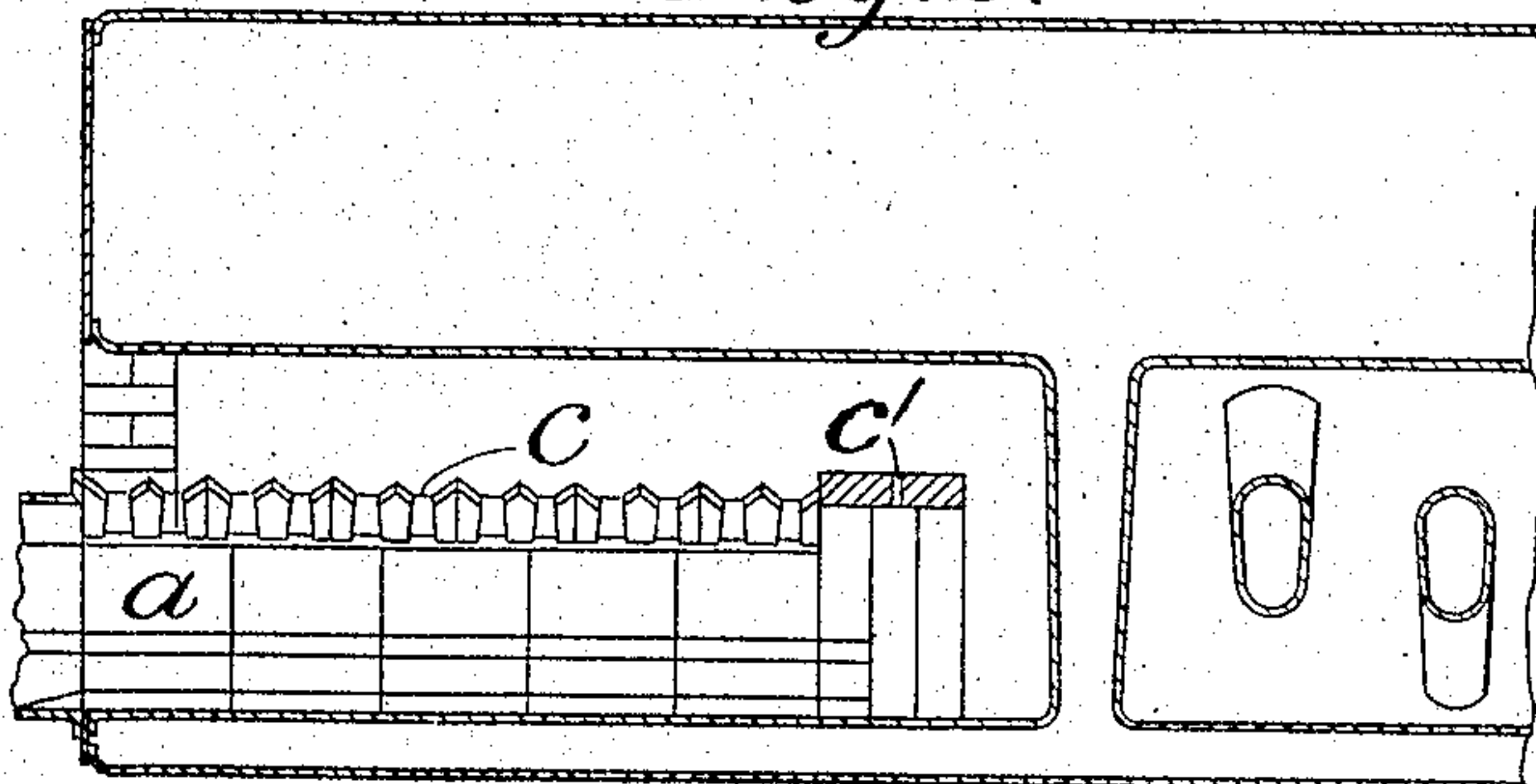


Fig. 5.

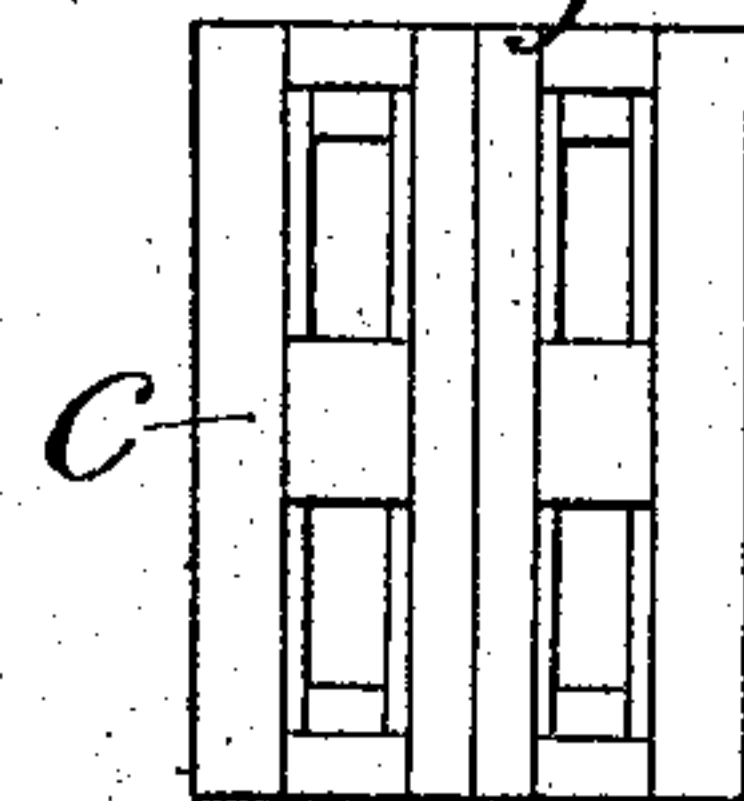


Fig. 6.

Fig. 3.

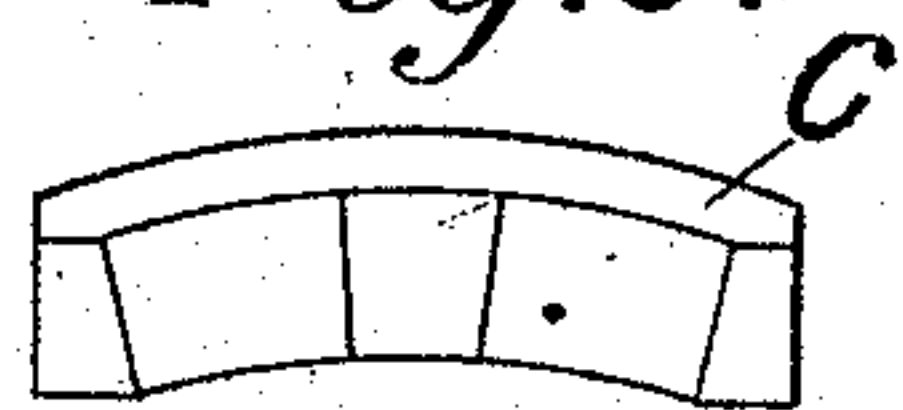
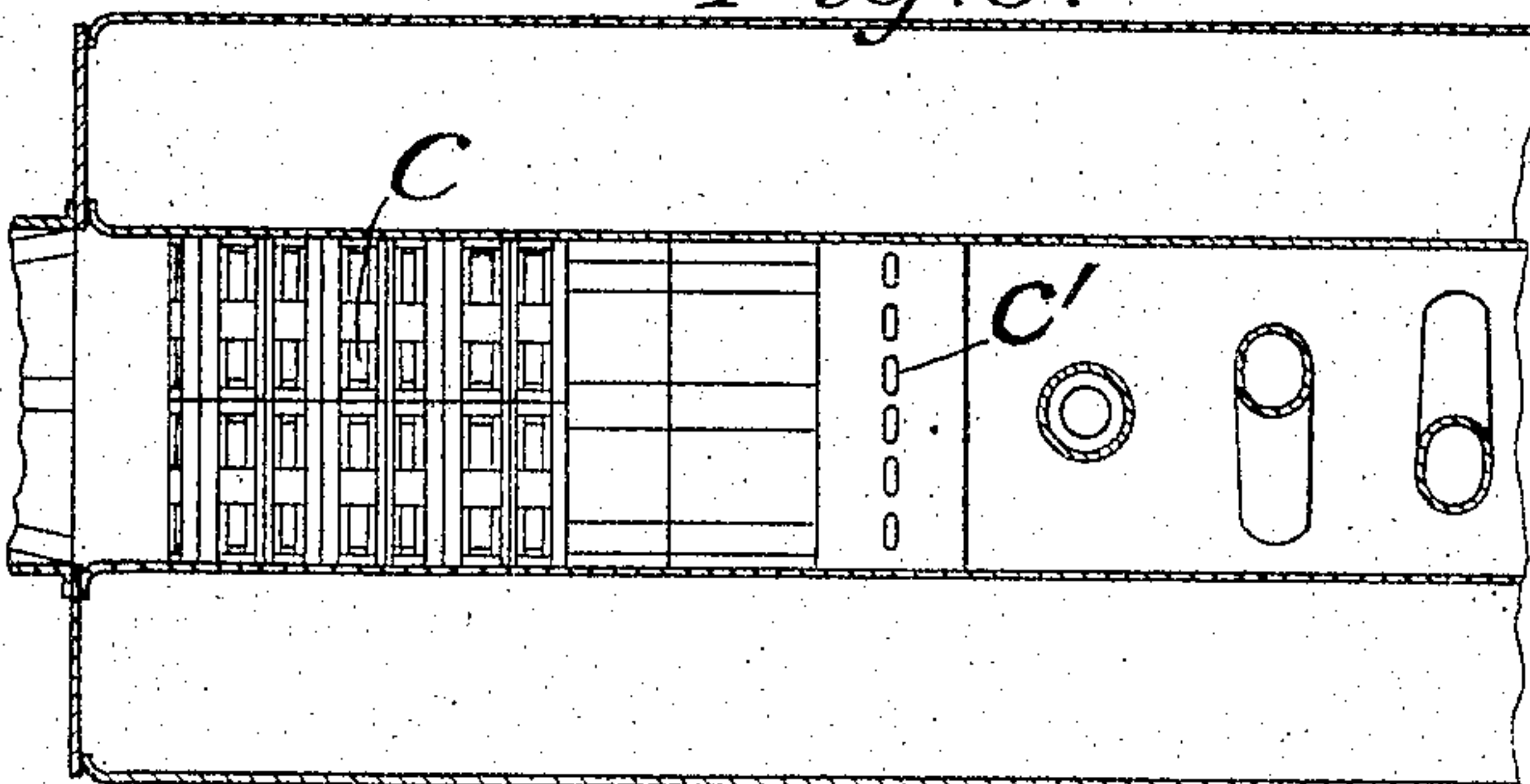
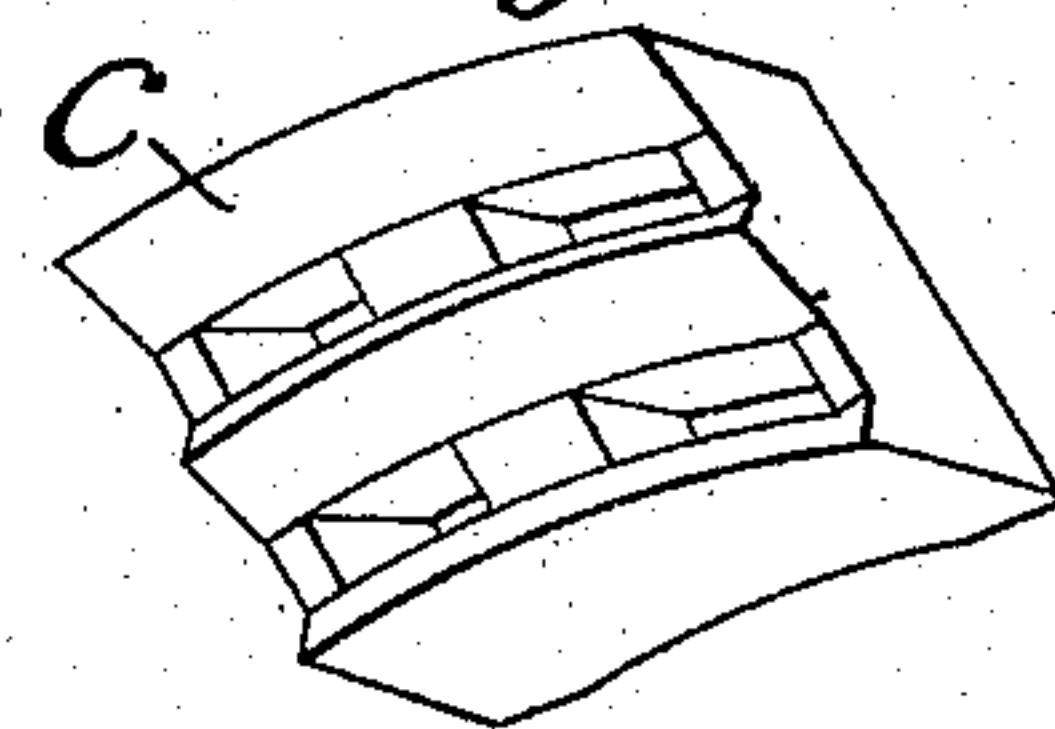


Fig. 7.



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3 SHEETS—SHEET 2.

Fig. 11.

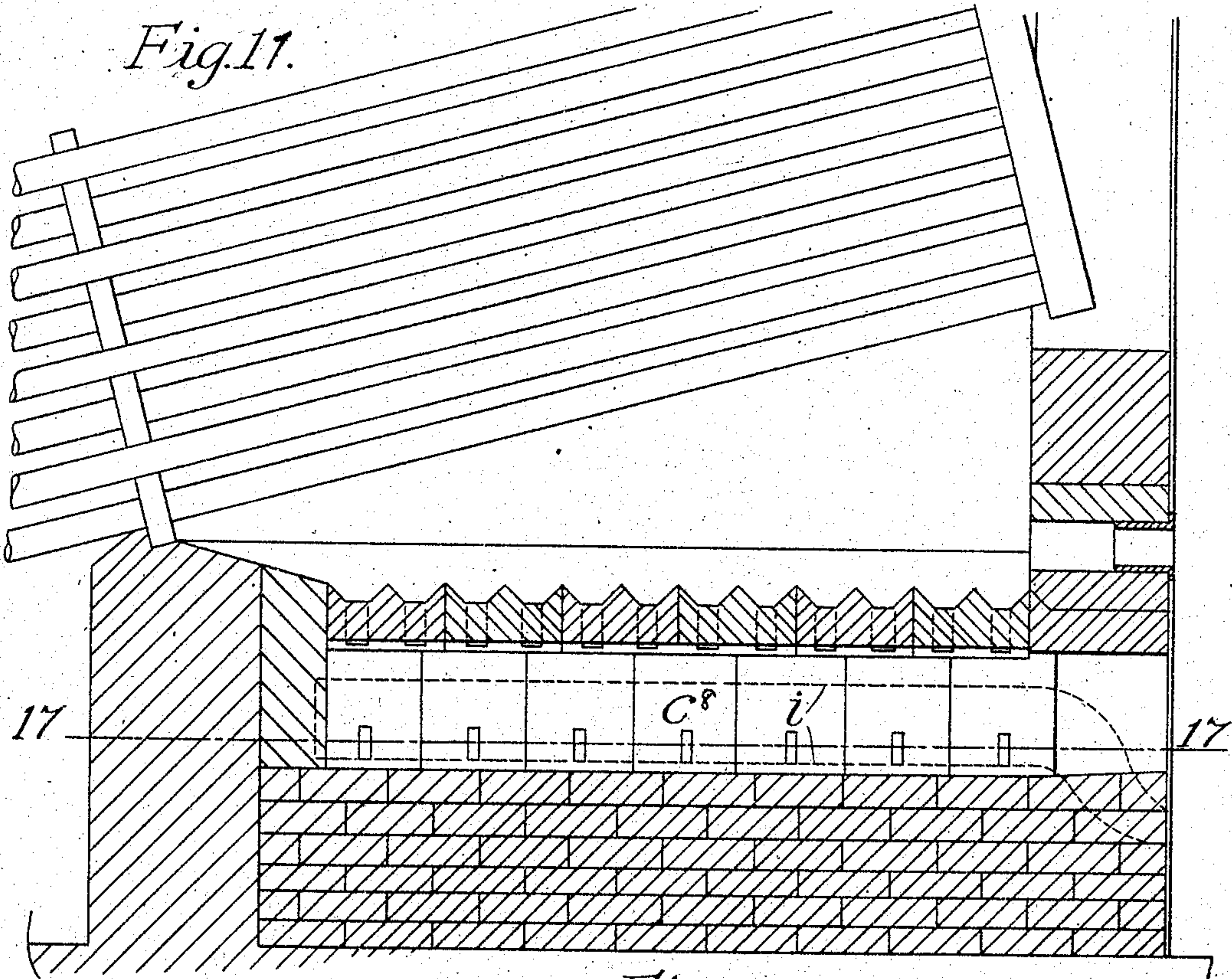
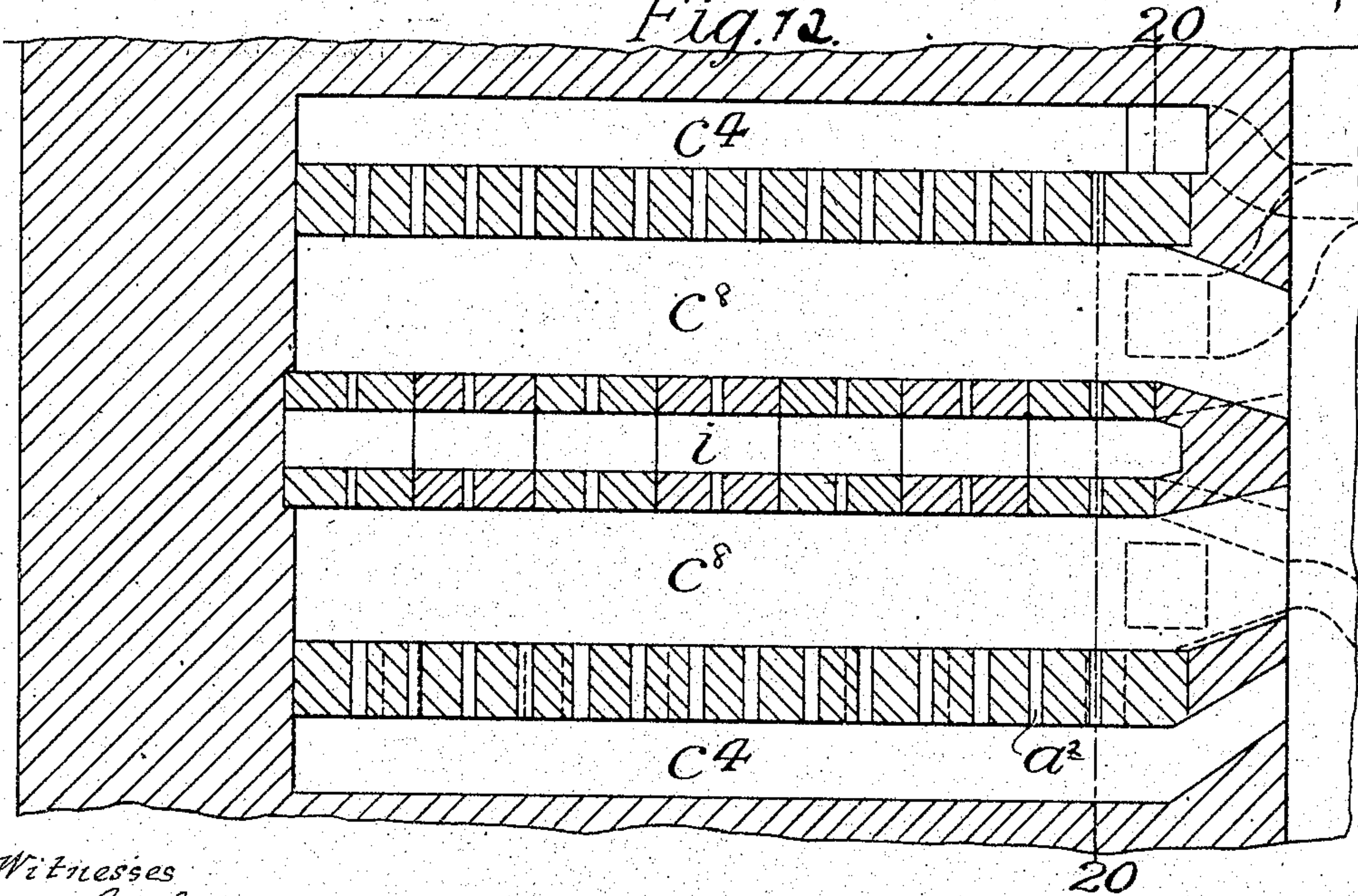


Fig. 12.



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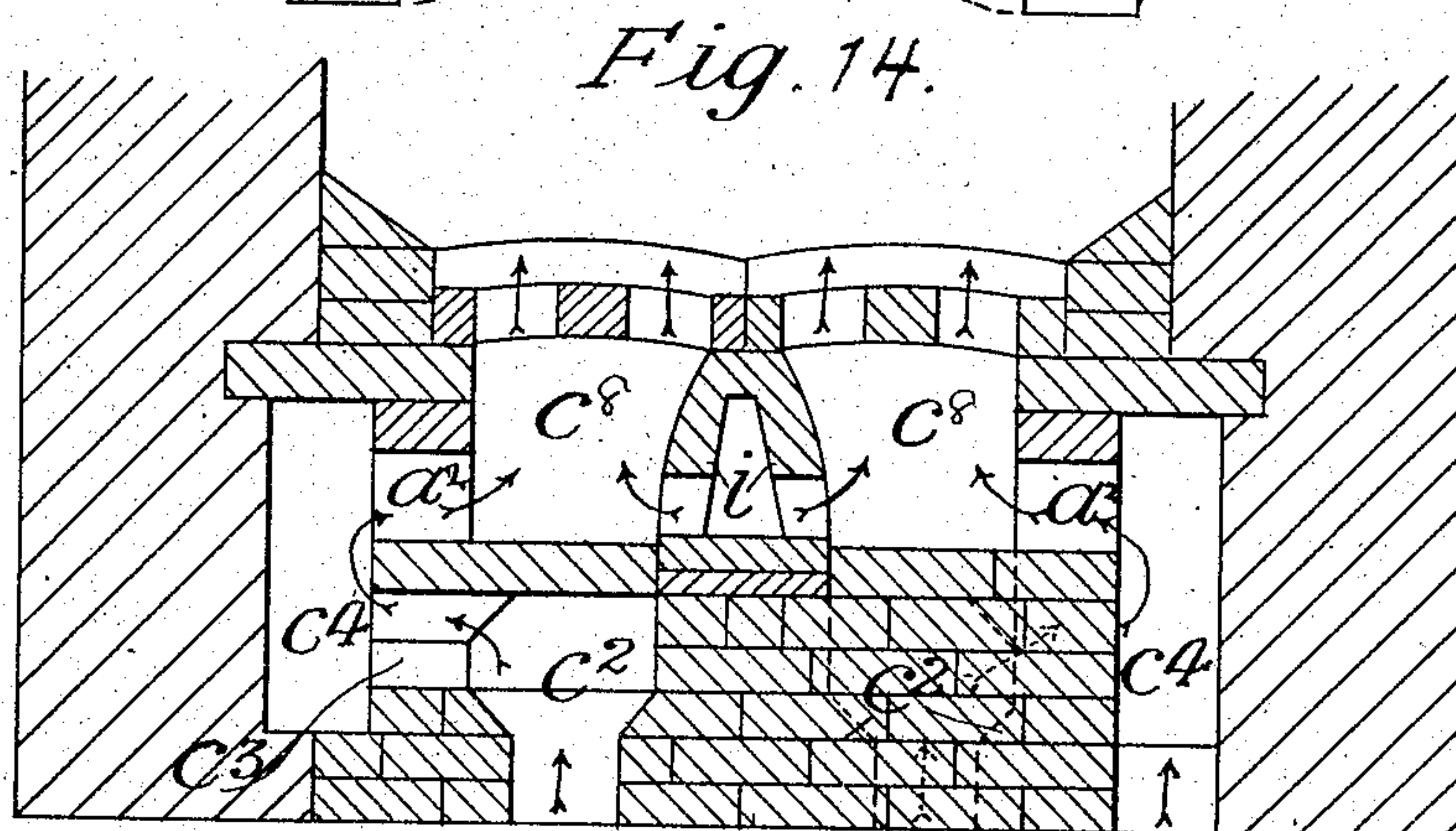
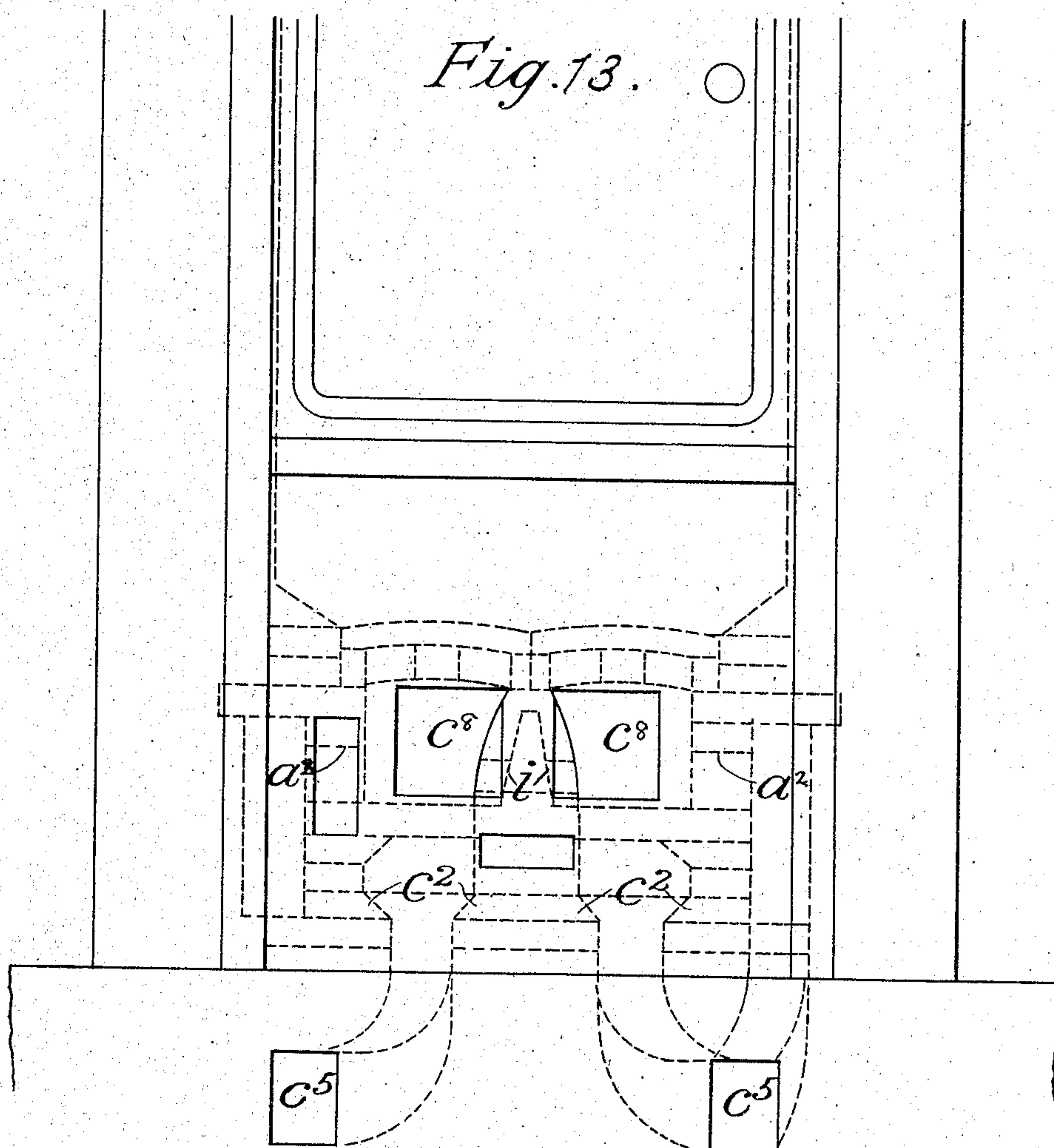
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

GEORGE ROBERTSON HISLOP, OF PAISLEY, SCOTLAND.

STEAM-BOILER OR LIKE FURNACE.

SPECIFICATION forming part of Letters Patent No. 786,764, dated April 4, 1905.

Application filed January 26, 1904. Serial No. 190,727.

To all whom it may concern:

Be it known that I, GEORGE ROBERTSON HISLOP, of the Gas Works, Paisley, Scotland, have invented certain new and useful Improvements in and Connected with Improve-
 5 ments in and Relating to Steam-Boiler or Like Furnaces, of which the following is a specification.

This invention has for its object a more
 10 economical combustion of gaseous liquid or solid fuel than hitherto attained in firing steam-boilers, stills, and the like by the effective commingling of the air required for perfect combustion with the gas or gases pro-
 15 duced before being brought into contact with the surface or surfaces to be heated, and thus remedying the present inherent defect in all systems of heating steam-boilers, stills, muffles, and similar apparatus.

The invention is illustrated by the accom-
 20 panying drawings, in which—

Figure 1 is a cross-sectional elevation of a single-flue boiler, showing the application thereto of a modification of the improved ar-
 25 rangements for mixing the gas and air prior to combustion. Fig. 2 is a longitudinal vertical section, and Fig. 3 a horizontal section, of the same. Figs. 4 to 10 show, detached, to a larger scale, the forms of silica tiles em-
 30 ployed in making up the screens through which the gaseous mixture passes into the boiler-flue. Fig. 11 is a longitudinal vertical section of a modified construction of the furnace as applied in connection with a water-
 35 tube boiler. Fig. 12 is a horizontal section of the same at the line 17 17. Fig. 13 is a front elevation of Fig. 11, and Fig. 14 a transverse section at the line 20 20 of Fig. 12.

According to my invention I first gasify
 40 the fuel, whether solid or liquid, in a producer or gasifying chamber, and thence I pass it into two parallel combustion chambers or flues, as at *a*, Fig. 1, of suitable dimensions and separated by a division-wall of
 45 bricks or tiles *b*, and into said gas I introduce a properly-regulated volume of air, previously heated or otherwise, at the entrance of the said combustion-chambers for the combustion of the gaseous fuel, and to effect a perfect com-

mingling of the air and the combustible gas I
 50 pass the whole through a screen composed of a series of perforated and preferably ribbed silica tiles, bricks, or blocks *c*, or through openings in a wall or screen, or between sepa-
 55 rate arched or other form of silica tiles or other refractory material, which may be of any of the forms shown at Figs. 2, 4, 5, 6, and 7. The said screen is placed at a suitable distance below the boiler-tubes, flue-plates, or
 60 outer shell, as the case may be, and so as to effect perfect combustion in said chambers or while passing through and above the said perforated tiles or openings and before com-
 65 ing into contact with the heat-absorbing surfaces of the boiler tubes, flues, or shell—as, for example, in the manner represented at Figs. 1, 2, and 3. By these means I effect the mixing of the gas and air within the fur-
 70 nace-chamber of all tubular and other boilers, stills, muffles, or like apparatus fired with similar furnaces. In the case of inter-
 75 nal-flue boilers of the Cornish, Lancashire, or marine type I introduce the gaseous fuel at the mouth and lower half of the flue or flues and its equivalent of air for combustion also at the front of the lower half of the boiler
 80 flue or tube hitherto forming the ash-pit, as indicated at *a*, Fig. 2, and instead of using the ordinary furnace-bars I introduce the special perforated tiles, screen, or other form of suitable openings, through which the gas
 85 and air are passed, as at *c* in Figs. 1 and 2, and thereby thoroughly mixed, so that perfect combustion is effected within the combustion-chamber and while passing through
 90 and above the ports or openings and before the gases come into contact with the heat-absorbing flue shell or tubes. In the primary combustion-chambers or lower half of the boiler-flue I introduce a thin side lining
 95 of silica tiles, as indicated at *d*, Figs. 1 and 8, to prevent the undue abstraction of heat from the commingling gas and air until perfect combustion has been secured in the combustion-flues and while passing through and above the perforations or openings at *c* and partly to protect that portion of the flue from undue heating. Under the bed of the

combustion chambers or flues I may also form one or two air-channels of bricks or clay tubes, as shown at *e*, Fig. 1, and in Figs. 9 and 10, through which I pass a supplementary supply of heated air to the furnace-bridge, where it is made to issue through a series of openings or perforations, (indicated at *c'*, Figs. 2 and 3,) the supply of all such gas and air being regulated at front of the boilers by suitable regulating devices. By the means thus described the entire circumference of the flue or flues of such boilers is utilized as heating-surface, thus adding largely to the steam-raising power of such boilers and at the same time minimizing or preventing the production of smoke.

Figs. 11 to 14 show the application of the system where the gases are introduced into the boiler-chamber or other furnace above the floor-level. The producer or other gas is divided into two or more streams at front, as in the case of flue-boilers, and the equivalent of air for combustion, previously heated or otherwise, is introduced into the gas and the gas and air enter the combustion-chambers *c*⁸, or I may introduce the air into the side flues *c*⁴, and from these flues the air passes through the ports *a*² with the chambers *c*⁸, or I may introduce the air partly through the flues *c*⁴ and the rest come in with the gas. At the same time I form air-channels *c*³ under the bed of the combustion-chambers *c*⁸, through which I pass a supplementary supply of air from the front to take up the heat conducted through the bed of the combustion-chambers wherein the air is circulated and passes, as indicated by arrows at Fig. 20, through openings *c*³ in the side walls into the spaces or flues *c*⁴, which may also receive an air-supply from the front, as already de-

scribed, thence through the openings *a*² into the combustion-chambers *c*⁸.

Figs. 11 to 14 also show means by which I may introduce a supplementary supply of secondary air, as indicated by arrows at Fig. 20, for combustion, consisting of a channel *i*, formed of bricks or of tubular clay or silica tiles and forming the central pier wall or walls between the combustion-chambers. The supply of said air may be heated or otherwise and the volume controlled by a suitable device.

Having now described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

In a steam-boiler furnace, in combination, a flue into which air and gas are admitted, a partition in said flue, a lining on each side of said flue for preventing the air and gas giving off too much heat in the initial stage of combination, a screen comprising ribbed and arched silica tiles located above said flue partly supported by the partition, adapted to effect intimate commingling of the air and gas and to lead the air and gas from said flue through said screen to the top of the combustion-chamber, combustion taking place in said flue, between said tiles and at the top of the combustion-chamber, a hollow bridge at the rear of said combustion-chamber, and air-channels at the foot of said flue conveying a supply of heated air to said bridge, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE ROBERTSON HISLOP.

Witnesses:

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JNO. ARMSTRONG, JUNR.