

No. 665,919.

Patented Jan. 15, 1901.

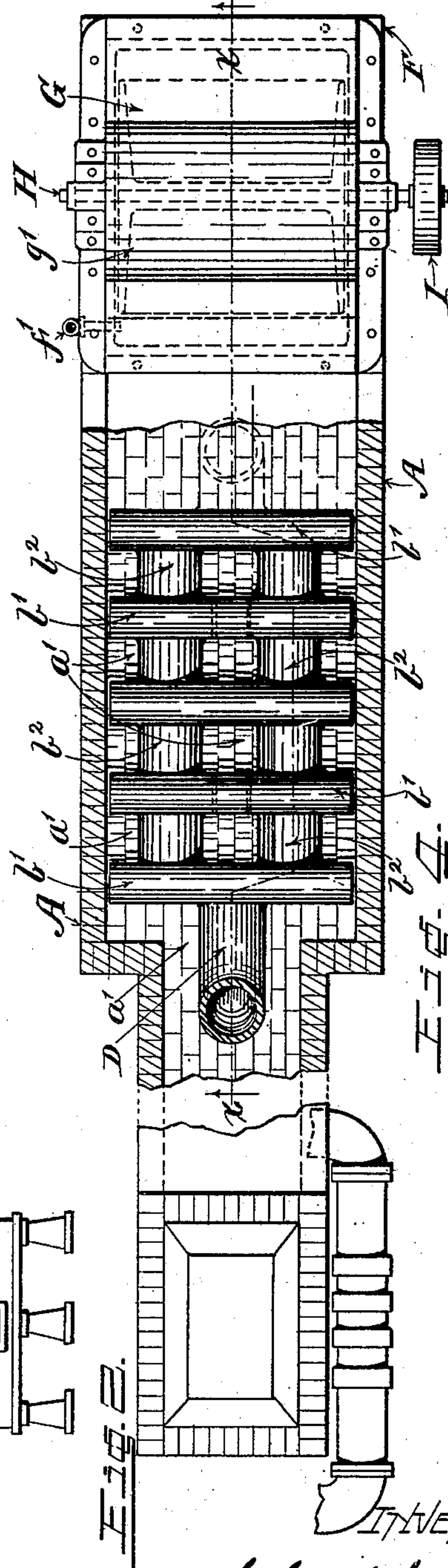
C. C. LODER.

FUME CONDENSING APPARATUS AND FUEL ACCUMULATOR FOR SMELTING FURNACES.

(Application filed July 10, 1899.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES:

To Messrs.
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No. 665,919.

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JME CONDENSING APPARATUS AND FUEL ACCUMULATOR FOR SMELTING FURNACES.

(Application filed July 10, 1899.)

(No Model.)

3 Sheets—Sheet 2.

Fig. 5.

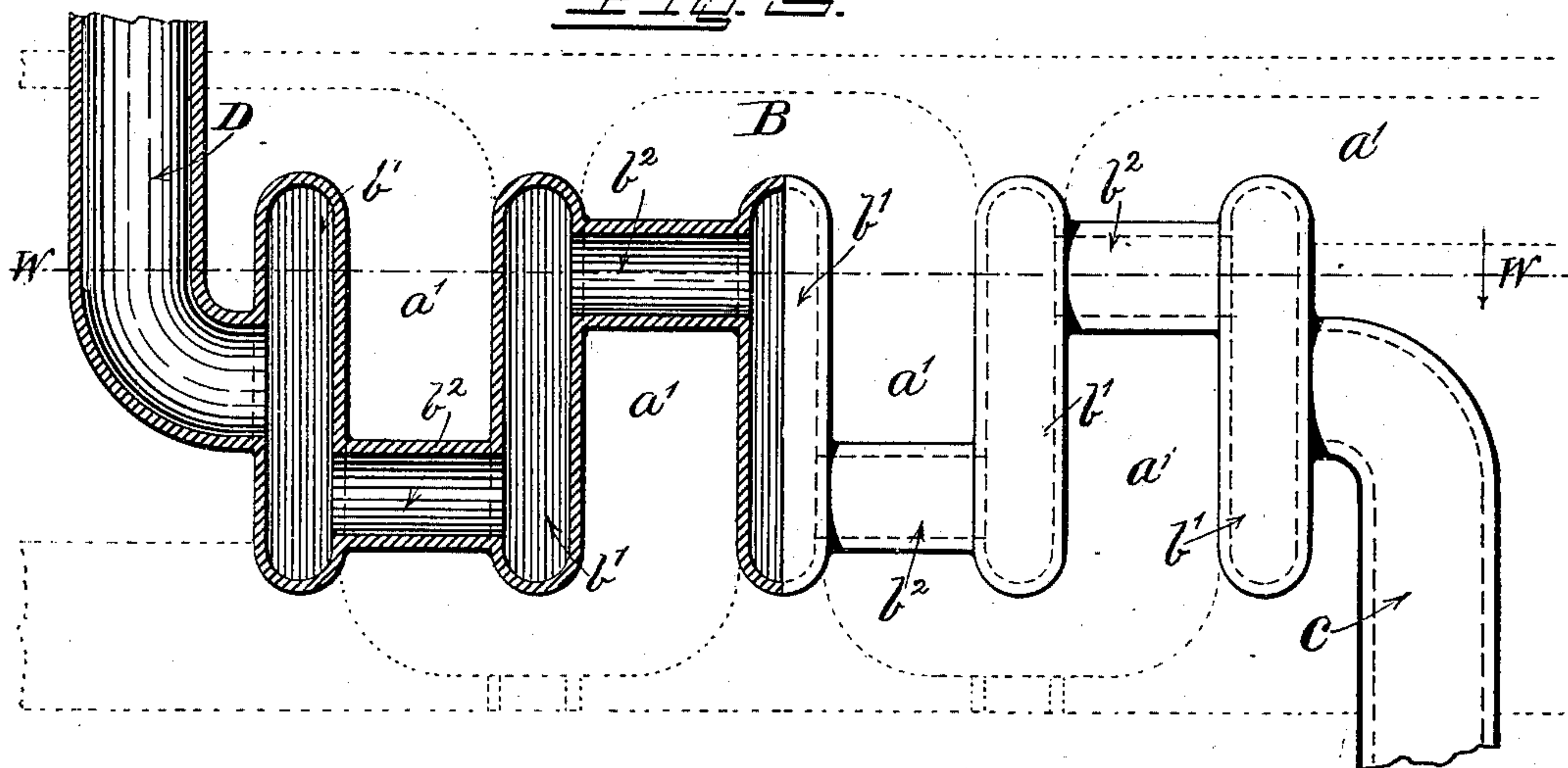


Fig. 6.

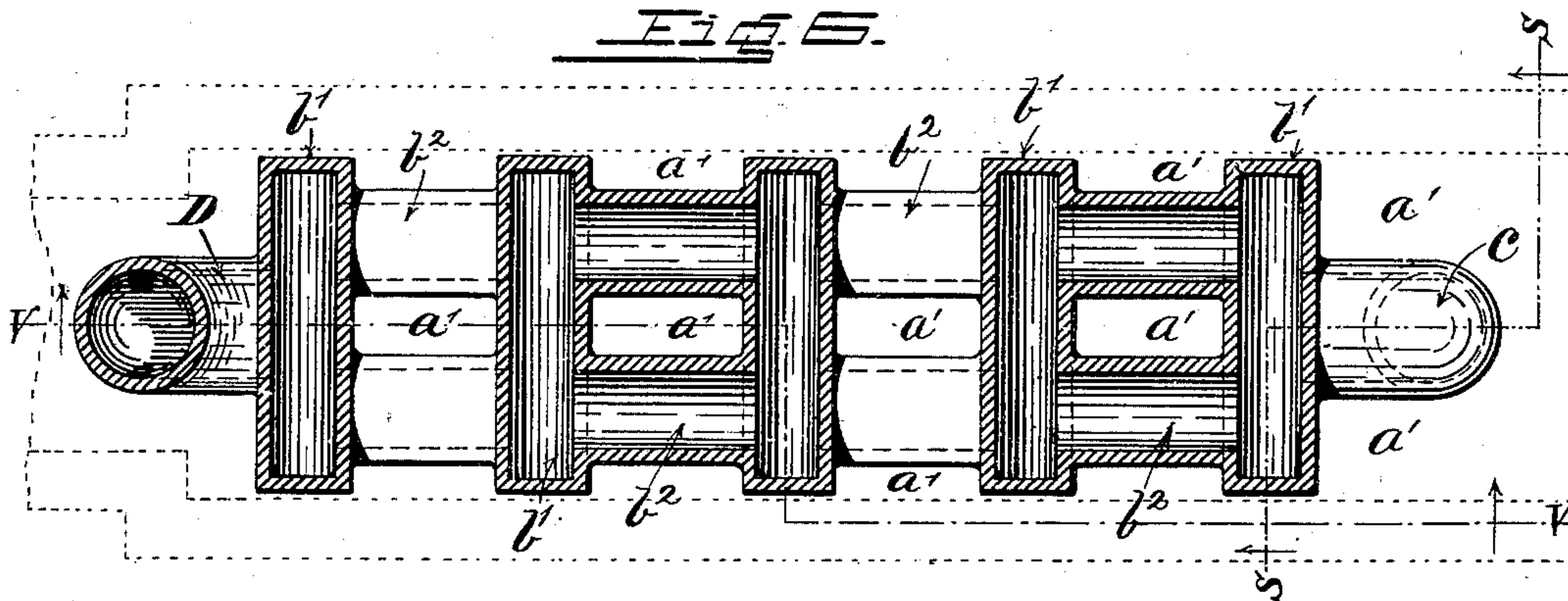
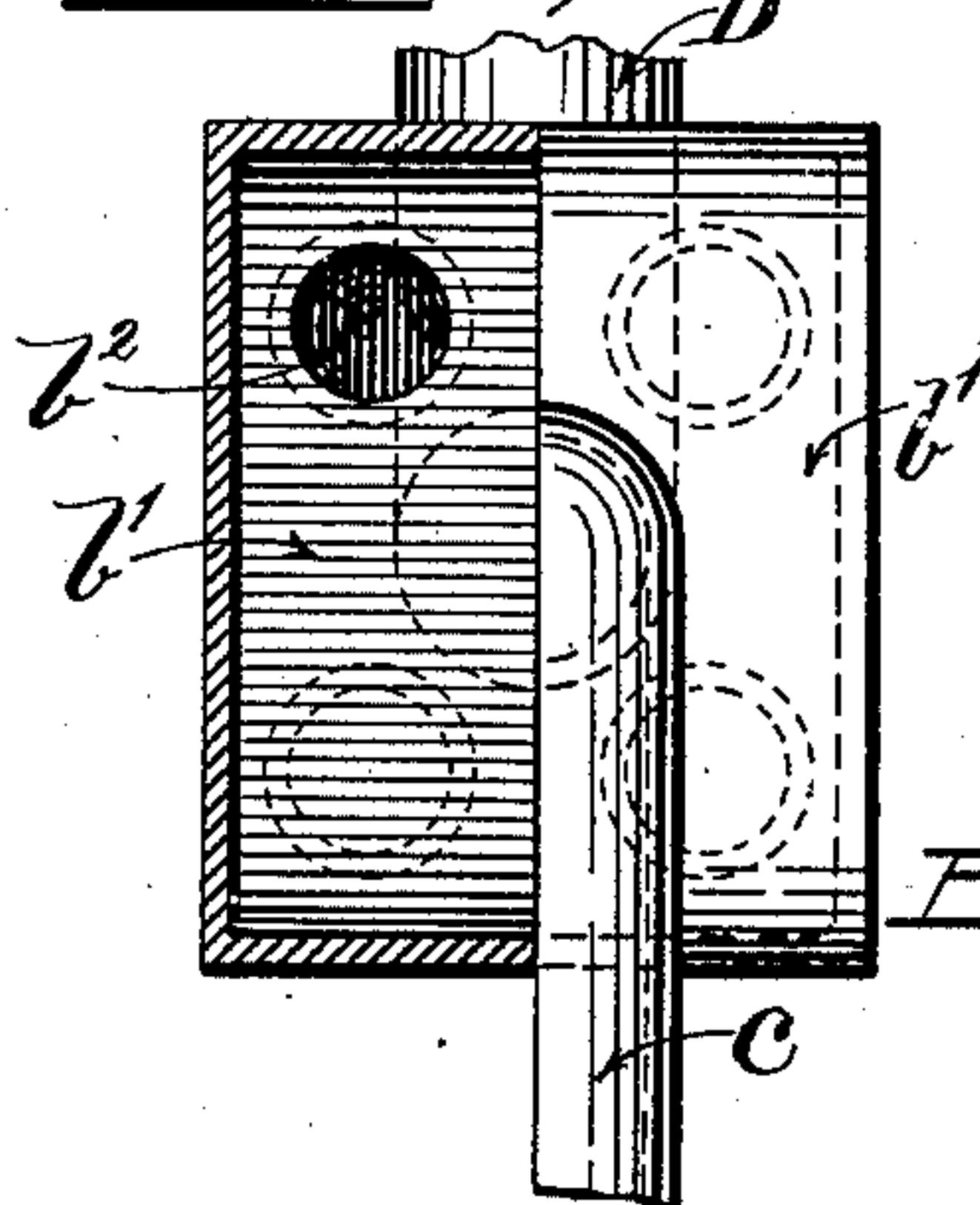


Fig. 7.



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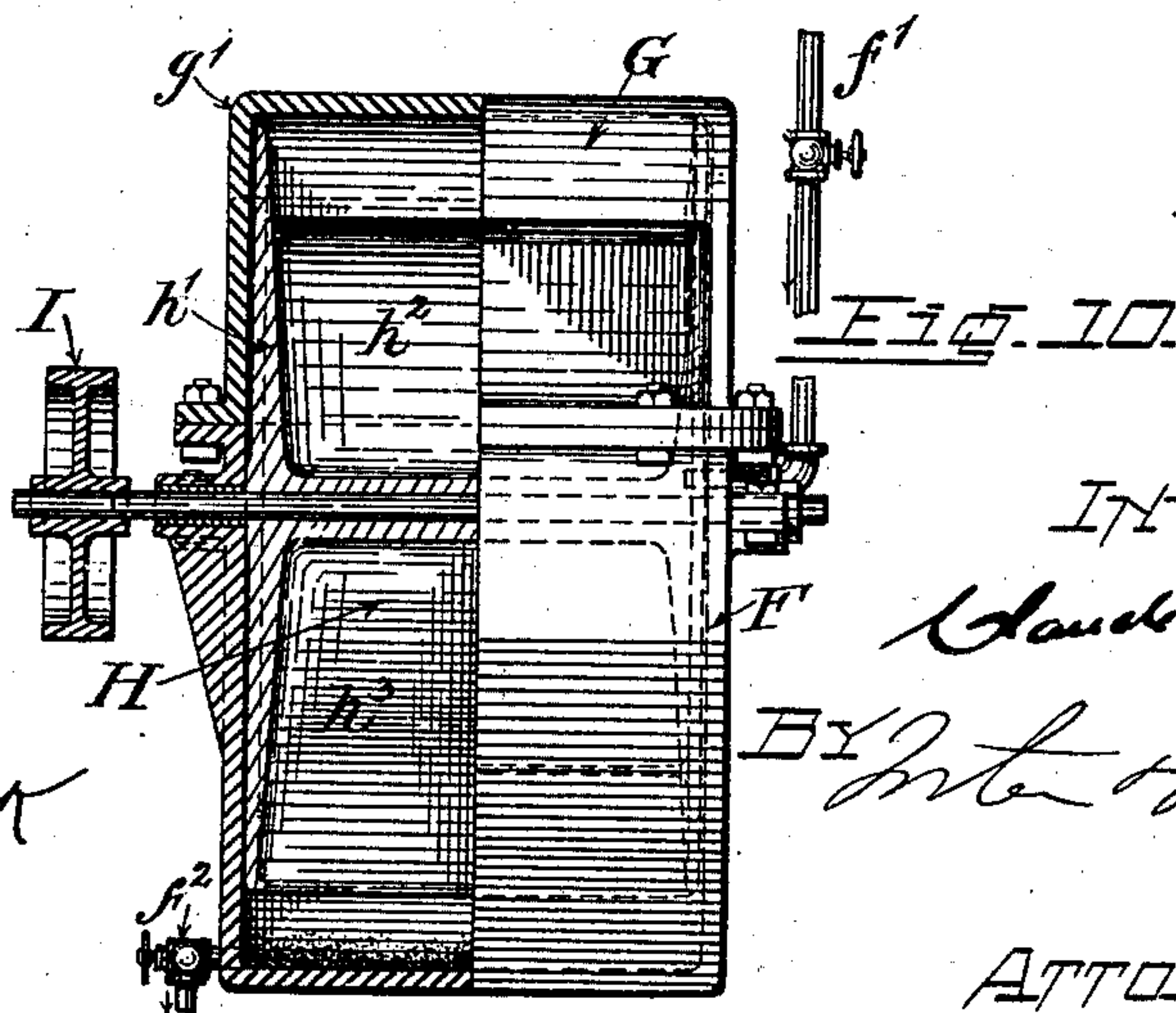
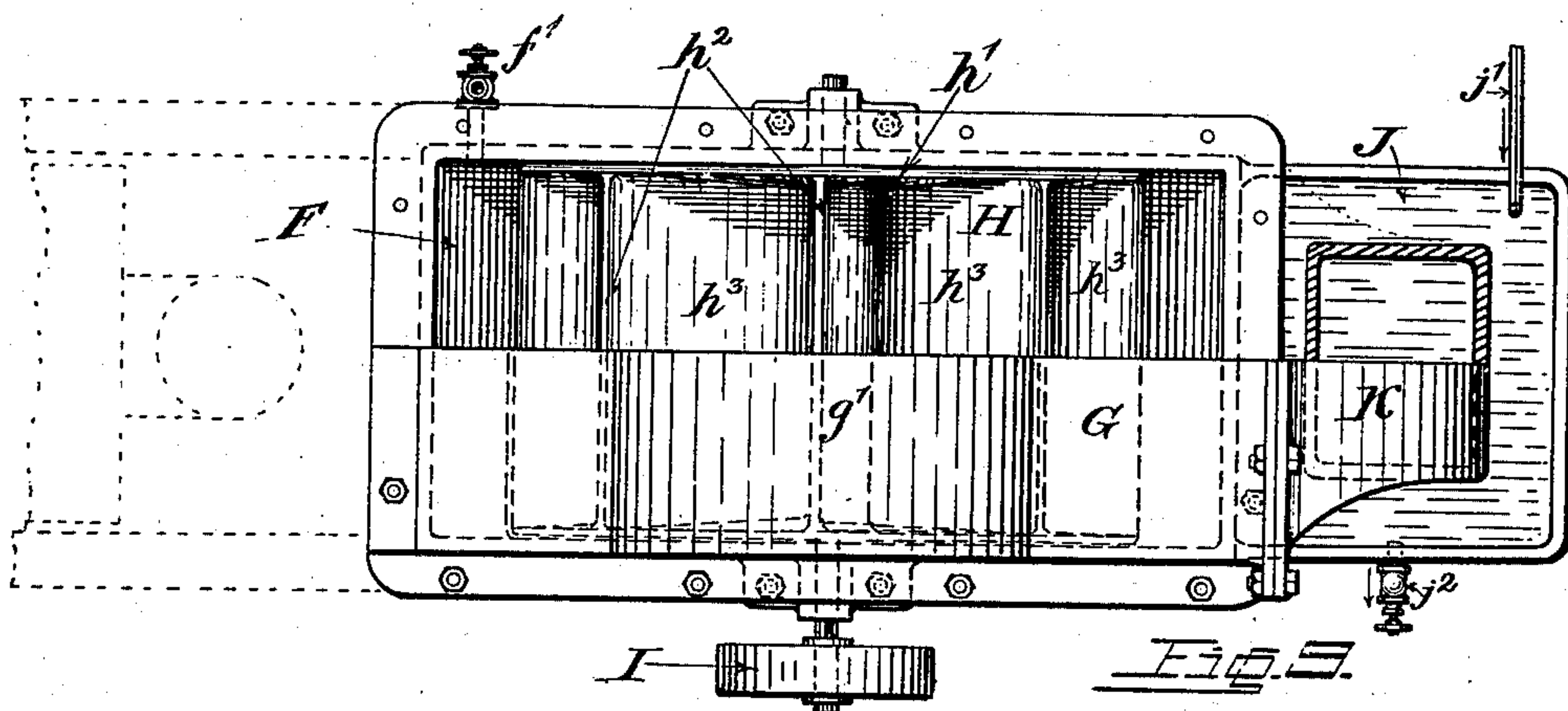
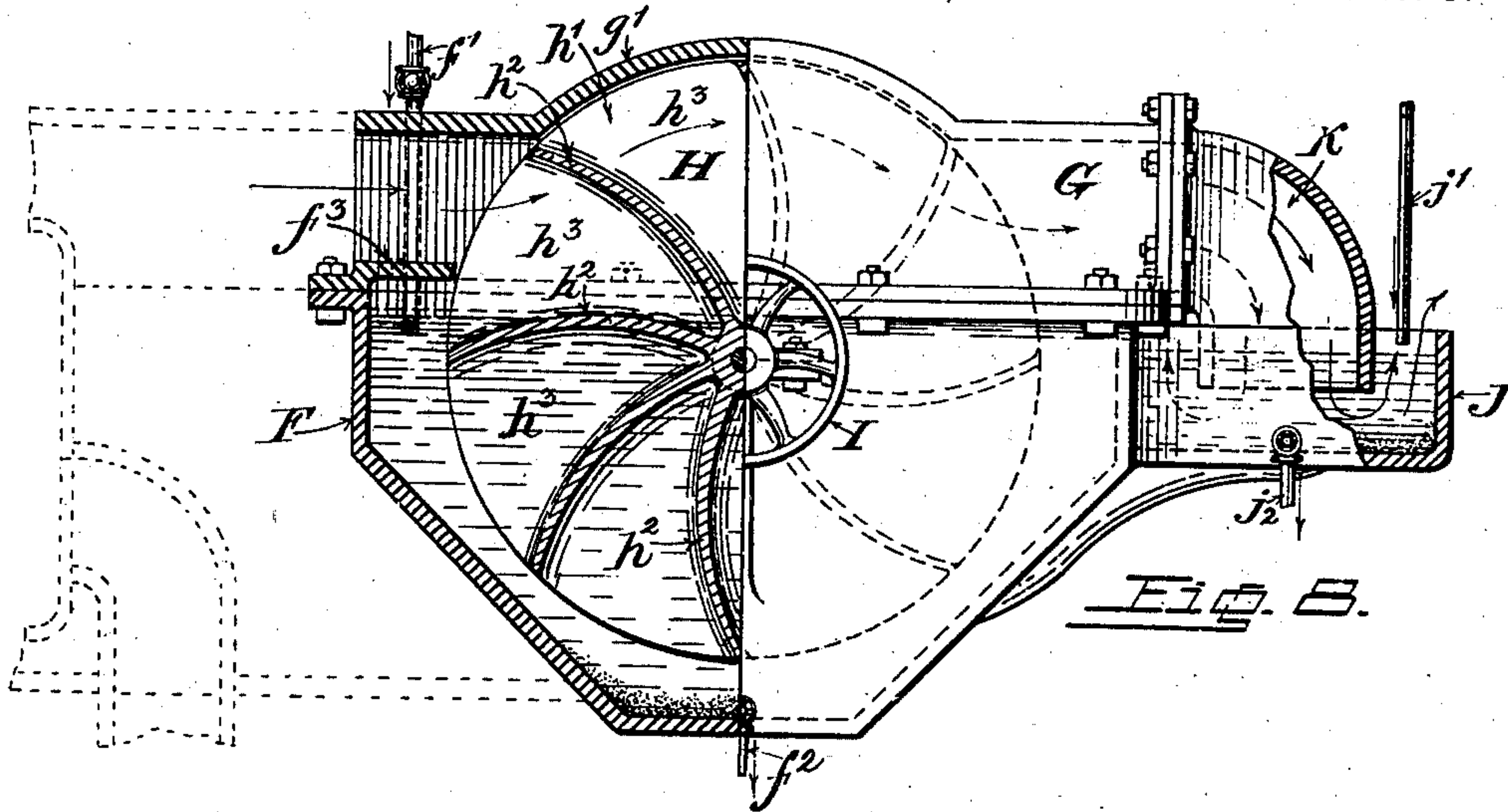
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FUME CONDENSING APPARATUS AND FUEL ACCUMULATOR FOR SMELTING FURNACES.

(Application filed July 10, 1899.)

(No Model.)

3 Sheets—Sheet 3.



WITNESSES:

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UNITED STATES PATENT OFFICE.

CLAUDE C. LODER, OF DENVER, COLORADO.

FUME-CONDENSING APPARATUS AND FUEL-ACCUMULATOR FOR SMELTING-FURNACES.

SPECIFICATION forming part of Letters Patent No. 665,919, dated January 15, 1901.

Application filed July 10, 1899. Serial No. 723,303. (No model.)

To all whom it may concern:

Be it known that I, CLAUDE C. LODER, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Fume-Condensing Apparatus and Fuel-Accumulators for Smelting-Furnaces, of which the following is a specification.

It is well known to those skilled in the art to which my invention appertains that the poisonous and obnoxious gases and fumes which are permitted to escape in the process of reducing metallic ores by the usual methods are a source of great annoyance, being largely detrimental to health and to the growth of vegetation in the vicinity of such smelting plants. It is also well known that in the treatment of metallic ores by the ordinary construction of smelting-furnaces the escaping fumes and gases, in addition to working their deleterious results, carry with them a fixed value of from five to ten per cent. of the product handled.

It is the object of my invention to overcome the detrimental effects above referred to, to obviate the losses stated, and to provide a comparatively simple, durable, and compact construction of apparatus affording economy in cost, space, and subsequent maintenance, dispensing with the large and expensive smokestacks and condensing-chambers and the arrangement of precipitating-tanks sometimes employed, and to produce a saving by accomplishing a higher degree of extraction, and thereby being able to treat low-grade ores successfully; and to these ends my invention consists in a condensing apparatus embodying the general features of construction and arrangement of parts having the mode of operation substantially as hereinafter more particularly set forth.

In the accompanying drawings I have illustrated a preferred embodiment of my invention, in which—

Figures 1 and 2 are respectively a side elevation and a plan view of an ordinary vertical shaft and furnace. Fig. 3 is a longitudinal section of my apparatus, taken on the line xx , Fig. 4. Fig. 4 is a horizontal section of the same on the line yy , Fig. 3, showing the cooling-receptacle in full lines. Fig. 5 is an

enlarged detail elevation of the cooling-receptacle, part being in vertical section, taken on the line vv , Fig. 6. Fig. 6 is a horizontal sectional plan on the line ww , Fig. 5. Fig. 7 is an end elevation and half-sectional view on the line ss , Fig. 6. Fig. 8 is a side elevation and part-sectional view of a hydromechanical device, accumulator, and draft-blower, with condensing and precipitating tanks. Fig. 9 is a plan view and part-horizontal section of the same; and Fig. 10 is an end view, in part section, of the same.

It will be understood that my improved cooling and condensing apparatus can be attached to and used in conjunction with a reverberatory furnace or other similar structure, although in the present instance I have shown it in connection with a vertical-shaft furnace X, the construction of which is well understood by those skilled in the art and need not be specifically described. Connected with such furnace so as to receive the products of combustion therefrom is a blast or draft chamber A, constructed of brick or similar material, and interposed within its draft-channel is a cooling-receptacle B. This receptacle may be constructed of cast-iron, copper, steel, or other similar material and comprises a series of hollow rectangular receptacles b' , disposed in a vertical transverse plane within the walls of the draft-chamber A, there being any desired number and the receptacles being arranged a sufficient distance apart to form between their vertical outer sides the draft or air passages a' . These transverse receptacles are connected together in any suitable way, and, as shown, each pair are connected by upper and lower longitudinally-disposed circulating-flues b^2 . The receptacle b' most remote from the furnace is provided with an inlet pipe or flue c , while the receptacle b' , adjoining the furnace, is fitted with a similar outlet-pipe D. These parts, including a series of any number of transverse receptacles and their connecting-flues, form the cooling-receptacle B and are designed to afford a maximum area of exposed surface within the draft-chamber. This cooling-receptacle can be constructed in sections and assembled in any convenient way or may be otherwise made and is suitably set within the draft-chamber and is supported upon a series of alternately-

disposed upper and lower transverse bulkheads $a^2 a^2$, built against the alternate upper and lower edges of the transverse receptacles b' , so as to form a continuous channel through the cooling-receptacle. Into the floor-wall adjoining the pit or lower curve of the passages a' are placed a series of openings having suitable closures E.

Connected in any suitable way and preferably built into the end of the draft-chamber A is a metallic hopper or tank F, of cast or sheet iron or similar material, which is fitted with a top or cover G of the same material and within which is mounted upon a transverse shaft a revoluble vane-wheel H, designed to be rotated in the direction of the arrow, Fig. 3, by power applied to a belt-wheel I. This tank is made water-tight and is filled with water or some suitable solution to a level about that of the shaft and is supplied with water or solution through the inlet-pipe f' and is drained through an outlet-pipe f^2 . The vane-wheel H is formed with circular end disks h' , between which are a number of transverse vanes, blades, or paddles h^2 , which form around the wheel a number of separated triangular open apertures h^3 , extending across the top of the tank F. Adjoining the air-passage a' there is a transverse partition f^3 , and this, with the central arched portion g of the cover G, is fitted accurately but freely to the peripheries of the wheel-disks h' and the outer edges of the vanes h^2 .

It will be seen that the vanes h^2 in traveling through the space above the water or solution will move in the direction it is desired the fumes and gases should travel, and thus create a suction from the furnace through the draft-chamber A. Also the water or solution, being nearly on a level with the bottom of the exit-opening from the chamber F, will prevent the formation of a vacuum below such exit and the fumes and gases will pass freely out of the chamber. It will also be observed that the passage for the fumes and gases above the water or solution is unobstructed except by the vanes, and such fumes and gases will therefore when the vanes are moving pass freely through the passage above the water or solution without being mixed therewith.

While the apparatus thus far described can be used alone, I prefer to use under certain conditions in connection therewith an auxiliary condensing or precipitating tank J. This is hooked to or formed upon the outer end of the tank F and is supplied with water or some suitable solution from an inlet-pipe j' and drained by an outlet-pipe j^2 . In the construction illustrated this tank has an open top, into which is projected the open end of an angle-spout K, the opposite flanged end of which registers with and is bolted to the open end of the cover G. The open end of the spout is carried beneath the surface of the liquid in the tank J.

Such being the preferred construction of the device, its operation will be largely understood therefrom; but I will state that in practice a forced current of cold air or water or similar fluid is circulated continuously through the cooling-receptacle B, entering the inlet c and passing in the direction of the arrows through the outlet D, the object being to reduce the initial high temperature of the fumes and gases arising from the combustion of the ores within the furnace while being carried through the circuitous passages a' of the draft-chamber. The passage of these fumes and gases is insured by the forced draft or suction created by the semisubmerged vane-wheel H. The fumes or gases upon leaving the furnace at a very high temperature carry with them in very minute particles a percentage of the products of combustion, part of which coming into contact with the cooling-receptacle B are precipitated into the pits adjoining the dampers or openings E, and a further precipitation of finer particles of the products of combustion is deposited in the tank F, to be drawn off through the outlet f^2 into a suitable settler or other receptacle. A further condensation of the fumes and precipitation of the product is effected by the use of the auxiliary tank J. By this arrangement it will be seen that I effect a forced draft or suction without the necessity of a high chimney or like construction. I also trap a large percentage of the poisonous fumes and precipitate the unconsumed particles of the product, which ordinarily escape through the forced draft of the smoke-stack and are lost. The unconsumed products deposited in the several receptacles are collected from time to time during the process of reduction and by any suitable treatment, as with a suitable plastic mass, as lime, are molded into cubes or bricks, which may be dried in a kiln, which may be heated with air from the outlet-pipe D, and these products can again be fed to the furnace for effecting a more thorough combustion of the same. Further, the tank J may under certain conditions be provided with a closed top and the fumes arising from it can be carried into a suitable receptacle to be utilized for other purposes—as, for instance, producing sulfuric acid.

With this general description of my invention its construction and use will be readily understood by those skilled in the art and without limiting myself to the precise details shown and described.

What I claim is—

1. In a condensing apparatus, the combination with a draft-chamber, of a cooling device comprising a series of rectangular receptacles disposed in vertical transverse planes within the walls of the draft-chamber and connected in pairs alternately at their upper and lower ends by flues, and bulkheads between the upper and lower walls of the draft-chamber and upper and lower ends respectively of alternate

receptacles to provide a circuitous passage through the draft-chamber, substantially as described.

5 2. In a condensing apparatus, the combination with a draft-chamber, of a cooling device comprising a series of rectangular receptacles disposed in vertical transverse planes within the walls of the draft-chamber and connected in pairs alternately at their upper and lower
10 ends by flues, bulkheads between the upper and lower walls of the draft-chamber and upper and lower ends respectively of alternate receptacles to provide a circuitous passage through the draft-chamber, and openings provided with closures between the lower bulk-
15 heads, substantially as described.

3. In a fume-arrester, the combination with a furnace, of a draft-chamber connected therewith, a cooling device mounted in the draft-
20 chamber, a tank having inlet and outlet passages directly connecting with its upper portion, the former communicating with the draft-chamber, said tank containing water or a solution to a level just below the said passages,
25 a vane-wheel mounted in the tank and closely fitting the same, and means for rotating the vane-wheel in a direction to move the vanes

through the space above the water or solution toward the exit-passage, whereby a suction is created from the furnace and the fumes and
30 gases pass through the tank above the water or solution, substantially as described.

4. In a fume-arrester, the combination with a furnace, of a draft-chamber connected therewith, a cooling device mounted in the draft-
35 chamber, a tank having inlet and outlet passages directly connecting with its upper portion, the former communicating with the draft-chamber, said tank containing water or a solution to a level just below the said passages,
40 a vane-wheel mounted in the tank and closely fitting the same, means for rotating the vane-wheel in a direction to move the vanes through the space above the water or solution toward the exit-passage, and a condensing-tank with
45 which the exit-passage communicates, substantially as described.

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

CLAUDE C. LODER.

Witnesses:

REULA G. COOK,
JOHN T. ADAMS.