

(No Model.)

3 Sheets—Sheet 1.

H. BIANCHINI.
BOILER.

No. 547,948.

Patented Oct. 15, 1895.

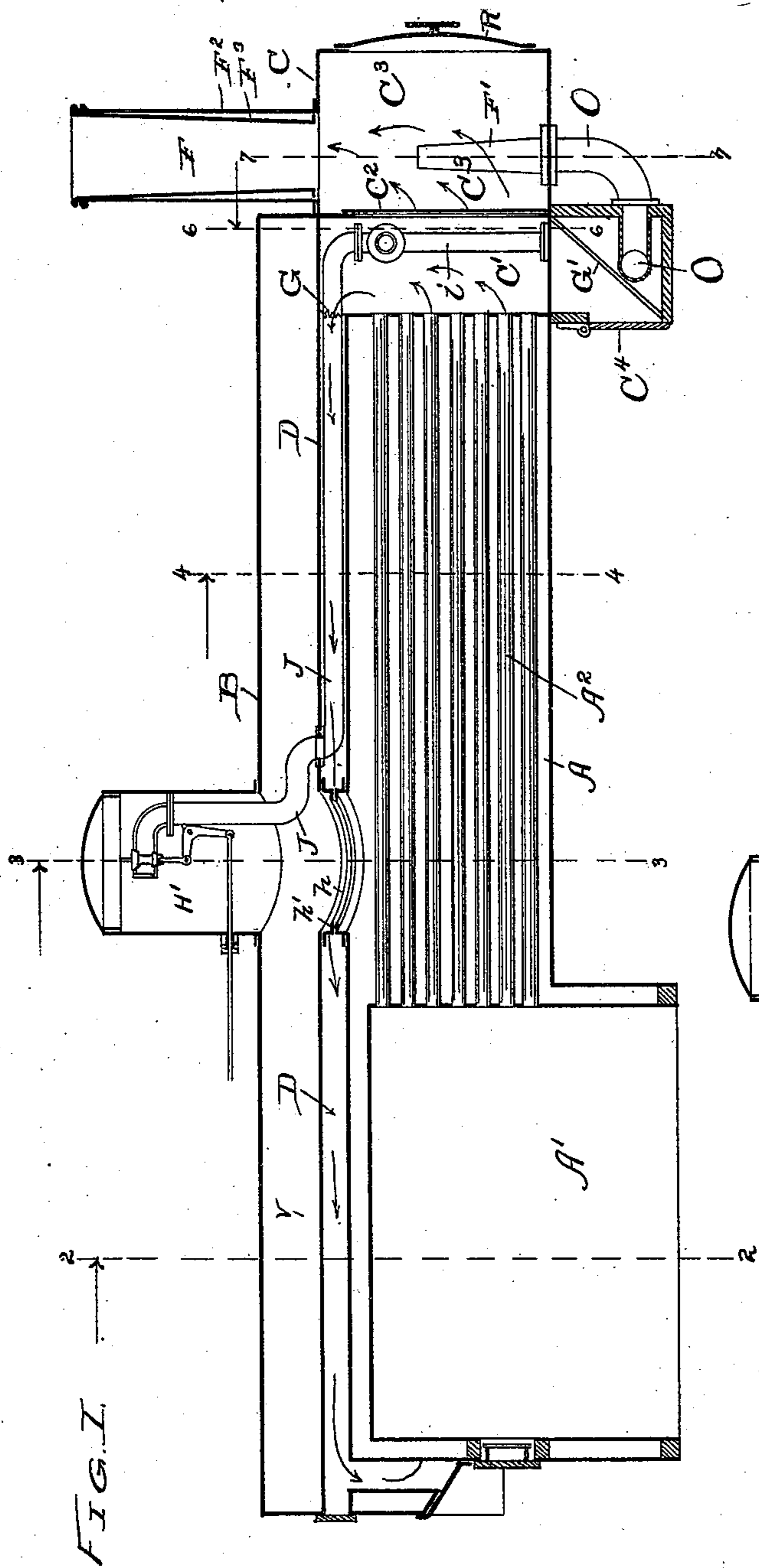


FIG. 1.

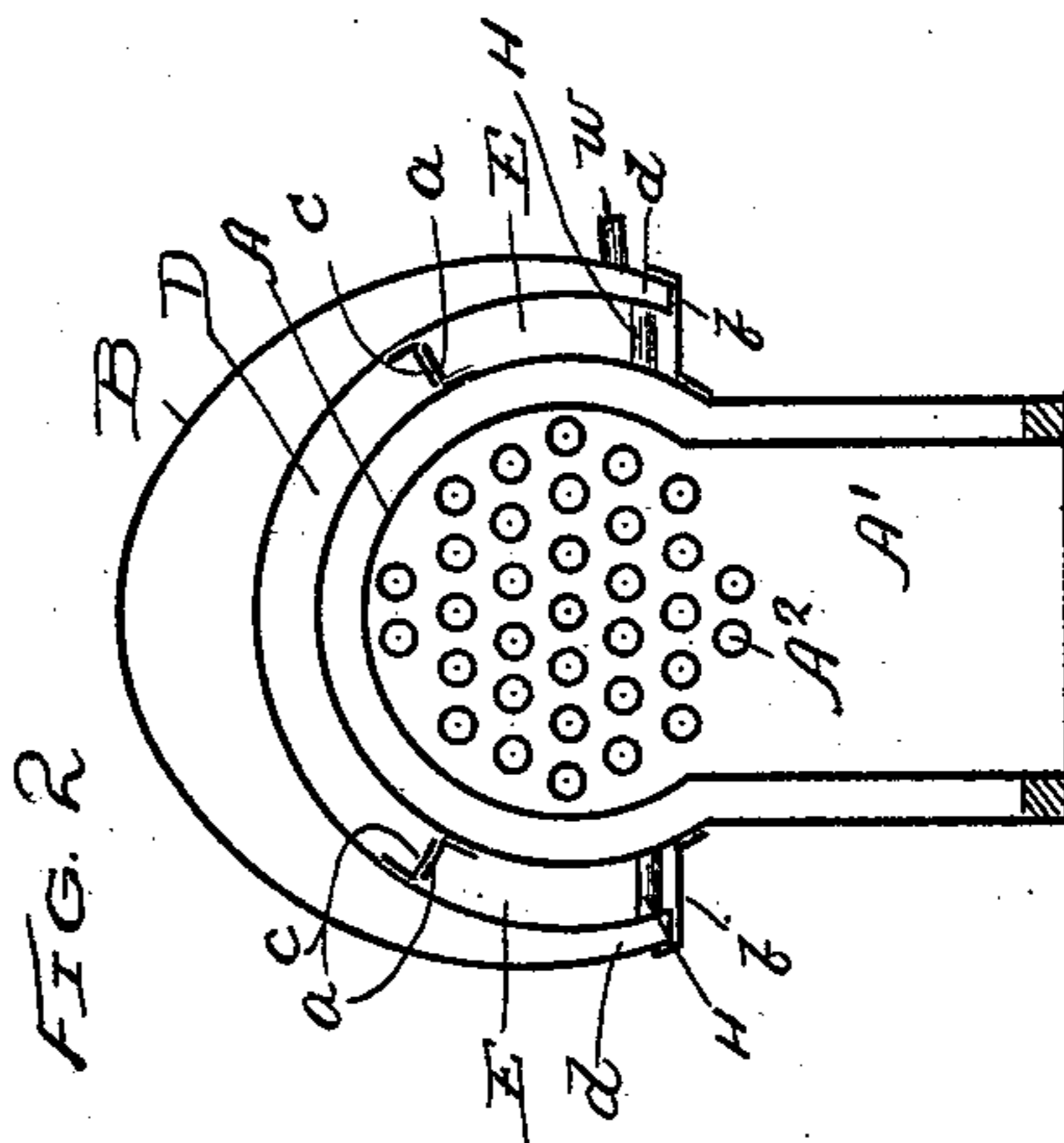


FIG. 2.

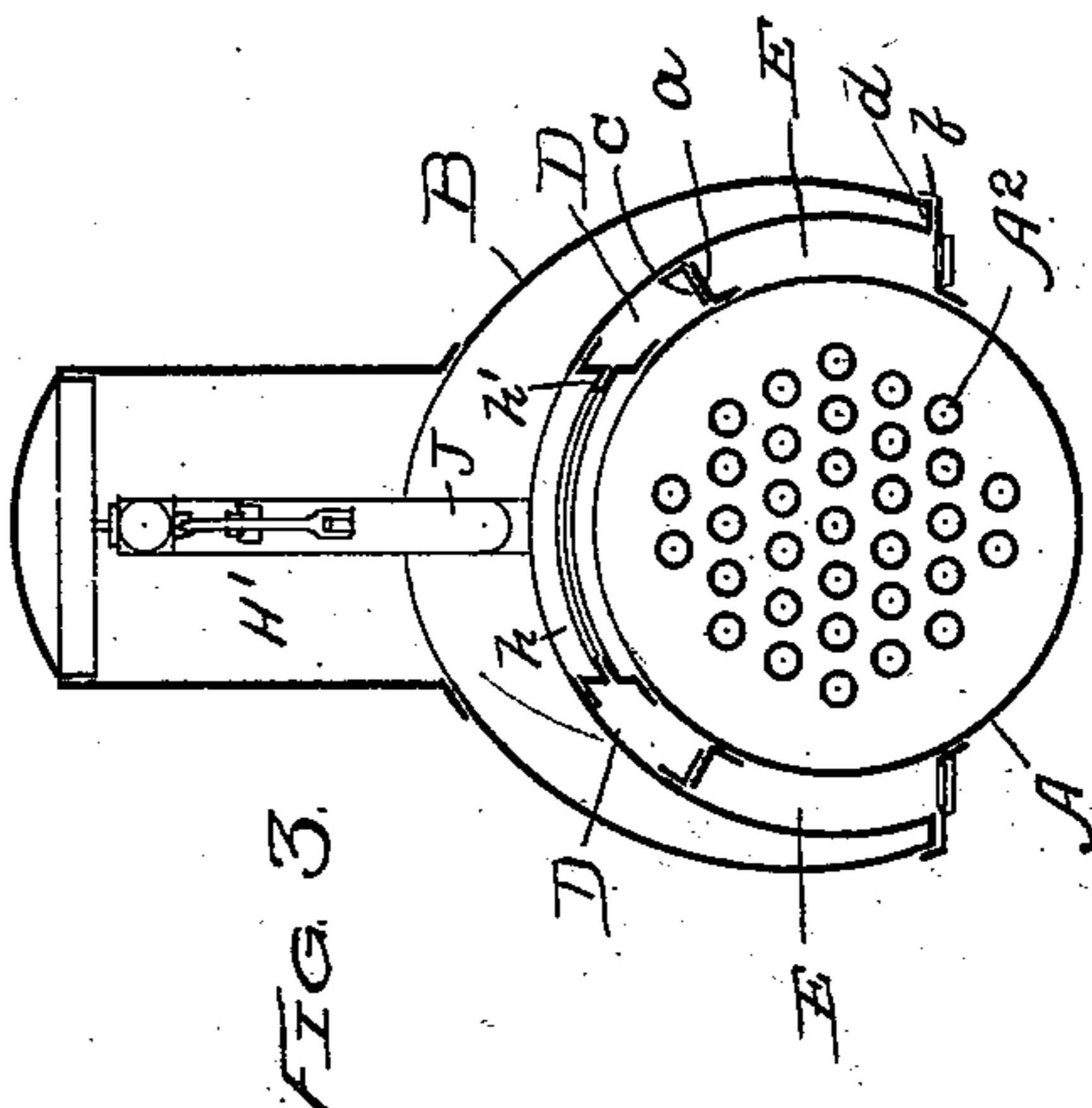


FIG. 3.

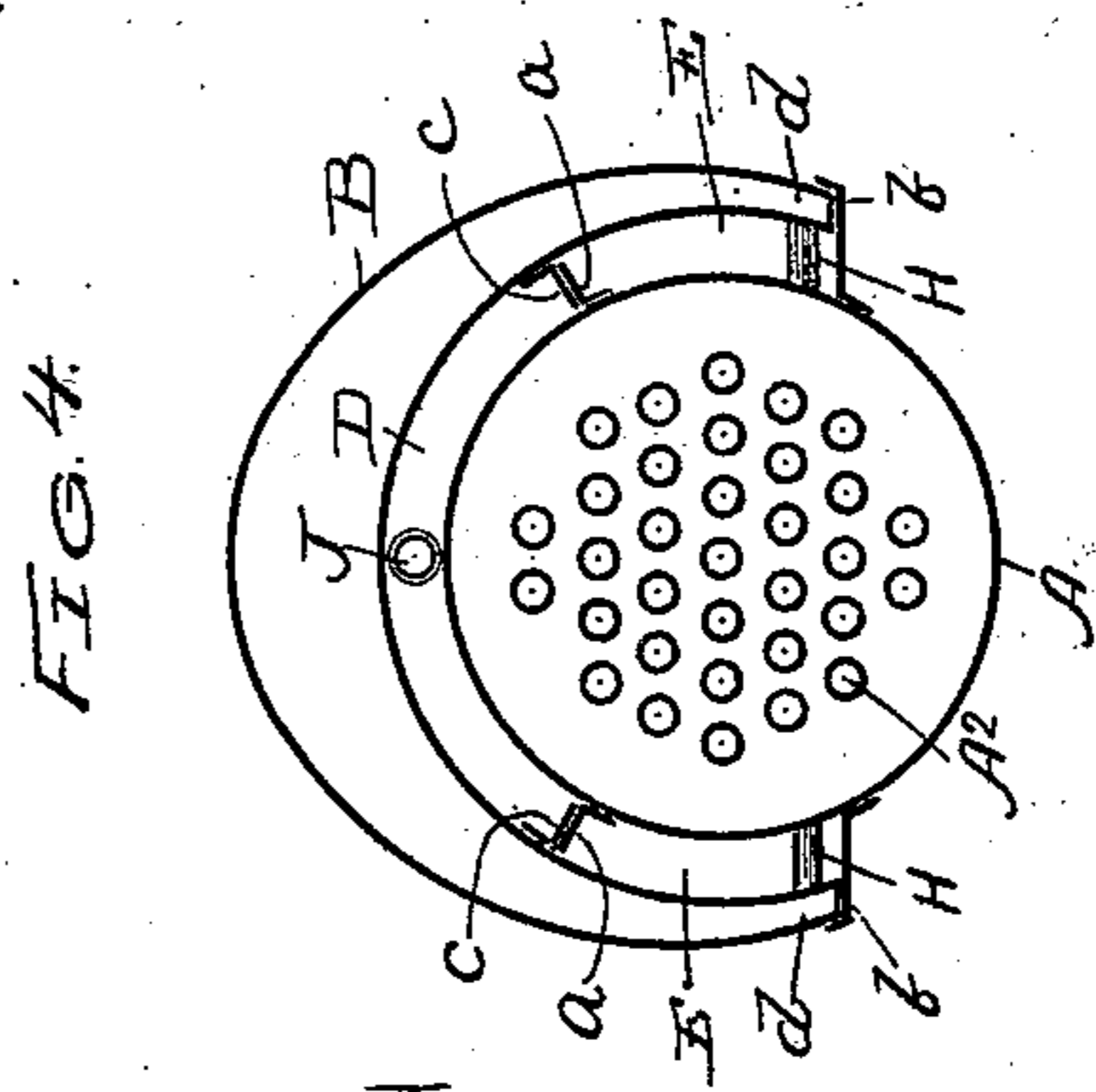


FIG. 4.

WITNESSES:
Lew. C. Curtis
A. W. Munday,

INVENTOR
HENRY BIANCHINI
By Munday, Everts & Adcock.
HIS ATTORNEYS.

(No Model.)

3 Sheets—Sheet 2.

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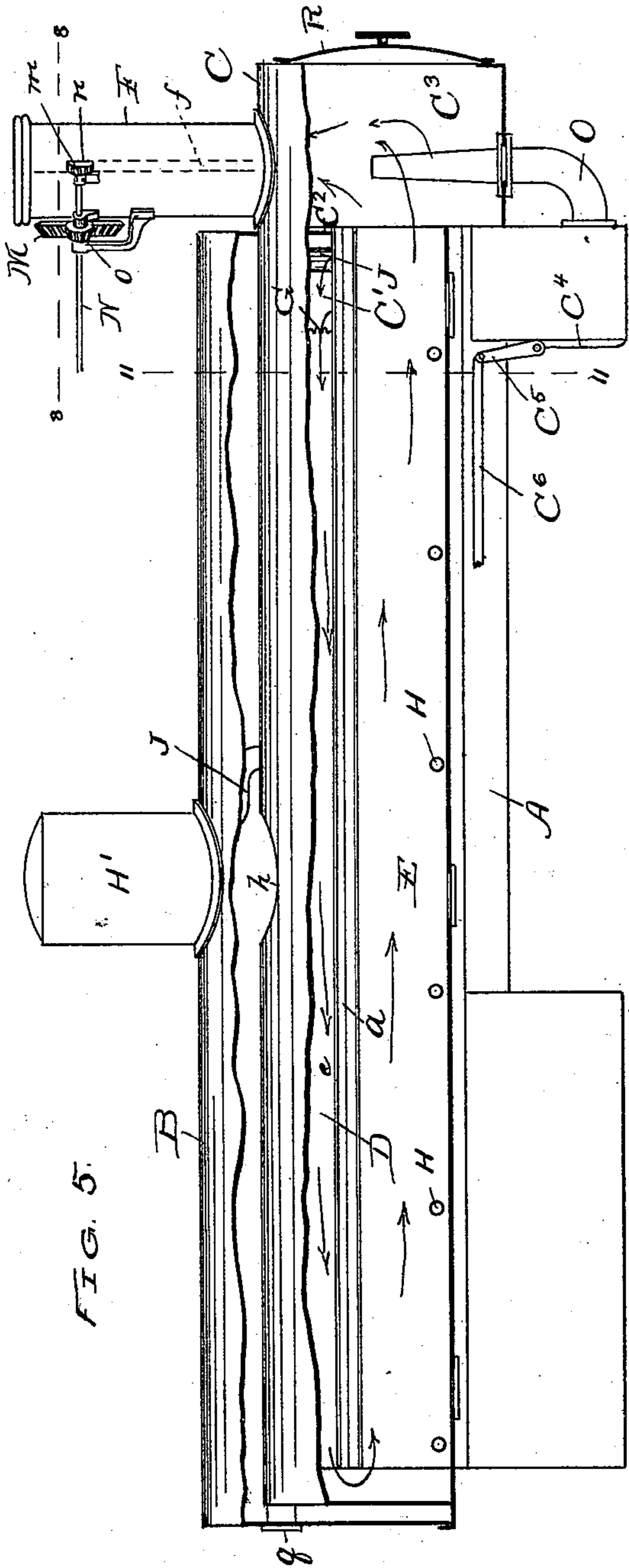


FIG. 5.

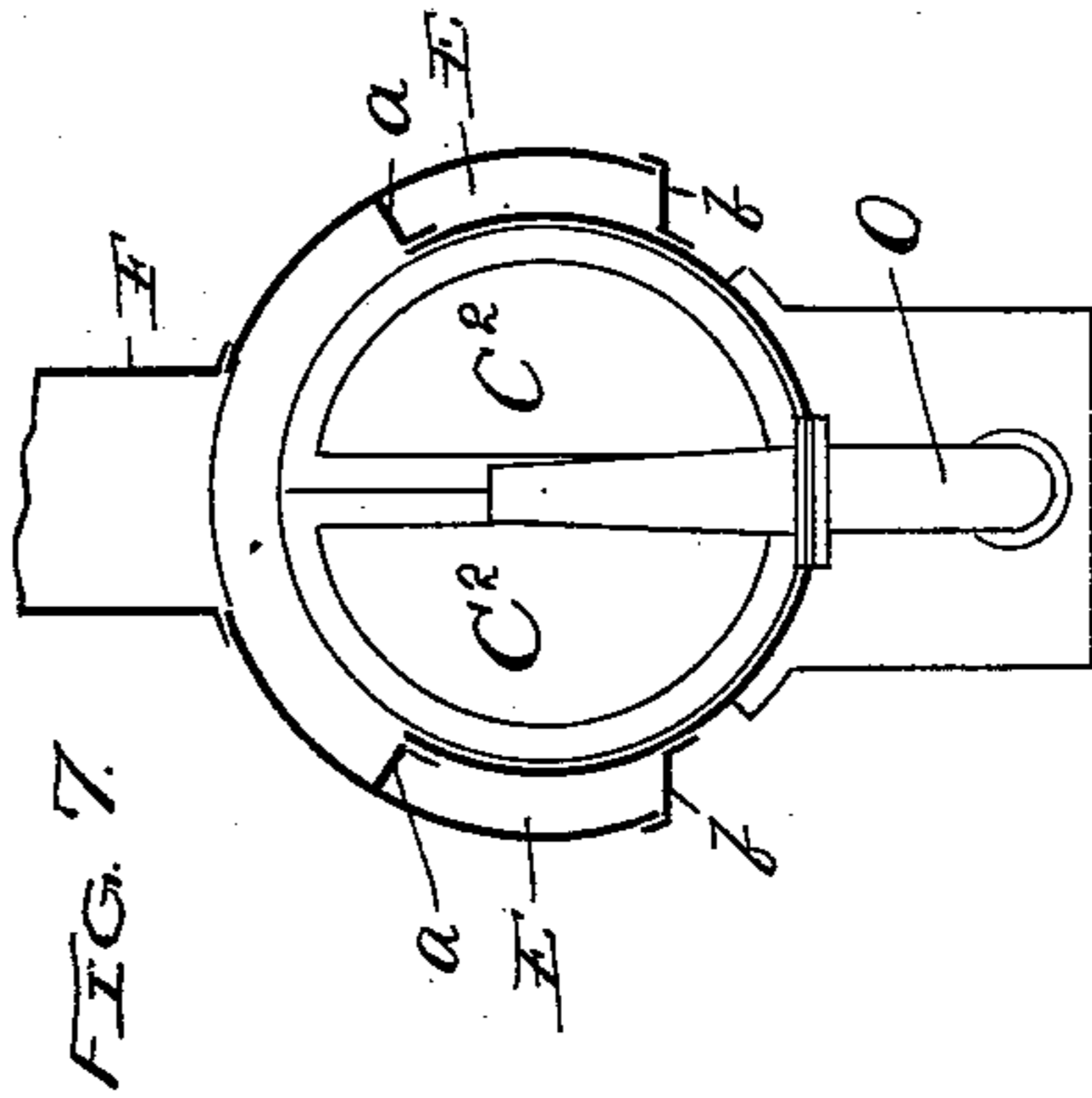


FIG. 7.

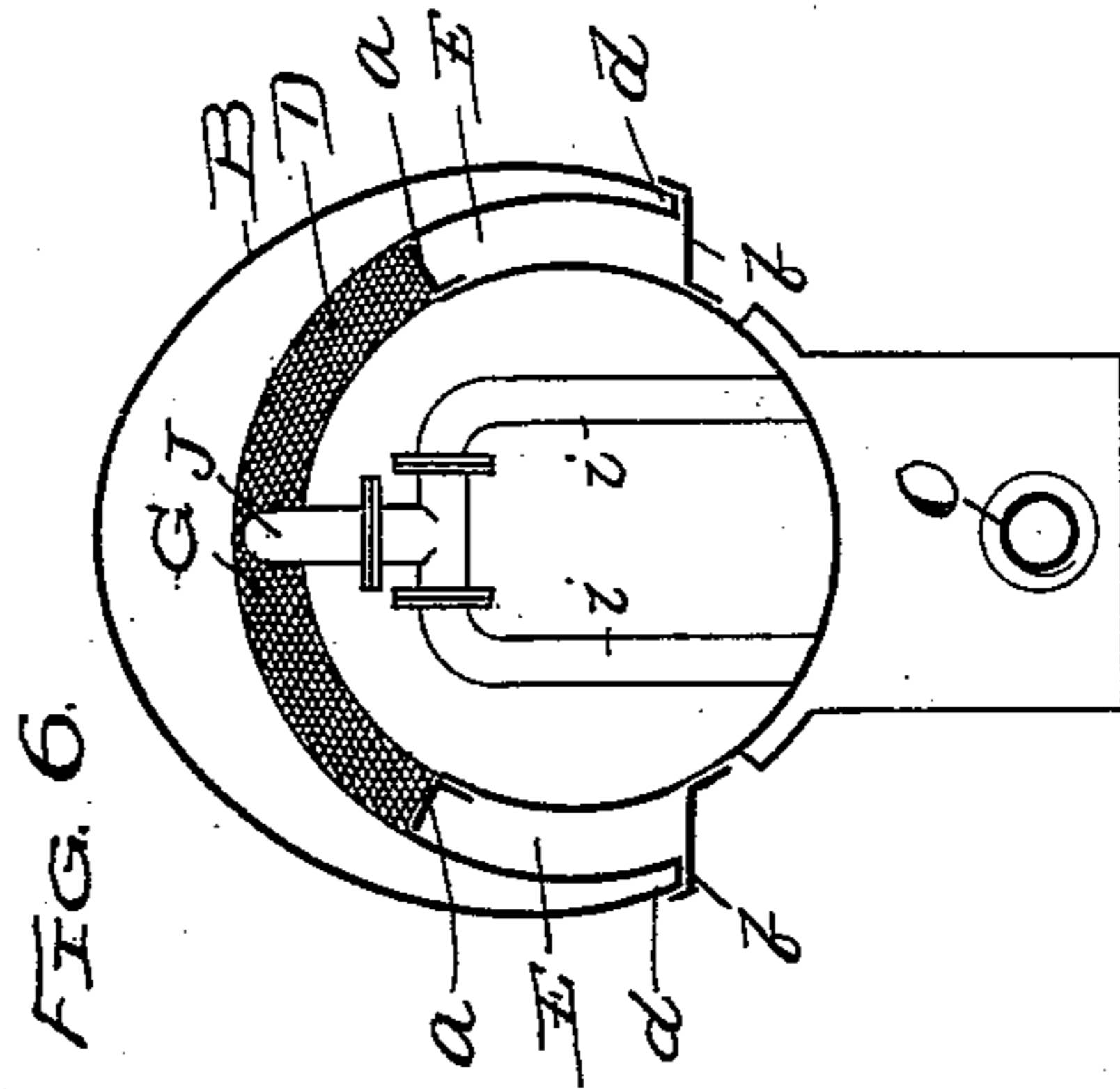
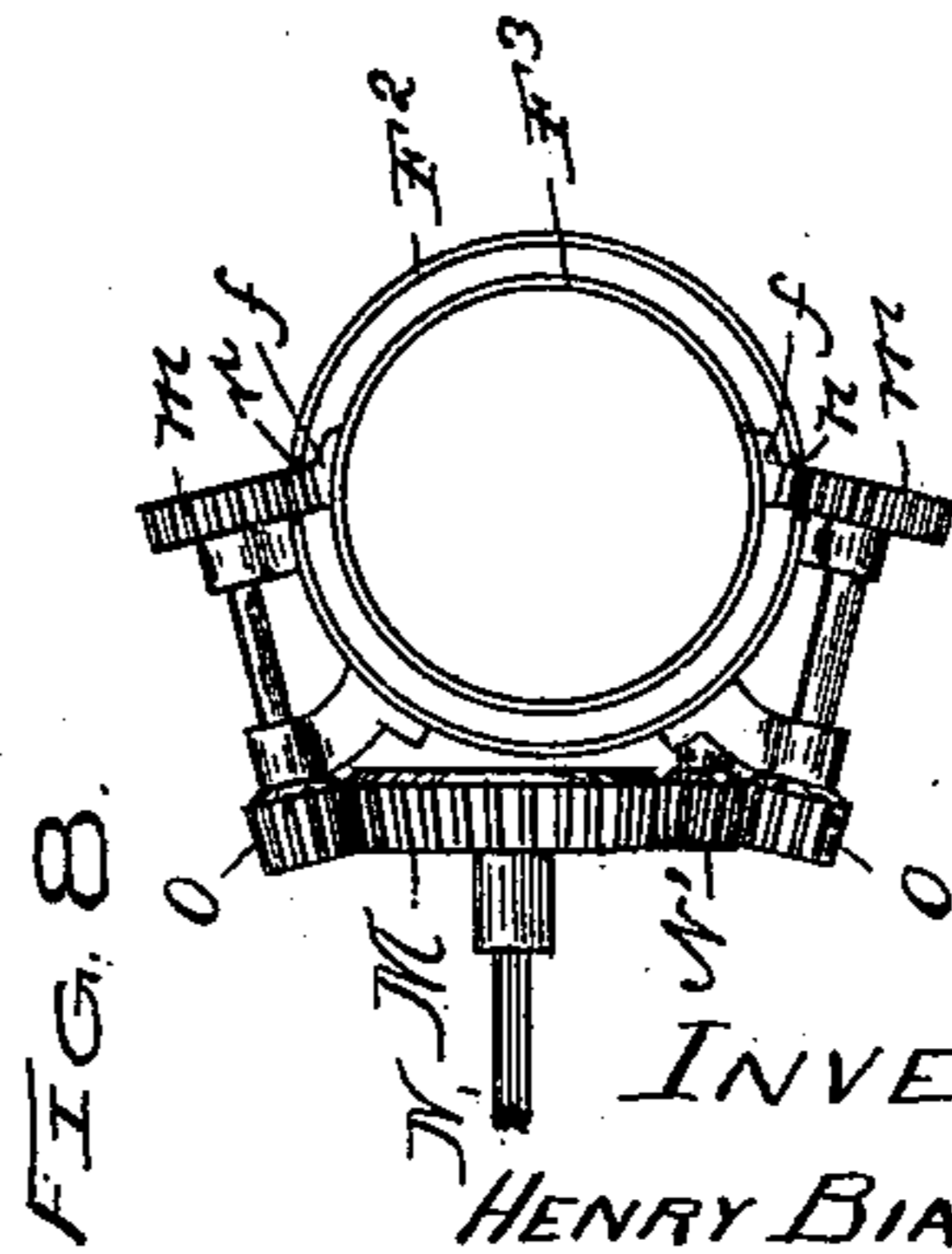


FIG. 6.



FI G. 8

INVENTOR:

HENRY BIANCHINI

BR Munday, Warts & Adcock,
HIS ATTORNEYS.

WITNESSES:

Sen. E. Curtis

A. W. Munday,

(No Model.)

3 Sheets—Sheet 3.

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FIG. 9

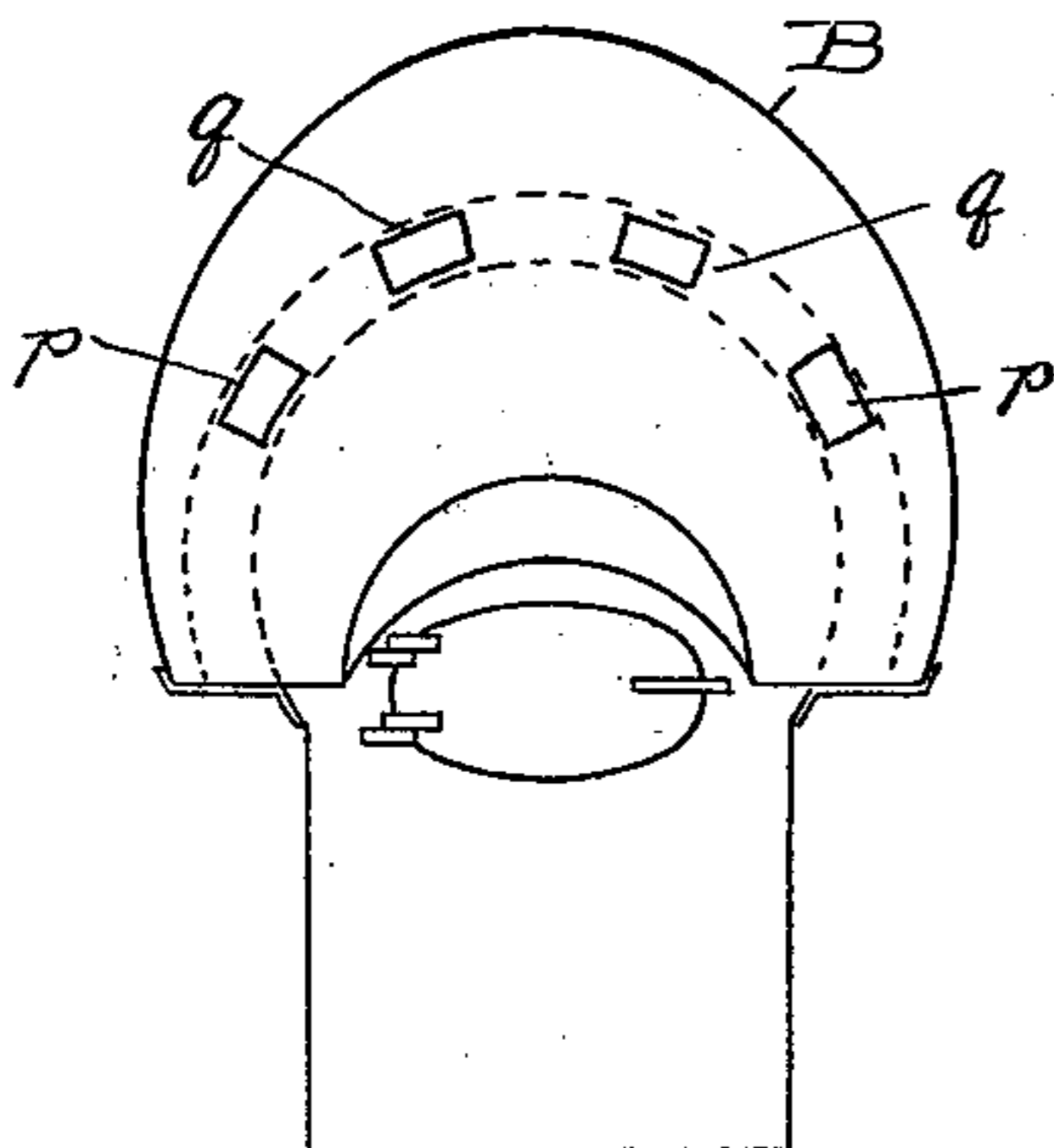


FIG. 10

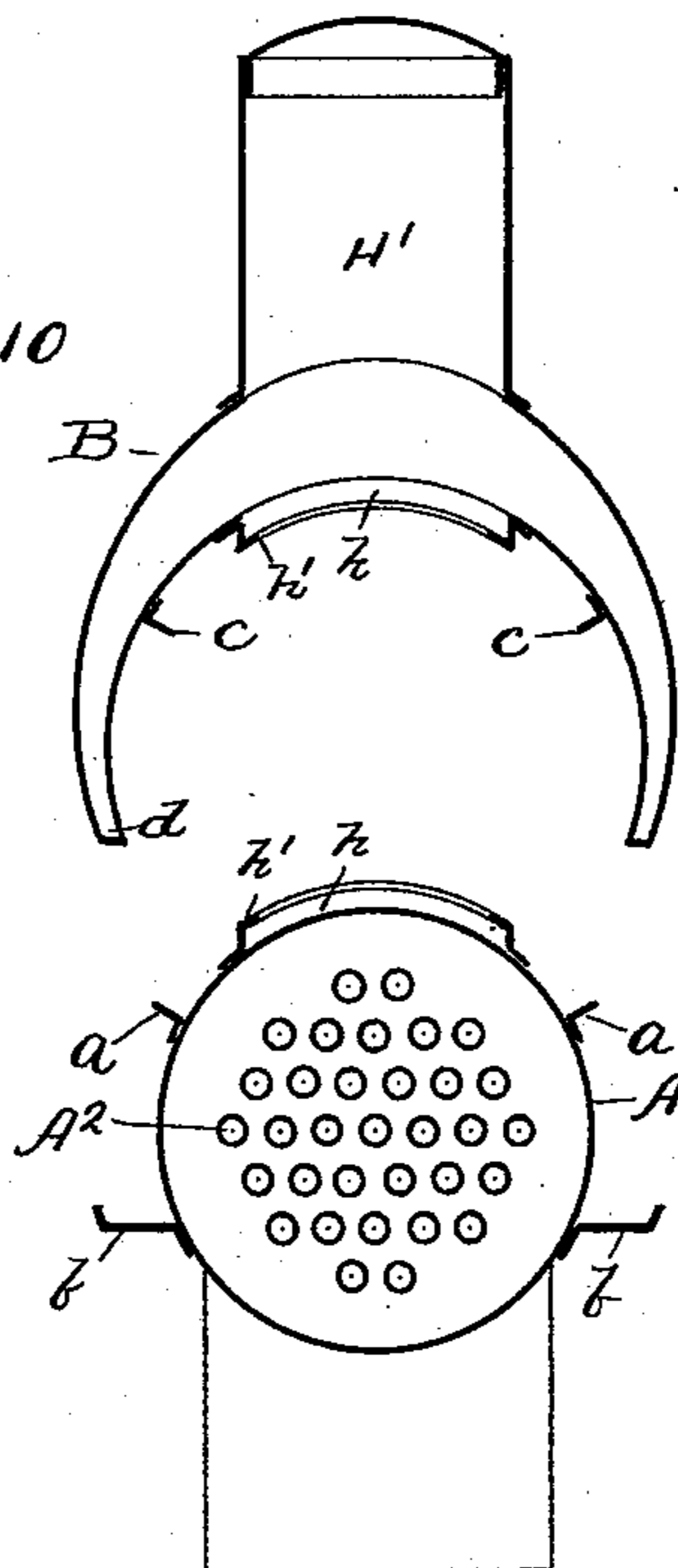


FIG. 11

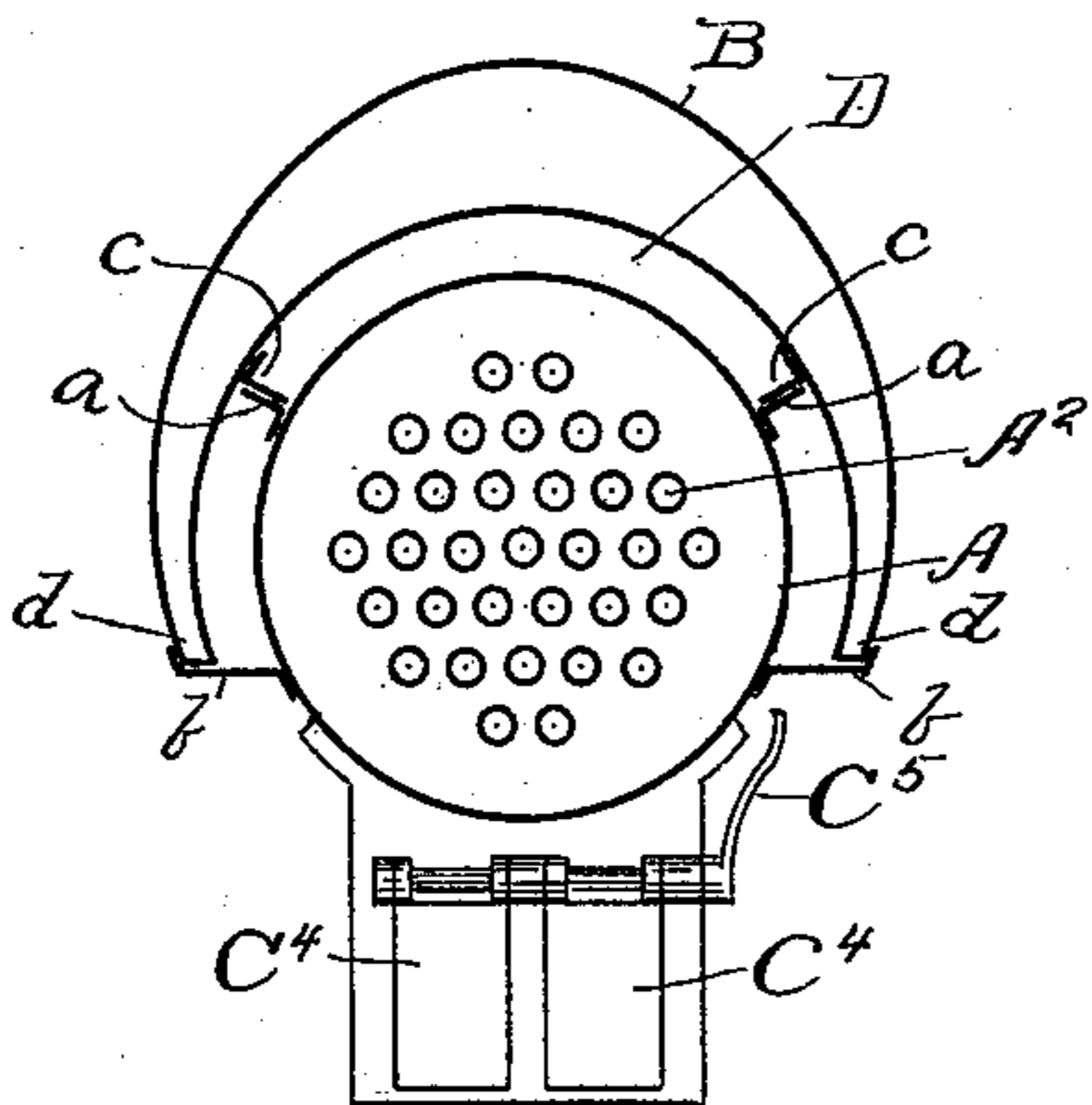
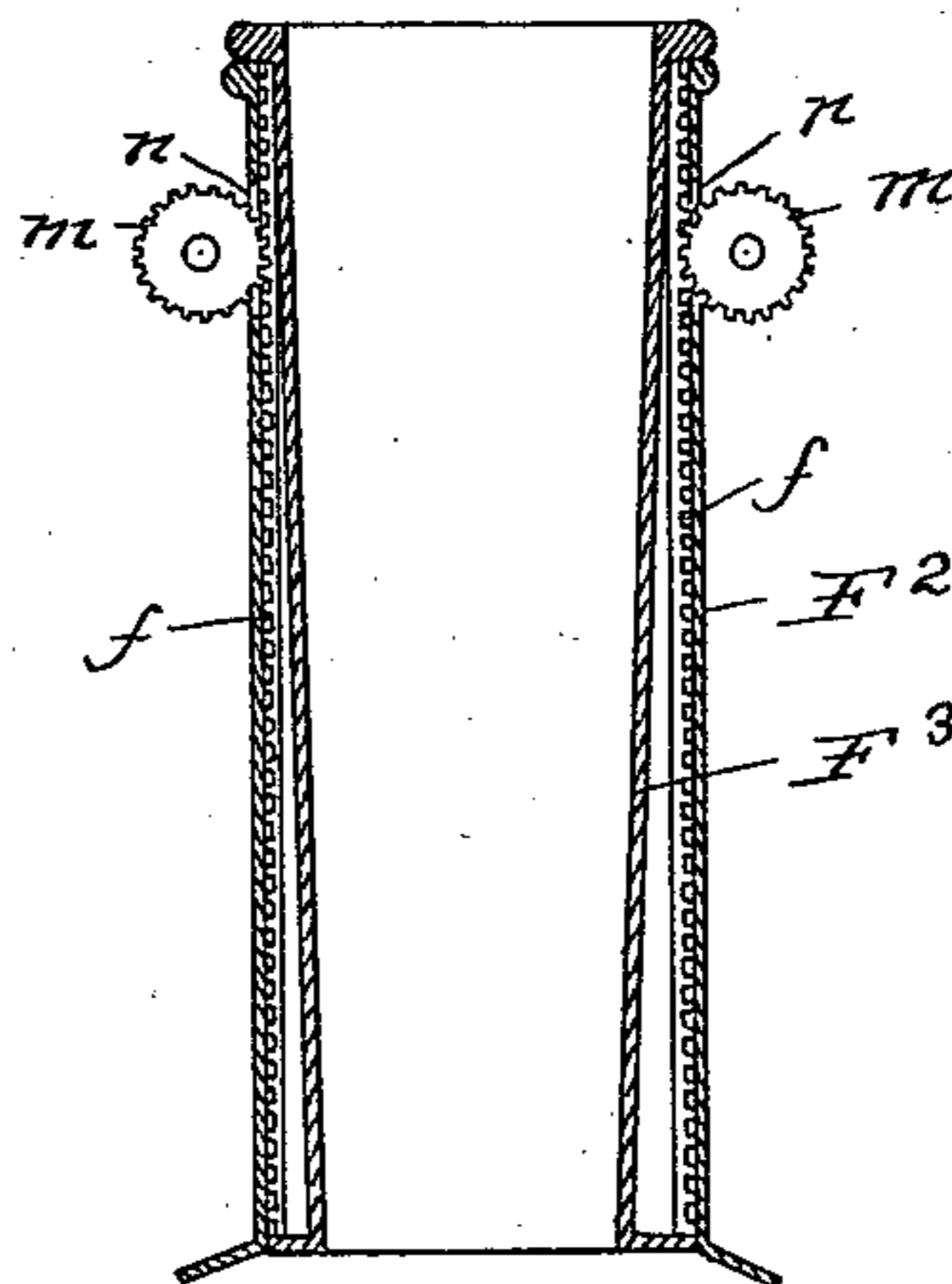


FIG. 12



WITNESSES:

Lew. C. Curtis
H. W. Munday,

INVENTOR:

HENRY BIANCHINI

By Munday, Everts & Adeock,

HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

HENRY BIANCHINI, OF CHICAGO, ILLINOIS.

BOILER.

SPECIFICATION forming part of Letters Patent No. 547,948, dated October 15, 1895.

Application filed October 8, 1894. Serial No. 525,217. (No model.)

To all whom it may concern:

Be it known that I, HENRY BIANCHINI, a subject of the King of Italy, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Boilers, of which the following is a specification.

This invention relates to improvements in boilers intended more especially for use in locomotives. It is well known that the gases and smoke which are given out through the stack of the ordinary locomotive are heated to about 300° centigrade at the time they are ejected. As the temperature is much above the vaporizing point of water, it will be seen that much of the heat which ought to be utilized is lost, and that consequently a large percentage of the fuel used is wasted. To prevent this loss of heat and waste of fuel is my main object in this invention, and to that end, instead of conducting the products of combustion in the customary way directly from the fire-box to the stack in an almost straight path, I pass them from the box to the stack by a circuitous path through water-holding portions of the boiler and in contact with steam-producing surfaces, and during this movement all the available heat-units contained in the gases are absorbed by the boiler-surfaces and utilized in the generation of the steam. In the formation of the passage ways constituting this circuit for the smoke and gases I have made the boiler in two parts—viz., a main part or boiler corresponding in most respects to the ordinary boiler, and in which are located the fire-box and heating-tubes, and a supplemental part or boiler placed over the main boiler and receiving the feed-water. The two parts communicate with each other, so that the lower boiler will be kept supplied with water from the upper one, and the smoke flue or passage referred to is formed between the main and the upper boiler. With this construction the upper boiler will be heated through the circuitous flue, but of course will not in that way receive as intense heat as the main boiler. The heat so received, however, will be sufficient to cause the deposit in the upper boiler of all or nearly all the incrusting material which may be in the water, so that by the time the water has found its way into the main boiler it will be substantially

freed from such matter, and the main boiler and its tubes be thus kept free from scales and incrustations.

In my improved construction the lower boiler is of the ordinary cylindrical formation upon the top, and the upper boiler is crescent-shaped in cross-section so that it is well adapted to set down upon and largely envelop the lower one. The ordinary smoke-box in front of the tubes is divided by a vertical partition extending across it from right to left and serving to turn the smoke and gases back into the passage-way or flue between the upper and lower boilers. After traversing the length of the boiler and to the rear end thereof the smoke and gases are again reversed in direction and move to the front of the engine, passing in so doing through flues also located and formed in the space between the boilers, and enter the portion of the smoke-box in front of the partition, and from thence pass out through the stack in the usual way. Inasmuch as the circuitous path provided in the boiler for the products of combustion may interfere at times with the perfect working of the draft, I provide my improved locomotive with an extensible stack, so that the latter may be lengthened whenever it becomes necessary to stimulate the fire. The means provided for this purpose are such as will enable the engineer to extend the stack at will and in a few seconds of time, and he can also restore it to its normal condition as quickly.

The invention consists in the novel construction of the boiler in respects above mentioned, and also in the novel details and features hereinafter set forth, and pointed out in the claims.

In the drawings, Figure 1 is a longitudinal vertical section of my improved boiler. Figs. 2, 3, and 4 are sections upon the lines 2 2, 3 3, and 4 4, respectively, of Fig. 1. Fig. 5 is a side elevation of the boiler, partly broken away. Figs. 6 and 7 are sections on the lines 6 6 and 7 7, respectively, of Fig. 1. Fig. 8 is a section on the line 8 8 of Fig. 5. Fig. 9 is a rear elevation. Fig. 10 shows the two boilers in section and detached. Fig. 11 is a section on line 11 11 of Fig. 5. Fig. 12 is a vertical section of the smoke-stack.

In said drawings, A represents the main or lower boiler, A' the fire-box, and A² the tubes

through which the flame and products of combustion pass into the rear chamber C' of the smoke-box C.

C² C² is the partition in the smoke-box, and by it the flame, &c., are turned back, and instead of entering the stack directly are caused to enter the flue or passage D, located centrally in the space between the main boiler and the crescent-shaped upper or supplemental boiler B. The flue D extends to the rear end of the boiler and there connects with two side passages E E, formed between the limbs of the upper boiler and the sides of the lower boiler, and these passages E extend to and open into the front chamber C³ of the smoke-box at the sides of said chamber, and thus conduct the smoke, &c., directly under the stack F and around the exhaust-nozzle F'. The course of the smoke and gases is plainly indicated in Figs. 1 and 5 by the arrows. The entrance to the flue D is guarded by a screen G, whereby the cinders, sparks, and solid portions of the fuel which may be drawn from the fire-box are arrested and collected in the chamber C' of the smoke-box, and from which they are discharged through the hinged door C⁴ as often as occasion requires. This door is opened and closed by the arm C⁵ and rod C⁶, the latter extending to some point which renders it convenient for the engineer to operate it even while running. A sloping floor G' insures the cinders falling against the door. As the steam does not enter this compartment of the smoke-box, the detritus arrested therein is always dry and does not cake or become lodged therein.

For the purpose of supporting the upper boiler B, I provide the main boiler with projecting ribs or flanges *a b*, extending along its sides, and the upper boiler with ribs or flanges *c* upon its under surface, adapted to engage and be properly secured to flanges *a*. The lower flanges *b* are positioned and fashioned so they will receive and support the lower edges *d* of the upper boiler. The flanges *a c* form the sides of the flue D, and the flanges *a, c*, and *b* form the top and bottom of the flues E. Communication between the upper and lower boilers is permitted by the transverse pipes H, of which there is a series along each side of the boiler, near the bottom edges of the upper boiler, and by the central opening *h*, immediately under the steam-dome H'. The opening *h* being located within the outlines of flue D, both the upper and the main boilers are furnished with coinciding and projecting flanges *h'*, which form a tight joint and prevent any leakage of the steam or water into the smoke-flue. Water is fed to boiler B at *w*, and the broken line *v* indicates the ordinary level of the water. The steam is fed from the dome through the pipe J, which I locate in the forward half of the flue D and in the smoke-box chamber C', in both of which said pipe is subjected to intense heat, so that the steam passing through it becomes very thoroughly heated and dry before it is called

into service. Within the chamber C' this pipe branches, and one of the branches *i* leads to each cylinder of the locomotive.

The stack, which is extensible, as already stated, is made of two cylinders, one telescoping within other. Of these the outer cylinder F² is stationary, while the inner one F³ is movable. The inner cylinder is provided upon oppositesides with longitudinal racks *f*, meshing with which are pinions *m*, journaled upon the outer cylinder and projecting through openings *n* therein. These pinions are located near the top of the outer cylinder and are operated by a gear M upon the shaft N, intermediate pinion N', and the pinions *o* upon the journals of pinions *m*. The shaft N may extend to the cab, or it may be provided with a crank near the stack, and in either case is easily and quickly operated so as to lengthen the stack or restore it to its normal condition. Ordinarily I do not anticipate that it will be necessary to extend the stack except when starting the fire or when reviving a low fire; but if occasion requires the inner stack-cylinder may be raised or lowered while the engine is running.

It will be noticed that the fire-box of my improved locomotive is arched at the ceiling instead of being flat as in the ordinary construction, and that the arch thus given to the ceiling is concentric with the arch of the outer or crown sheet of the lower section or part boiler A, thus rendering the space between the top sheet of the fire-box and the crown-sheet of the boiler uniform in depth. These features are important, as the arched form resists the warping, twisting, and bulging so common in flat-top boxes, and the uniform depth between the sheet permits the use of stay-bolts of a uniform length, all of which expand and contract alike, and thus maintain the integrity of the structure much longer than would bolts of unequal length.

The exhaust-pipe O, leading from the cylinders, is placed horizontally, as shown, instead of perpendicularly, as in the common way, and the exhaust-nozzle is connected to it at its center, as also shown.

At *p p* are doors for cleaning the smoke-flues E, and at *q q* are doors for cleaning the center flue D. The partition C² of the smoke-box is also preferably made in two parts, the dividing-line between which is a central one, so as to adapt it for easy removal in getting access to the chamber C' and the forward end of the fire-tubes and flue D. Access to the front chamber of the smoke-box is obtained in the usual way through the door R.

By my construction the water circulates freely in both boilers, and steam is generated contemporaneously in both, while at the same time the main boiler is kept constantly supplied with water from the upper one. The two boilers, considered together, about equal the ordinary boiler in size, as the added fire-tubes, the circuitous smoke-flues, and the second smoke-chamber do not require space

exceeding that found in the prevailing styles of locomotives.

By my invention I obtain the following advantages: first, great economy in the use of
5 fuel, due to the circuitous path given to the products of combustion through the water-holding parts of the boiler and the greatly enlarged water-heating surface with which the products of combustion come in contact;
10 second, increased power and speed, because my boiler generates steam faster and permits the development of greater pressure than can be obtained in present locomotives; third, a material reduction in the time required for
15 getting up steam, which reduction I estimate at from one-quarter to one-third; fourth, the ability to clean the smoke-box while running; fifth, the arresting of the cinders and fuel in the smoke-box; sixth, the ability to increase
20 the draft by lengthening the stack; seventh, the depriving of the water of its incrusting matter while it is in the upper boiler, whereby the lower boiler and the tubes therein are kept free and clean from incrustation; eighth,
25 the prevention of warping, bulging, &c., of the fire-box ceiling by giving it an arched or curved form.

I claim—

1. The boiler consisting of a main part A
30 provided with a fire box, and a crescent-shaped upper part B, supported above the main part, the space between the parts A and B being divided longitudinally and forming flues adapted to conduct the smoke &c. from the
35 smoke box to the rear of the boiler and thence back again to the box, substantially as specified.

2. The boiler consisting of a main part A having a fire box at one end, a crescent-shaped
40 upper part B supported above the part A and a divided smoke box C, the space between the parts A and B being partitioned longitudinally and forming flues adapted to conduct the smoke &c. from the smoke box to
45 the rear of the boiler and thence back again to the smoke box, substantially as specified.

3. The boiler consisting of a main part A having a fire box at one end, a crescent-shaped
50 upper part B supported above the part A, and a divided smoke box C, the space between the parts A and B being partitioned longitudinally and forming flues adapted to conduct the smoke &c. from one of the chambers of the smoke box to the rear of the boiler,
55 and from thence to the other chamber of the smoke box, substantially as specified.

4. The boiler made in two parts A and B, having steam and water communication with each other, the part B having a feed water in-
60 let and also having its own heating surface, and said part A having a fire box and receiving all its water from part B, whereby scaling and incrustation will take place mainly in part B, substantially as specified.

5. The boiler made in two communicating
65 parts A and B, with circuitous smoke flues D and E between them, the part A contain-

ing the fire box and the part B receiving the feed water and supplying the part A therewith, substantially as specified. 70

6. The combination in a boiler, of the main part A and upper crescent-shaped part B, said parts having flanges or ribs upon their opposite surfaces adapted to divide the space between them into flues, substantially as speci- 75 fied.

7. The combination in a boiler, of the main part A and upper crescent-shaped part B, said parts having flanges *a*, *b*, and *c*, upon their opposite faces with the divided smoke box 80 communicating with the flues formed between the parts A and B by the flanges, substantially as specified.

8. The combination in a boiler, of a fire box, a smoke box receiving the flame &c. from the 85 fire box, the circuitous flues such as D and E, the screen located at the entrance to flue D, and the stack, substantially as specified.

9. The combination in a locomotive boiler, of a fire box, a smoke box receiving the smoke 90 from the fire box and conducting it to a horizontal flue D, and a screen arranged at the entrance to said flue from said smoke box, substantially as specified.

10. The combination in a locomotive boiler, 95 of a fire box a smoke box receiving the smoke from the fire box and conducting it to a horizontal flue D, a screen arranged at the entrance to said flue from said smoke box, and means for opening the smoke box to allow 100 the discharge of the accumulated cinders, substantially as specified.

11. In a locomotive boiler, the combination with the flue D and the screen located at the entrance thereto, of a smoke box C arranged 105 to receive the cinders arrested by the screen, said box having a sloping floor and a discharge door, substantially as specified.

12. The combination with the boiler of a locomotive of an extensible stack consisting of 110 a stationary outer section, a telescoping inner section, the inner section being provided with racks upon its sides, and the outer section with gears meshing with said racks, and means for operating said gears in unison, substantially 115 as specified.

13. The circuitous smoke flue boiler, consisting of the main boiler A having a fire box the ceiling whereof is arched, and a crescent-shaped upper boiler B, the smoke flues being 120 formed between said main and upper boilers, substantially as specified.

14. The circuitous smoke flue boiler, consisting of the main boiler A having a fire box the ceiling whereof is arched concentrically 125 with the top of said part A, and a crescent-shaped upper boiler B, the smoke flues being formed between said main and upper boilers, substantially as specified.

15. The improved locomotive boiler consist- 130 ing of a main boiler A, having a fire box with an arched ceiling, an upper boiler B, circuitous smoke flues formed between the parts A and B, a divided smoke box having a screen

for arresting sparks arranged at the entrance to said flues, a discharge door for said box and means whereby it may be operated while the locomotive is running, and an extensible
5 stack, substantially as specified.

16. The two part boiler for locomotives, the part A whereof contains the fire box and is filled with fire tubes to its top, and the part B whereof surmounts the part A and contains
10 the steam space, the open space between the two parts being utilized as circuitous smoke flues, substantially as specified.

17. The two part locomotive boiler A, B, having circuitous smoke flues D and E therebetween and a smoke box having two chambers, 15 the forward chamber connecting with the stack and the flues E delivering the smoke at the sides of said forward chamber, substantially as specified.

HENRY BIANCHINI.

Witnesses:

EUG. C. BIANCHINI,
ERMETE NEMIE.