

No. 619,051

Patented Feb. 7, 1899.

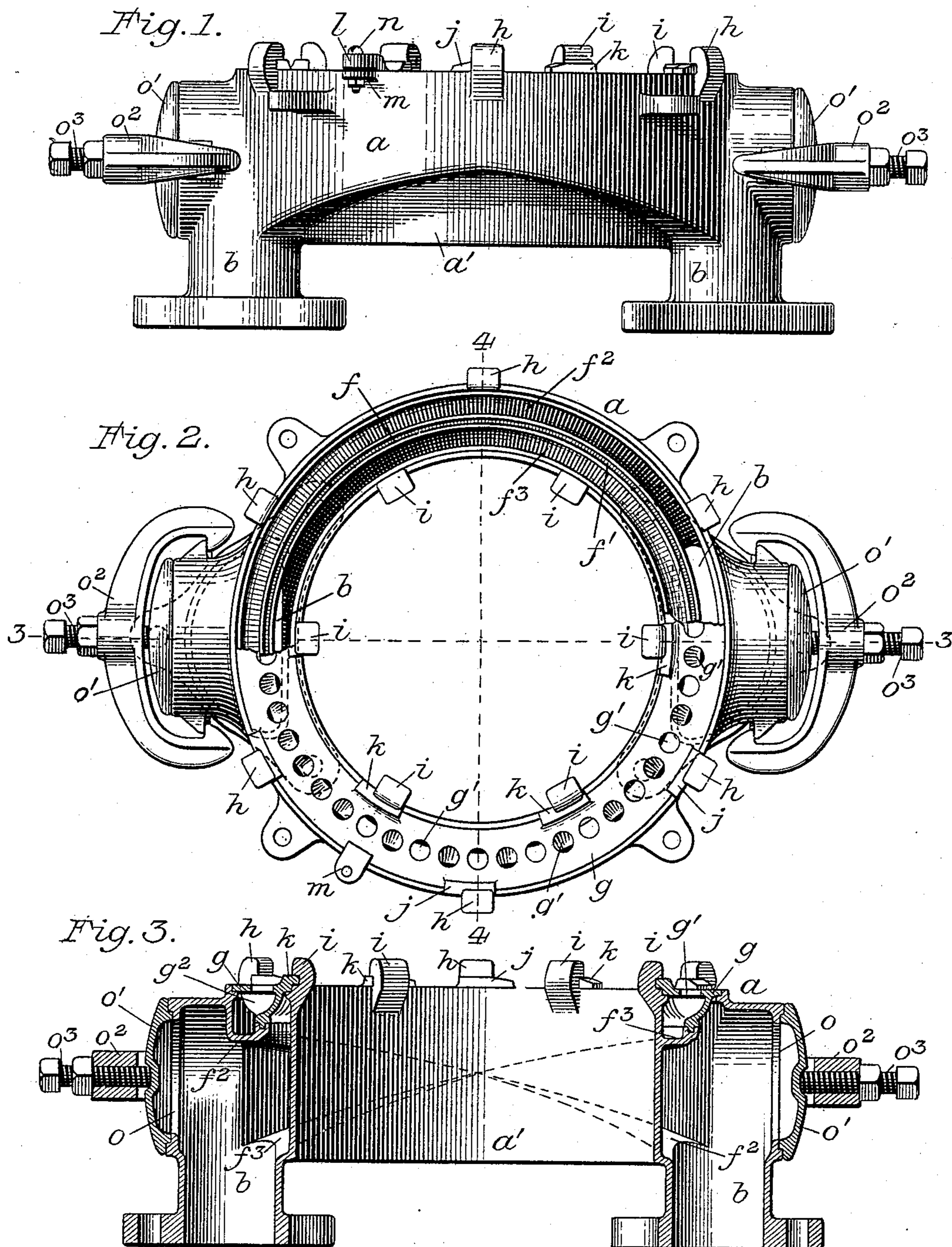
J. Y. SMITH.

SMOKE CONSUMER AND BACK PRESSURE REDUCER.

(Application filed July 8, 1898.)

(No Model.)

5 Sheets—Sheet 1.



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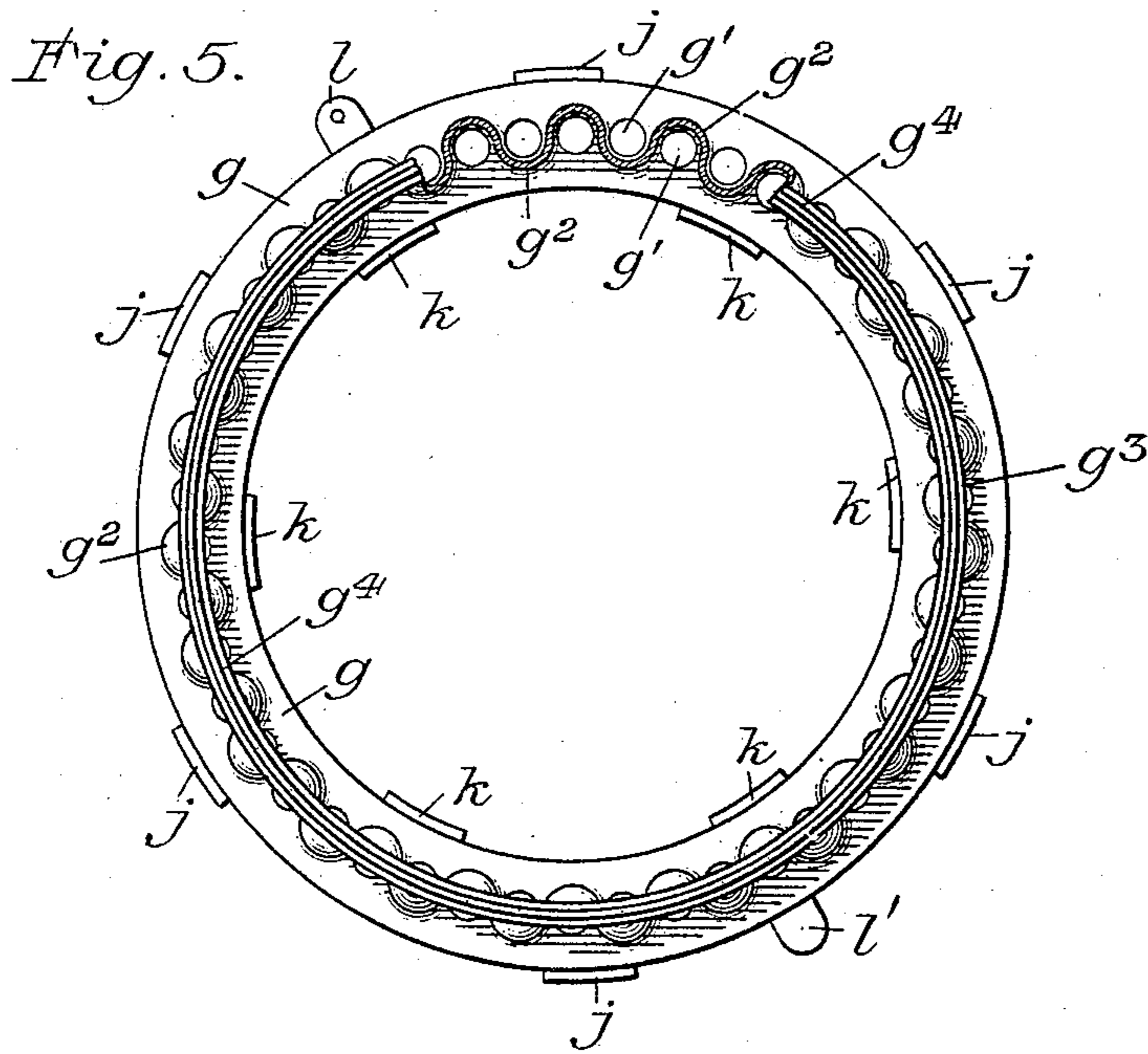
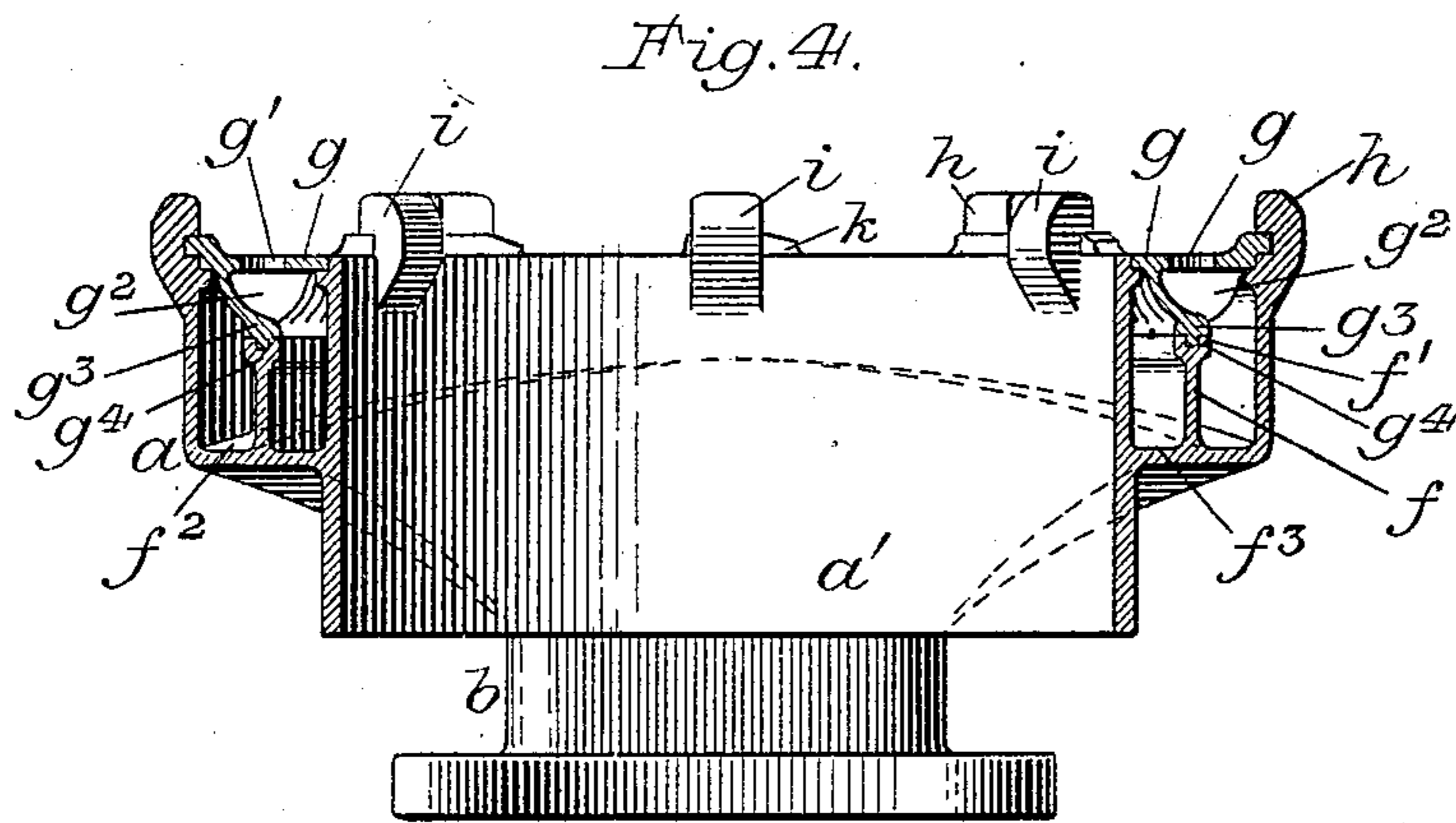
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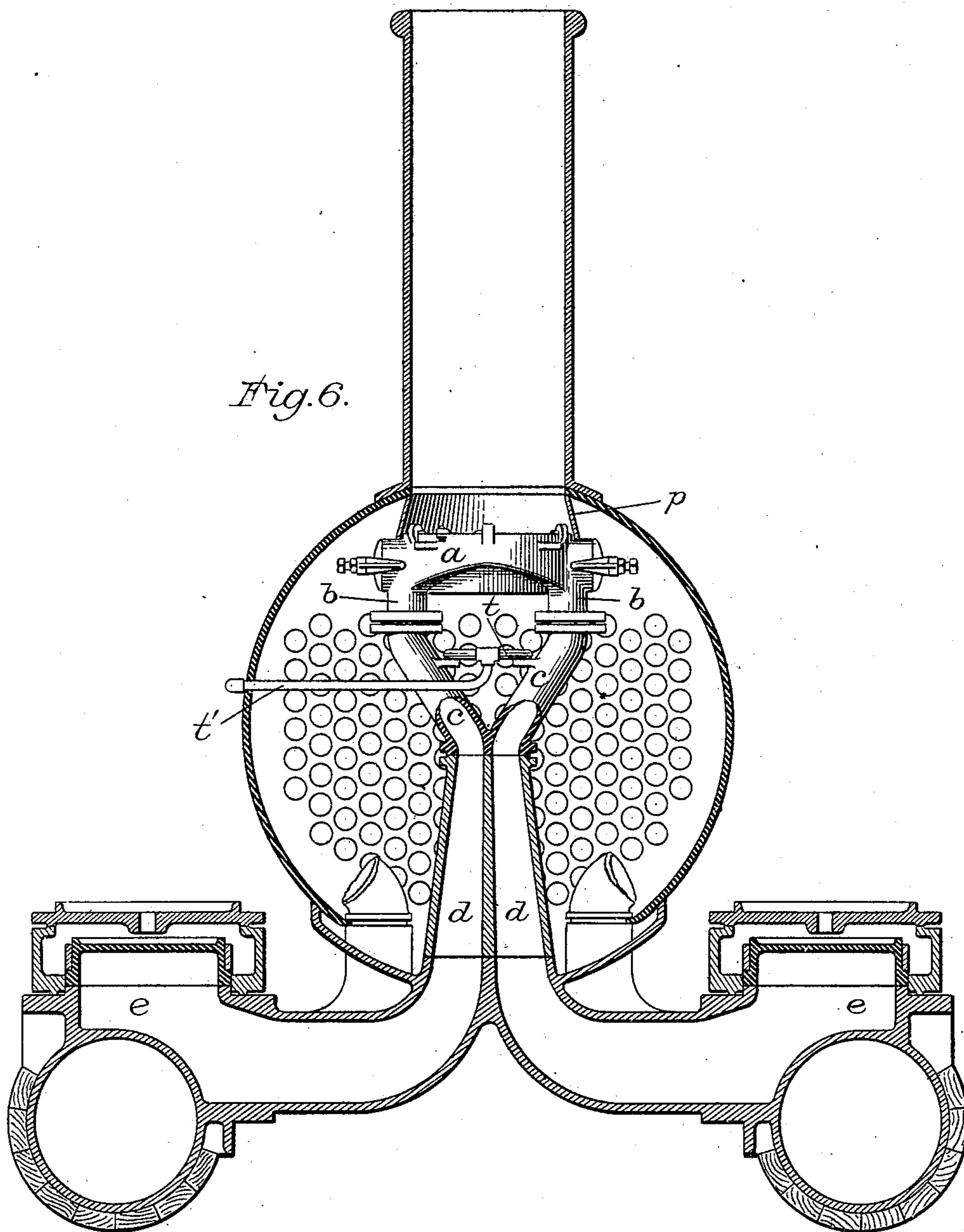
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5 Sheets—Sheet 3.



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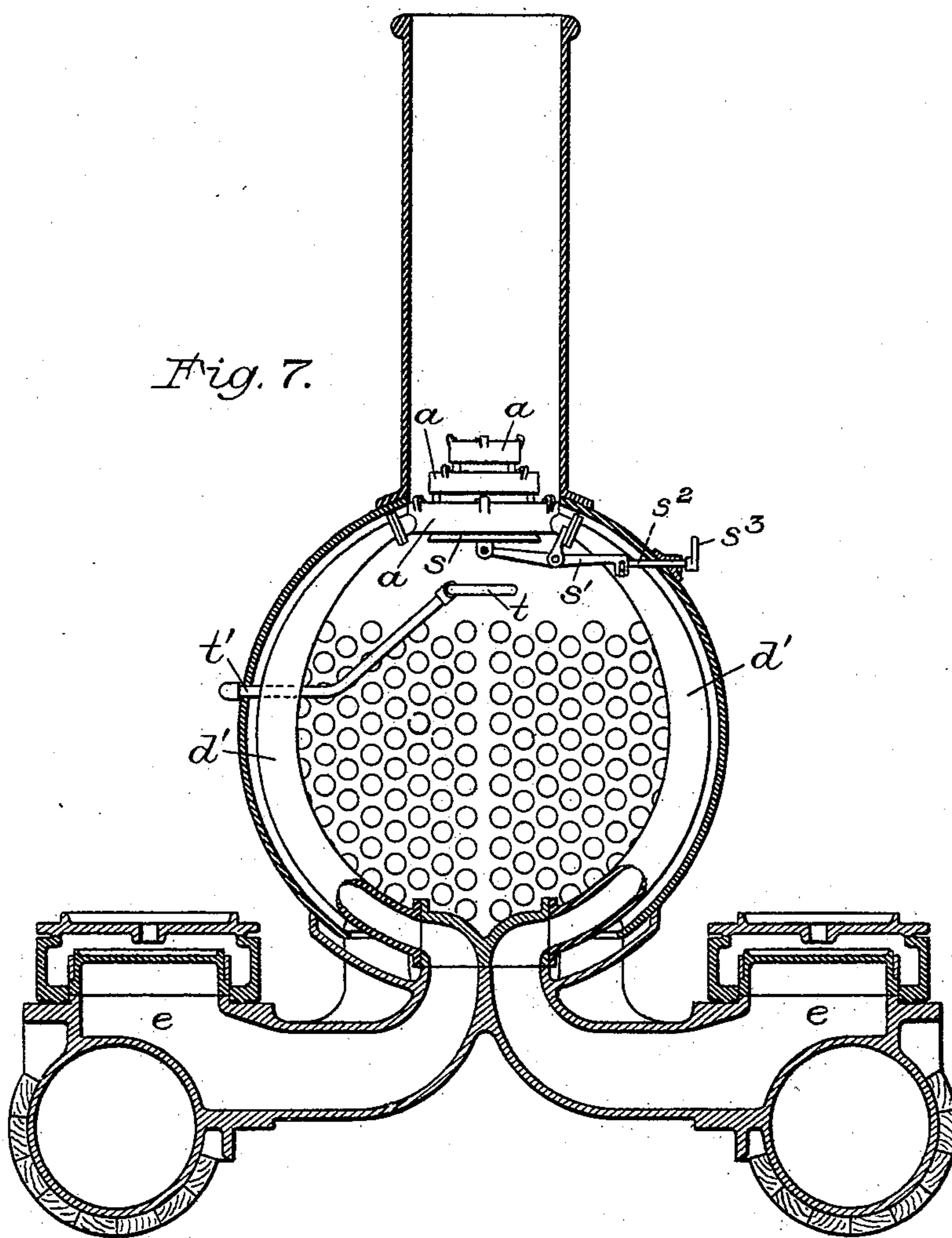
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5 Sheets—Sheet 4.



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Patented Feb. 7, 1899.

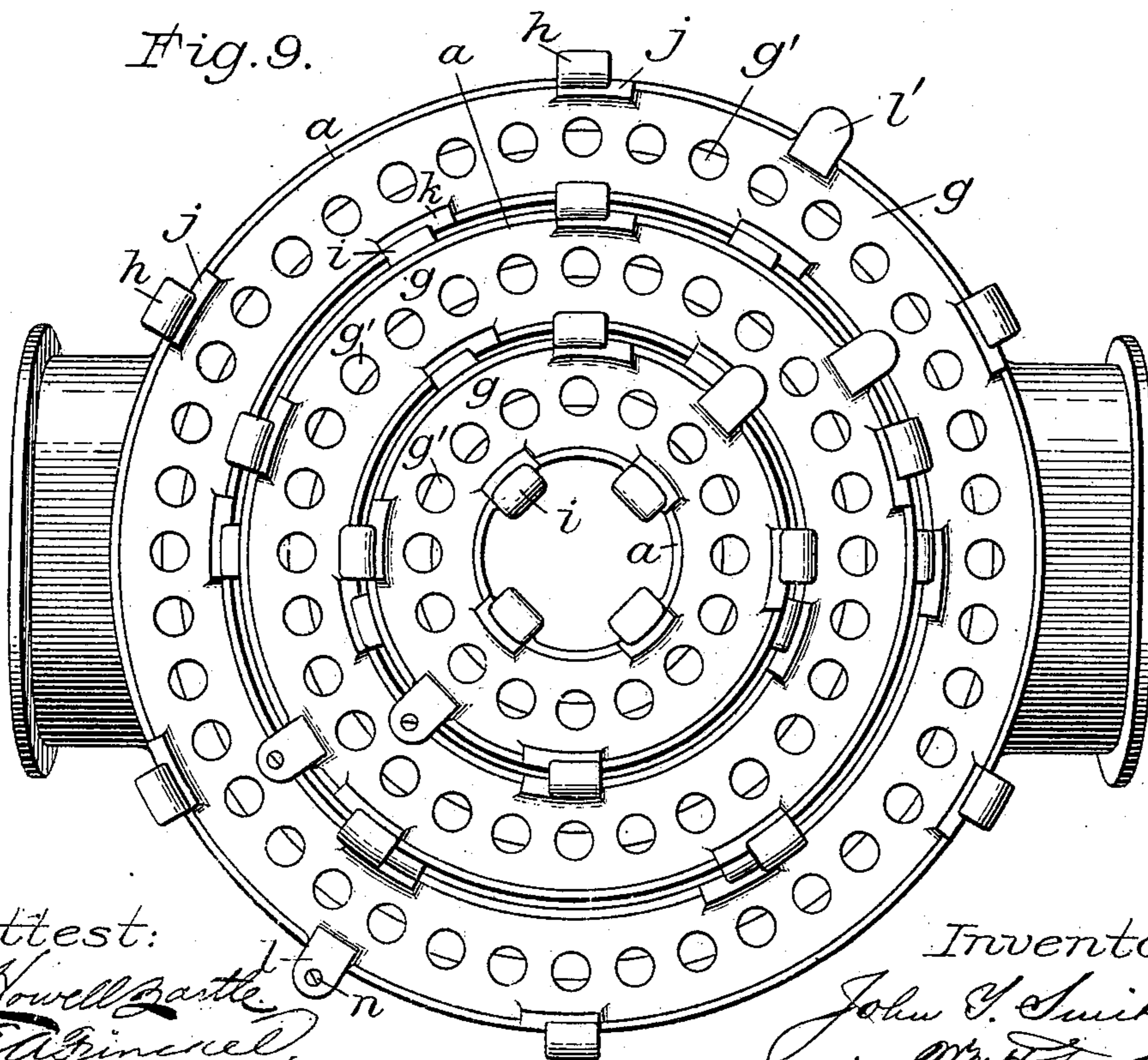
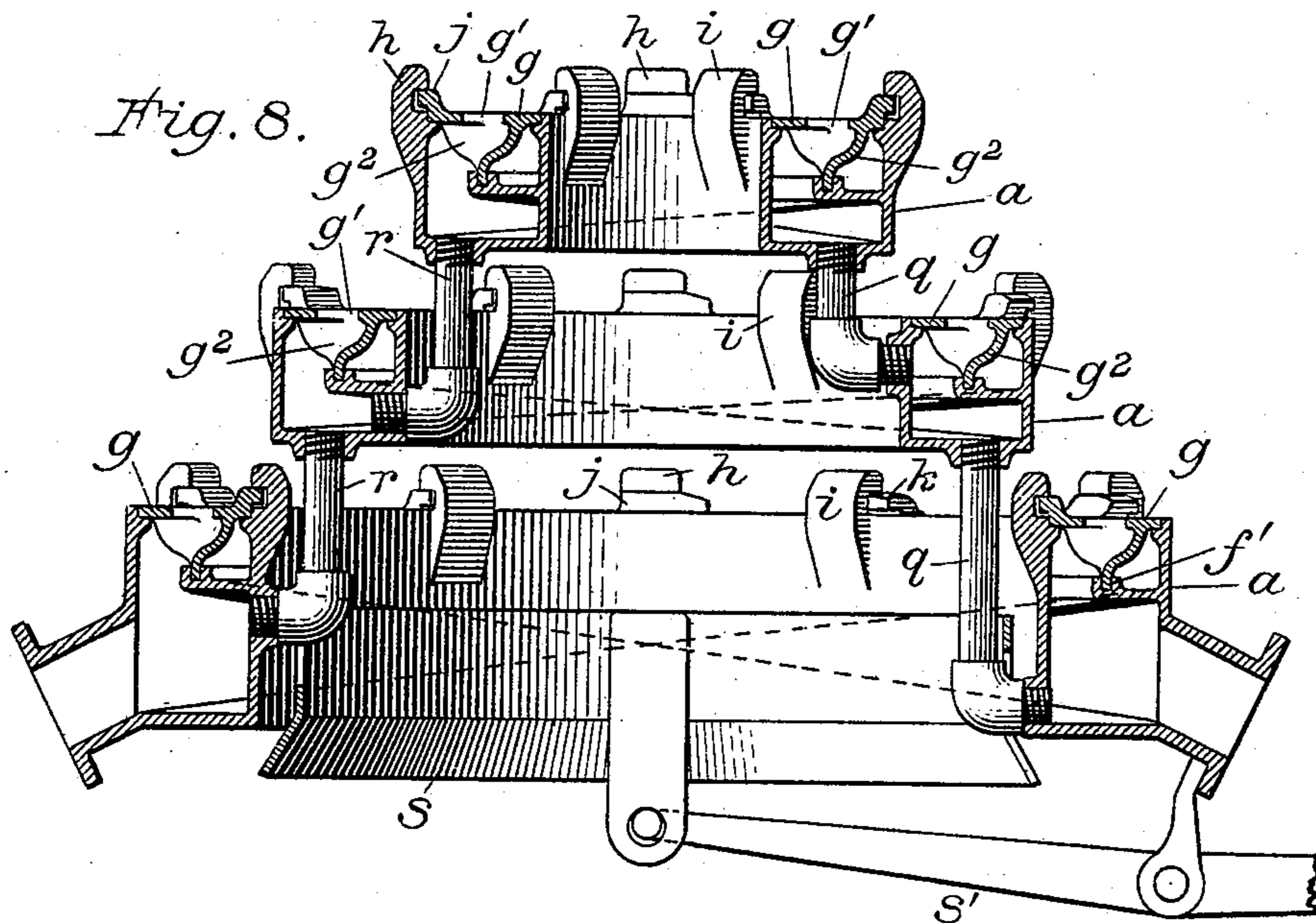
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5 Sheets—Sheet 5.



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UNITED STATES PATENT OFFICE.

JOHN Y. SMITH, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR OF TWO-THIRDS TO CHARLES T. SCHOEN AND WILLIAM C. DE ARMOND, OF PHILADELPHIA, PENNSYLVANIA.

SMOKE-CONSUMER AND BACK-PRESSURE REDUCER.

SPECIFICATION forming part of Letters Patent No. 619,051, dated February 7, 1899.

Application filed July 8, 1898. Serial No. 685,434. (No model.)

To all whom it may concern:

Be it known that I, JOHN Y. SMITH, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Smoke-Consumers and Back-Pressure Reducers, of which the following is a full, clear, and exact description.

The object of this invention is twofold—namely, first, to consume, destroy, dissipate, or otherwise eliminate or get rid of the smoke arising from combustion in furnaces, and, second, to reduce or obviate the back pressure in engines; and where the apparatus of my invention is employed in a steam plant or steam apparatus in which a furnace and an engine are combined these two functions are performed conjointly. It is apparent from this statement of the object of the invention that my said invention is applicable to all sorts of furnaces and also to engines and to a great variety of, if not all, steam plants; but for the sake of a concrete example and in description of the principle of my invention I will describe my said invention herein as applied to a locomotive-engine; but I wish distinctly to be understood as not limiting my invention to such use, and, further, I wish to be understood as comprehending in the claims hereinafter made all uses to which my invention is applicable.

I wish also to add that my invention is capable of use with steam, air, gas, and other power or motive fluid.

With this comprehensive statement in mind my invention consists of a smoke-consumer and back-pressure reducer composed of a chamber adapted to receive the motive agent at two points and divided into two compartments which communicate with the external atmosphere by a peculiar exit device, which latter forms one of the essential features of the present invention.

Another peculiarity of the present invention is the manner of dividing the chamber into two compartments; and still another feature of the invention resides in details of construction whereby the apparatus may be read-

ily assembled and access had thereto for cleaning and other purposes.

Additional features of the invention, comprising details of construction and combination of parts, will appear more fully hereinafter.

In the accompanying drawings, illustrating my invention, in the several figures of which like parts are similarly designated, Figure 1 is a side elevation. Fig. 2 is a plan view with a portion of the exit device broken away. Fig. 3 is a cross-section taken substantially in the plane of line 3 3, Fig. 2. Fig. 4 is a transverse section taken substantially in the plane of line 4 4, Fig. 2. Fig. 5 is a bottom plan view of the exit device with a portion of its foot-flange broken away and in horizontal section. Fig. 6 is a partly-sectional elevation illustrating one arrangement of my invention in a locomotive. Fig. 7 is a view similar to Fig. 6, showing another arrangement and also illustrating a modification of the apparatus, the latter being shown on a larger scale in Figs. 8 and 9, Fig. 8 being a vertical section and Fig. 9 a top plan view.

Assuming that the apparatus is to be applied to a steam-locomotive using coal for fuel, I provide in the smoke-box and adjacent to the smoke-stack, as in Fig. 6, the chamber *a*. This chamber is made as an annulus and, as in the modification Fig. 6, is cast integrally with the tubular flanged feet *b*, which are adapted to be connected by a *Y* (lettered *c*) to tubes *d*, which extend from the exhaust-ports of the engines *e*.

The chamber is divided into two compartments by a vertical wall *f*, the face of which is provided with a groove *f'*. This vertical wall is connected transversely with the outer wall of the chamber *a* by a bottom *f²*, which slants in opposite directions from its highest point next to one of the tubular feet, downwardly to its lowest point next to the opposite tubular foot, while on the opposite side the said wall *f* is connected by a transversely-arranged bottom *f³* with the inner wall of the chamber, and said bottom *f³* similarly slants from its highest point opposite the highest

point of the bottom f^2 to its lowest point opposite the lowest point of the bottom f^2 . Thus the divided chamber has two compartments, separated from one another by a vertical wall common to both, but by individual bottoms, the said bottoms, and consequently the two compartments, communicating immediately only with the opposite tubular feet and not with each other. The conformation and construction of the vertical wall and its bottoms will be seen by comparison of Figs. 1 to 4, and while the outer wall of the chamber conforms to the inclination of the bottoms the inner wall a' is of uniform height, as clearly shown in Figs. 1, 3, and 4.

It will be observed that the top of the two compartments is open and supplied with a removable cover-plate g . This cover-plate is made with a series of perforations g' , and its lower side is constructed with a serpentine flange g^2 , which, as shown more particularly in the mutilated portion of Fig. 5, passes about the perforations g' alternately, so that the alternate holes or perforations are on opposite sides of the said flange, or, in other words, the first and third holes are on one side of the flange and the second and fourth on the opposite side of the said flange, and so on continuously throughout the series of holes, each hole thus having an individual pocket formed in and by the serpentine flange. The flange g^2 terminates in a foot g^3 , which is provided with a vertical web g^4 , which is adapted to fit in the groove f' of the wall f to form a practically tight joint therewith.

As shown in Figs. 3 and 4, the edges of the inner and outer walls of the chamber may be rabbeted or otherwise prepared to receive the plate g , and undercut or overhanging lugs h and i project above the said outer and inner walls, their grooves being cut at an incline, and the plate is provided with correspondingly-inclined lugs j and k to cooperate with said lugs h and i when the plate is given a circular movement in order to bind by their combined wedge action the plate with a tight joint over the top of the chamber a . When the plate is so secured over the chamber, its flange and foot complete the division of the chamber into two compartments, and these compartments have no intercommunication. One of the compartments opens from one of the tubular feet through the exit device—that is to say, the plate g —to the smoke box and stack by means of the peculiar arrangement of the serpentine flange and the cover-plate with relation to the holes therein, and the other compartment has an analogous communication from the other tubular foot to the smoke box and stack. In order to further secure the cover-plate in place, lugs l and m on the cover-plate and chamber-wall, respectively, may be connected by a bolt n . The lug l may be duplicated, as at l' , Fig. 5, on the opposite side of the cover-plate, to afford means for rotating the said cover-plate and for lifting it in and out of place.

If desired, hand-holes o may be provided at the sides of the chamber in order to obtain access to said chamber for cleaning purposes, and such cleaning may be effected by burning out with a plumber's torch. The hand-holes are provided with covers o' , which may be held in place by usual yokes o^2 and set-screws o^3 , substantially as shown in Figs. 1 to 3.

It will be observed by comparing Figs. 3 and 4 that the tubular feet are substantially elliptical, and this for purposes of affording large area of working surface, and the compartments have the greatest area at the induct and the least at the exit, so as to equalize the pressure throughout the compartments, all of the parts being designed to afford the freest possible flow of the active fluid.

As shown in Fig. 6, the apparatus of my invention may be located somewhat below the smoke-stack, and the petticoat p may be introduced between the two to make a continuous communication between the apparatus and the smoke-stack.

Instead of making the connection between the engine-exhaust and my apparatus in front of the smoke-flues of the boiler, as in Fig. 6, I may deflect the connecting parts, as at d' , Fig. 7, and in that case the said pipes will be connected to the sides of the apparatus, and the hand-holes may or may not be employed.

In some cases and with some flues it may be possible to use a nest of connected two-compartment chambers of different sizes, as shown in Figs. 7, 8, and 9, the respective compartments of the several chambers being connected from one to the other by pipes q and r .

As shown in Figs. 7 and 8, the smoke-passage through the apparatus may be provided with a hollow plug s , which will serve as a sort of damper to regulate the area of such passage, and such damper may be supported upon a lever s' , which in turn is adapted to be operated by a rock-shaft s^2 , having a crank s^3 , which may be supplied with a rod or other operating device leading to the cab.

As shown in Figs. 6 and 7, I may employ a ring-blower t for use in diffusing or dissipating and so minimizing the nuisance of smoke while the engine is idle or the locomotive not running, and this ring-blower may receive steam from the engine through a pipe t' .

The operation is substantially as follows: When the engine is running, the exhaust-steam escapes first into one compartment and then the other of the chamber a , and as it forcibly emerges through the holes in the cover-plate or exit device it draws the smoke from the furnace and so attenuates or dissipates it as to render it practically imperceptible and entirely innocuous. At the same time and by this operation a "vacuum," so called, is produced in the other chamber and extending to the other engine draws out of it all or practically all back pressure, and thus

relieves the engine from the influence of such back pressure, and this cycle of operations is repeated in alternate chambers and with opposite engines as long as the latter are running.

Tests made extending over a month on a locomotive in actual usual duty and under ordinary circumstances demonstrate that not only is the smoke consumed or destroyed, but there are no sparks or live cinders emitted from the smoke-stack; also, that the consumption of coal is largely reduced; also, that the accumulation of cinder and dirt in the smoke-box or extension front is enormously reduced; also, that the same duty may be gotten out of an engine under very much less pressure of steam than is required without my invention; also, that all of these beneficial results were attained without the use of a spark-arrester in the smoke-stack, and, also, that by reason of the excessive reductions of back pressure in the engines there is little or no thrashing of the engine—that is to say, the sidewise motion—and consequently the wear on the track is largely reduced and the engines work more easily, and I am led to believe that with my invention the extension-front may be entirely dispensed with. No attempt will be made herein to explain theoretically or scientifically the action of my apparatus in effecting these results; but, as already stated, they have been obtained in the actual use of the invention.

I have shown and described a serpentine foot-flange on the exit device or cover-plate; but I wish to be understood as not limiting my invention to that conformation, since it is obvious that other forms or constructions of this foot-flange may be utilized so long as communication with the opposite compartments is preserved through alternate holes in the said exit device or cover-plate.

What I claim is—

1. An apparatus for the purpose described, comprising a chamber having a fluid-pressure connection and divided into two compartments by a wall, each compartment having a double-inclined bottom branching from and solid with said wall, and a cover for said chamber having a serpentine flange provided with a foot to make a tight joint with the wall and a series of holes or perforations alternately opening into the two compartments on opposite sides of the said flange, substantially as specified.

2. An apparatus for the purpose described, comprising a chamber divided into two compartments by a wall, double-inclined bottoms for said compartments extending in opposite directions from said wall, a pressure-inlet, individual connections between the inlet and the two compartments, and a cover-plate for said chamber removably applied thereto, and having a series of outlets and a flange constructed with pockets for each outlet, the said pockets leading alternately to opposite compartments, and a foot on said flange fitted

to the wall and forming a continuation thereof up to the holes in the cover, substantially as specified.

3. An apparatus of the character and for the purposes described, comprising a chamber divided into two compartments by a wall, the bottoms of said compartments being formed as double inclines extending laterally or transversely from the said wall and having their highest points at opposite sides of the chamber, pressure-inlets arranged adjacent to the highest points of the bottoms, each compartment communicating with its own inlet at the lowest point of its bottom, and a cover-plate applied to said chamber and having a foot-flange fitted to said wall to constitute a continuation thereof, the said plate having a series of holes and the said foot-flange extending from one side of one hole to the other side of the next adjacent hole and between the holes, so as to separate them and cause one hole to communicate with one compartment and the next hole with the other compartment of the chamber and so on continuously throughout the series of holes, whereby upon the admission of pressure to one compartment an outward blast will be produced through said compartment and its communicating holes, and a vacuum will be produced in the other compartment, substantially as specified.

4. In an apparatus of the character and for the purposes described, a chamber having concentric inner and outer walls, a concentric division-wall between them provided with double-inclined bottoms, one of which bottoms projects laterally from the outer wall to the division-wall, and the other projects from the inner wall to the division-wall, individual pressure-inlets for the two compartments into which the respective bottoms run out, and a cover-plate applied to the chamber and having holes, each of which has its own pocket formed in and by a foot-flange which is jointed to the division-wall and forms a continuation thereof and of the respective compartments and effects communication with the respective compartments through alternate holes, substantially as specified.

5. In an apparatus of the character and for the purposes described, the combination with a chamber divided into two compartments by a division-wall, of a cover-plate provided with a foot-flange which forms a continuation of the division-wall, and is provided with a series of holes which alternately communicate with opposite compartments, and means to detachably connect the said cover-plate with the said chamber, substantially as specified.

6. In an apparatus of the character and for the purposes described, the combination of a chamber divided into two compartments by a division-wall having a grooved face, and a cover for said chamber provided with a foot-flange, fitted to the groove in the face of the division-wall, the said plate having a series of holes and the foot-flange passing from one

hole to another back and forth, so as to put adjacent holes in communication with opposite compartments, substantially as specified.

7. An apparatus of the character and for the purposes described, comprising a series of chambers each divided into two independent compartments and means for connecting the several compartments in similar series, and with a pressure apparatus, whereby upon the admission of pressure to one series of com-

partments an outward blast will be produced through said compartments, and a vacuum will be produced in the other series of compartments, substantially as specified.

In testimony whereof I have hereunto set my hand this 5th day of July, A. D. 1898.

JOHN Y. SMITH.

Witnesses:

GEO. T. HILDUBRAND,

CHAS. V. MCGLAUGHLIN.