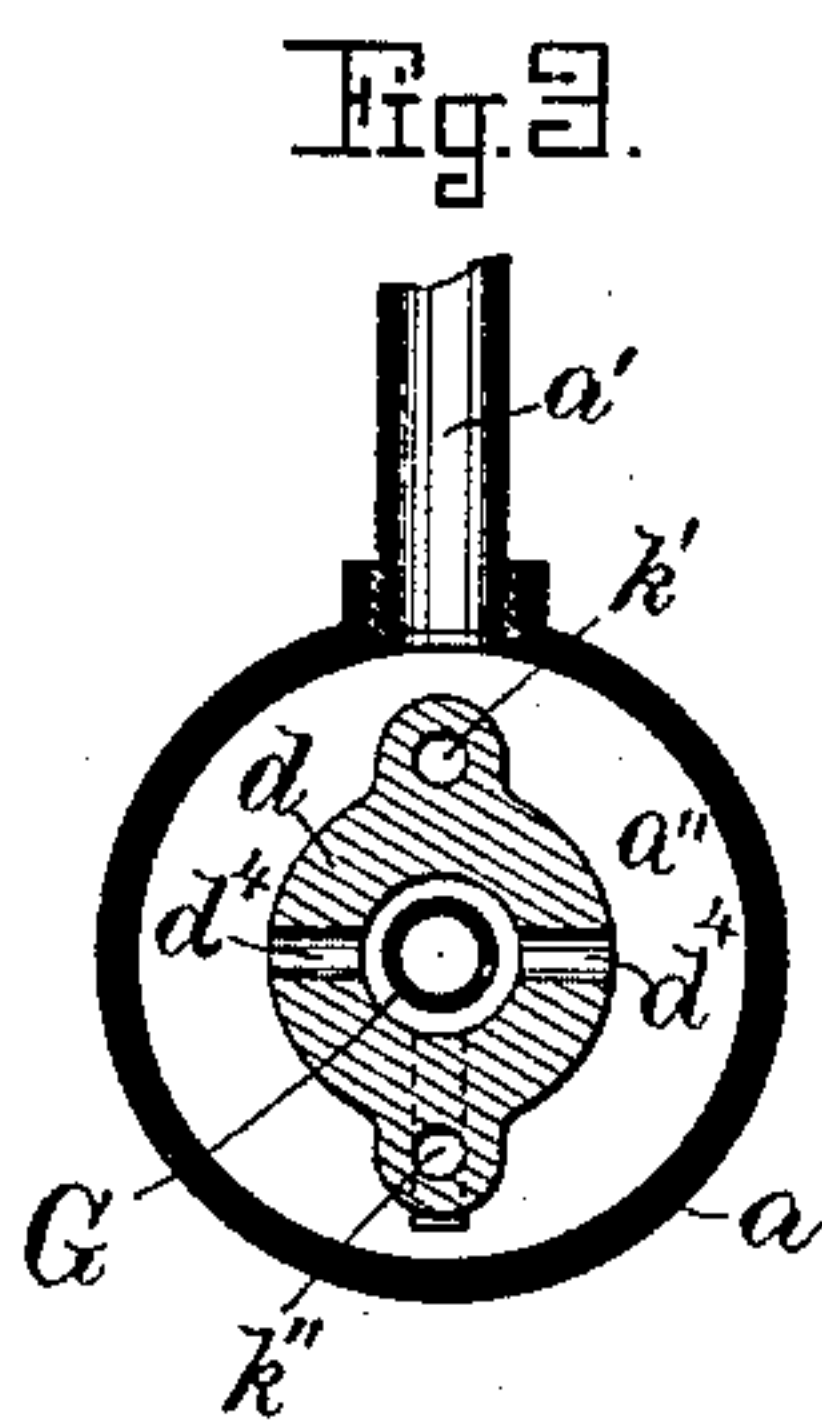
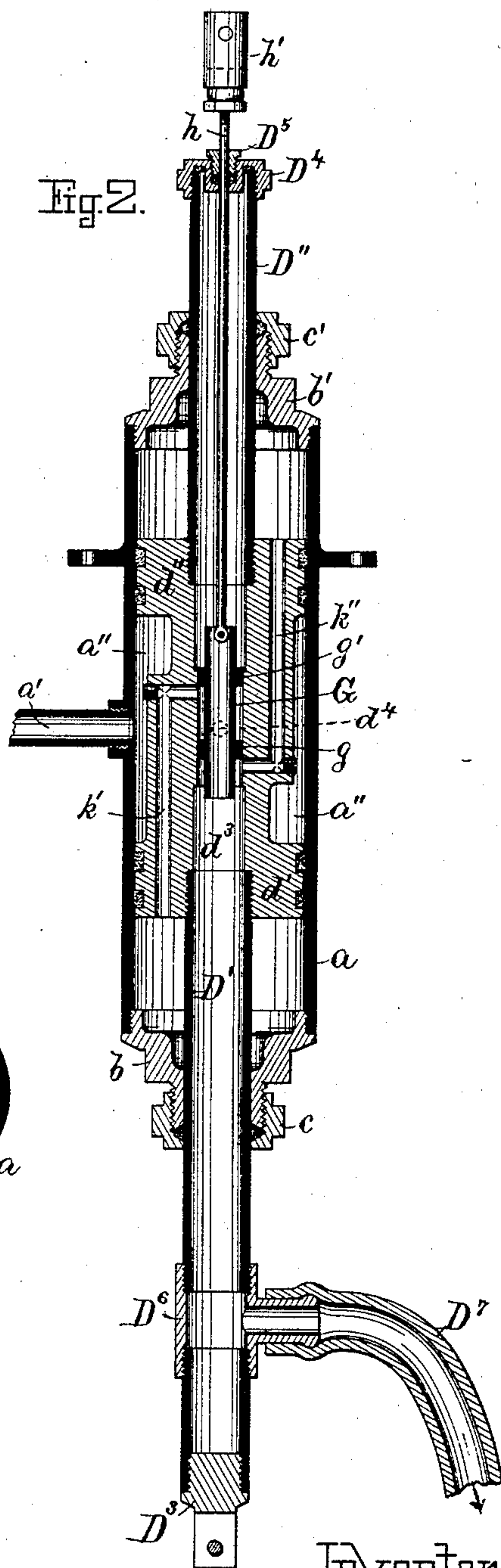
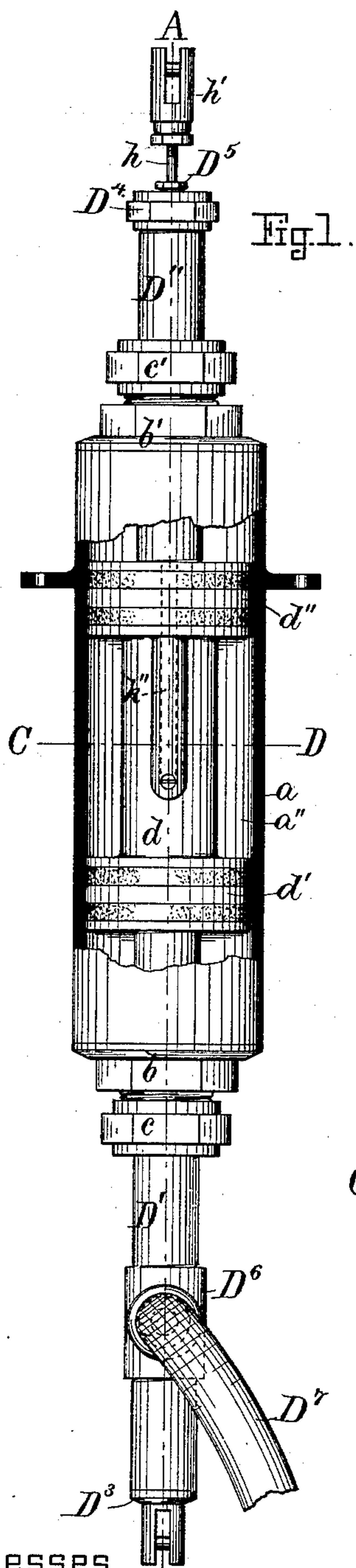


J. E. SPENCER.

AUTOMATIC DAMPER REGULATOR.

No. 327,337.

Patented Sept. 29, 1885.



Witnesses
Henry Chadbourne.
Bertha F. Hawes.

Inventor
John E. Spencer
by *Alban Andren*
his atty.

(No Model.)

2 Sheets—Sheet 2.

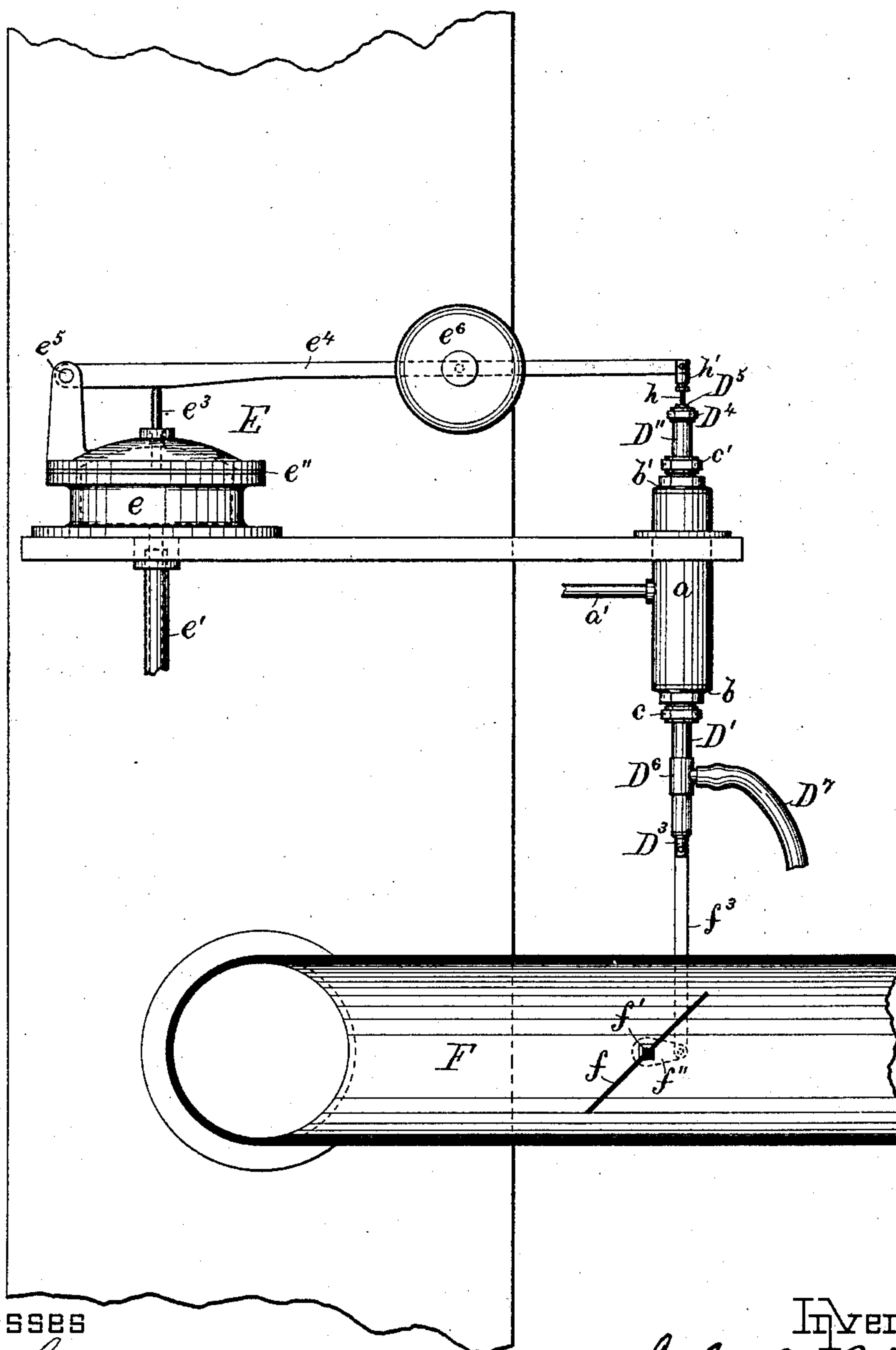
J. E. SPENCER.

AUTOMATIC DAMPER REGULATOR.

No. 327,337.

Patented Sept. 29, 1885.

Fig4.



Witnesses

Henry Chadbourn.
Bertha F. Harvey.

Inventor

John E. Spencer
by Alban Andrieu
his atty.

UNITED STATES PATENT OFFICE.

JOHN E. SPENCER, OF SALEM, MASSACHUSETTS, ASSIGNOR OF ONE-HALF
TO SMITH & SMART, OF SAME PLACE.

AUTOMATIC DAMPER-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 327,337, dated September 29, 1885.

Application filed July 25, 1885. (No model.)

To all whom it may concern:

Be it known that I, JOHN E. SPENCER, a citizen of the United States, residing at Salem, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Automatic Damper-Regulators; and I do hereby declare that the same are fully described in the following specification, and illustrated in the accompanying drawings.

10 This invention relates to improvements in automatic damper-regulators for the purpose of automatically adjusting the damper in the flue or chimney leading from a steam-generator, according to variations in the steam-pressure of such generator, so as to retain any desired normal, or nearly so, pressure in the generator. Heretofore this has been done by means of a suitable pressure device consisting of a cylinder or chamber having a piston, diaphragm, or other part on which the steam-pressure is acting on a lever connected directly to the damper to close the latter in proportion to the increase and to open it in proportion to the decrease of the pressure in the steam-generator; but such direct action from the pressure device to the damper is objectionable, because it conveys too much of a strain on the lever on which the pressure device acts, and consequently causes said lever to act in spasmodic jerks and starts, without that nicety of action that is necessary for properly adjusting the position of the damper relative to a slight increase or decrease of the pressure in the steam-generator. To obtain such delicate adjustment of the damper, and at the same time relieve the pressure-lever of any undue or excessive strain, I connect said lever to a light balance-valve or cut-off located within a hollow piston that is movable in a stationary cylinder, the piston-rod of which is connected in a suitable manner to the damper, by which arrangement, as the pressure is increased in the generator, the light balance-valve is moved upward in the hollow piston, so as to cause the live steam to enter the cylinder below said piston, by which it is forced upward, and as its piston-rod is connected to the damper the latter is gradually made to close in the ratio of the increase of pressure, and vice versa. It will thus be

seen that all the resistance that the pressure-lever has to overcome is the raising or lowering of a very light balance-valve, and the operation of the damper is effected by the live steam acting on the upper or lower end of the piston (as the case may be) that is connected to the damper, and by such intermediate device, located between the pressure device and the damper, I obtain a most delicate and accurate automatic control of the damper relative to the increase or decrease of the steam-pressure.

My invention is carried out as follows, reference being had to the accompanying drawings, where Figure 1 represents a sectional side elevation of the improved automatic damper-regulator, and Fig. 2 represents a central longitudinal section on the line A B shown in Fig. 1. Fig. 3 represents a cross-section on the line C D, also shown in Fig. 1. Fig. 4 represents a side elevation of the regulator arranged between and connected to a pressure device and damper, as will hereinafter be more fully shown and described.

Similar letters refer to similar parts wherever they occur on the different parts of the drawings.

In Fig. 4, E represents a suitable steam-pressure device of any well-known construction, it being only essential that it shall be so constructed as to cause the live pressure of the steam in the generator to impart motion to a lever or other device. In said Fig. 4 I have shown such pressure device to consist of a cylinder or chamber, *e*, having pipe *e'*, leading from it to the steam-generator, the upper end of chamber *e* being covered with a flexible diaphragm, *e''*, having an upwardly-projecting pin, *e'''*, acting on the lever *e''''*, that is hung on the stationary fulcrum *e''''''*, as shown.

e'''''' is a balance-weight that is adjustable out, or in on the lever *e''''* in the usual manner.

F is the flue leading from the fire-place or smoke-chamber of a steam-generator to the chimney, as usual, and *f* is the damper located therein in the ordinary manner, said damper being attached to the spindle *f'*, on which it may turn in bearings, as usual.

f'' is an arm or lever secured to the damp-

er-spindle f' in the ordinary manner, such arm having hinged to it the link f^3 , the upper end of which is hinged to the lower end of the hollow piston-rod of the automatic regulator, as shown in Fig. 4. Said regulator consists of a stationary cylinder, a , having secured to its lower end the head b , provided with a stuffing-box, c , as shown in Figs. 1 and 2. To the upper end of said cylinder a is secured a similar head, b' , provided with a stuffing-box, c' , as shown. d is the hollow piston located within cylinder a , such piston having the packed piston-heads d'' and d' in its upper and lower ends, respectively, as shown in Figs. 1 and 2. a' is a steam-pressure pipe leading from the steam-generator to the interior of cylinder a , at a point between the piston-heads d' d'' , as shown in Fig. 2. d^3 is the central perforation extending from top to bottom of the hollow piston d , and within it is located the tubular balance-valve G , having cylindrical enlargements g and g' , fitting steam tight within the central bore, d^3 , of the piston d , as shown in Fig. 2. To the piston-head d' is secured the hollow piston-rod D' , that passes through and is guided in the lower head, b , and stuffing-box c , its lower end being closed by plug D^3 , and hinged to the rod f^3 . (Shown in Fig. 4.) To the piston-head d'' is secured the hollow piston-rod D'' , that passes through and is guided in the head b' and stuffing-box c' , as shown in Fig. 2. To the upper end of piston-rod D'' is secured the perforated head D^4 , provided with stuffing-box D^5 , through which passes the rod h , the lower end of which is hinged to the tubular balance-valve G , and the upper end of it having attached the forked piece h' , that is hinged to the free end of lever e^4 , as shown in Fig. 4. a'' is the annular space in cylinder a , between the piston-heads d' and d'' , into which live-steam pressure is conveyed from the steam-generator through supply-pipe a' . Horizontally through the hollow piston d are made one or more perforations, d^4 d^4 , by which steam-communication is at all times established between the live-steam pressure in annular space a'' and the annular valve-space between the cylindrical enlargements g g' on the valve G . k' is a port or channel, the upper end of which enters the hollow d^3 in piston d a little above perforations d^4 , and having its lower end opening into cylinder a below the piston-head d' , as shown in Fig. 2. k'' is a similar port or channel, the lower end of which enters the hollow d^3 of piston d a little below the perforations d^4 , and having its upper end opening into cylinder a above the piston-head d'' , as shown in said Fig. 2. D^6 is a T or branch on the hollow piston-rod D' , to which is connected the flexible tube D^7 , for conducting the exhaust-steam from the upper and lower portions of cylinder a to any desired place. The operation of this my improved automatic damper-regulator is as follows: If the

steam-pressure in the generator should rise above the desired normal one, the outer end of pressure-lever e^4 will be caused to swing upward, and in so doing the cylindrical balance-valve G will be raised to the position shown in Fig. 2, and when in such a position the live steam from pipe a' and annular space a'' will enter the perforations d^4 d^4 and pass through the now open port or channel k' into the lower portion of cylinder a below the piston-head d' , causing the piston and the hollow piston-rod D' to rise by being forced upward by the live-steam pressure. In the ratio as the hollow piston-rod D' ascends, the damper f is caused to gradually close the draft-opening in the flue or chimney F until the steam-pressure, by the reduced draft, is lowered to the normal one, causing the lever e^4 gradually to descend, and by its connection to balance-valve G causes the steam-supply to the lower part of cylinder a to be cut off. When the hollow piston d is in the act of rising, the steam that is in cylinder a above the piston-head d'' is free to pass out through the channel k'' into the central space, d^3 , (below the valve enlargement g ,) and to exhaust through hollow piston-rod D' and flexible pipe D^7 . In case the pressure in the generator falls below the normal one, then the lever e^4 will gradually descend by the influence of the weight e^6 , and by its connection to the balance-valve G the latter will be automatically moved downward within the hollow piston d far enough to permit the live steam from pipe a' and annular space a'' to enter perforations d^4 d^4 and port k'' , after the port k' is closed by the valve-enlargement g' , and thus the steam-pressure is conveyed to the interior of cylinder a above the piston-head d'' , causing the hollow piston d to move downward within cylinder a , and by its connection, as described, to the damper f the latter will gradually and automatically be opened, so as to increase the draft, and thus cause the steam-pressure in the generator to rise to the desired normal one, when the lever e^4 will be forced gradually to its normal position and the steam cut off from port or channel k'' . As the piston d descends, the steam remaining in cylinder a below the piston d' will pass through channel k' into the hollow piston-rod D' , and thence downward through the hollow valve G , the hollow piston-rod D' , and out through the flexible pipe D^7 , as above described.

Having thus fully described the nature, construction, and operation of my invention, I wish to secure by Letters Patent and claim—

1. In an automatic damper-regulator, a pressure device and an adjustable damper, combined with an intermediate cylinder arranged between them and having its valve connected to the pressure device and its piston to the damper or its connections, as and for the purpose set forth.

2. In an automatic damper-regulator, the
stationary cylinder *a*, having hollow piston *d*
and piston-heads *d'* *d''*, the balanced valve *G*
g *g'*, the ports *k'* *k''*, the hollow piston-rod *D''*,
5 and hollow piston-rod *D'*, connected to the
adjustable damper in the manner and for the
purpose as herein set forth and described.

In testimony whereof I have affixed my sig-
nature in presence of two witnesses.

JOHN E. SPENCER.

Witnesses:

ALBAN ANDRÉN,
E. J. TORREY.