

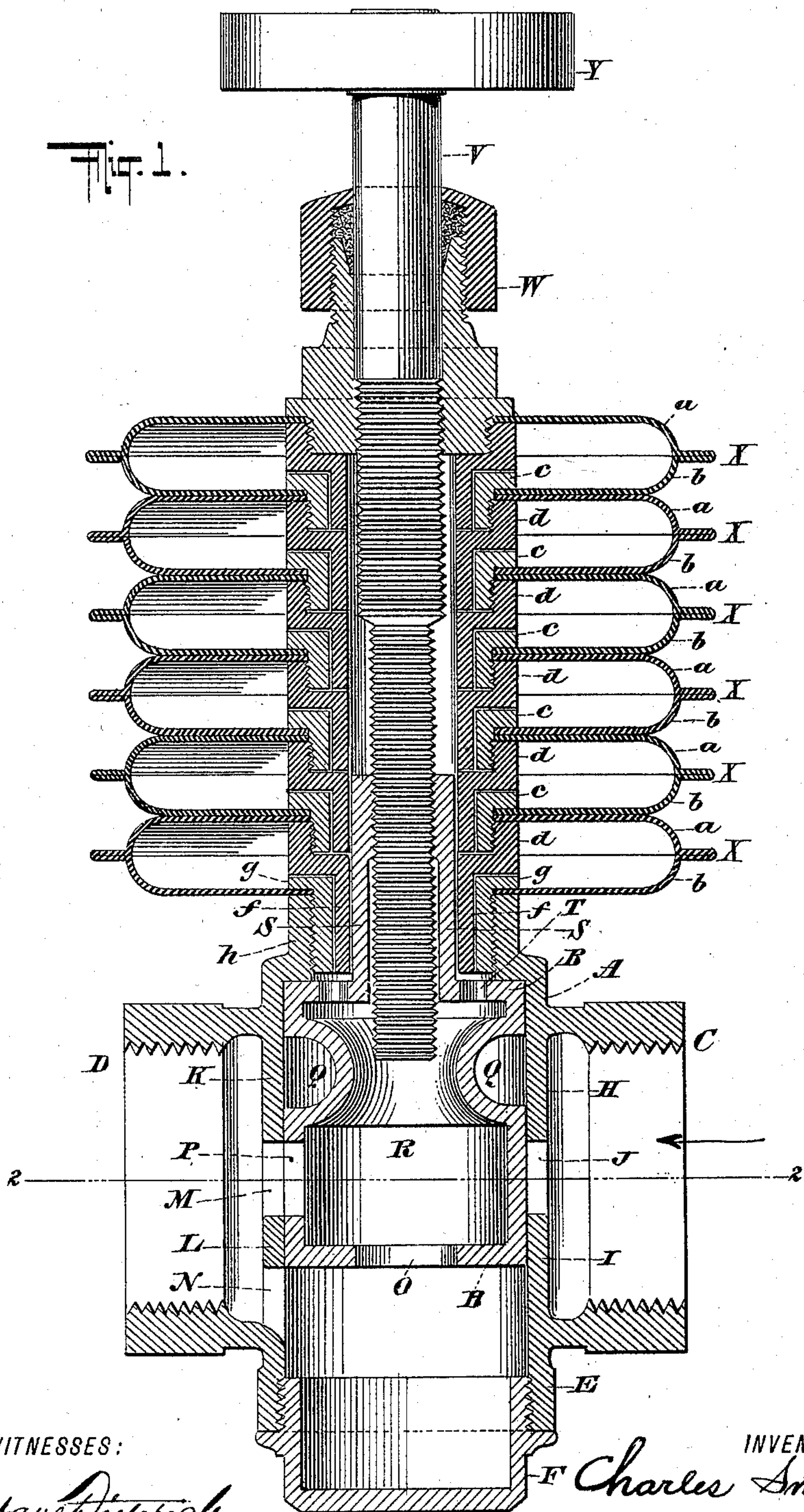
(No Model.)

2 Sheets—Sheet 1.

C. SMITH.
REDUCING PRESSURE VALVE.

No. 585,711.

Patented July 6, 1897.



WITNESSES:

Gustave Dietrich
John Kellenbeck

INVENTOR

Charles Smith

BY

Chas. C. Gill

ATTORNEY.

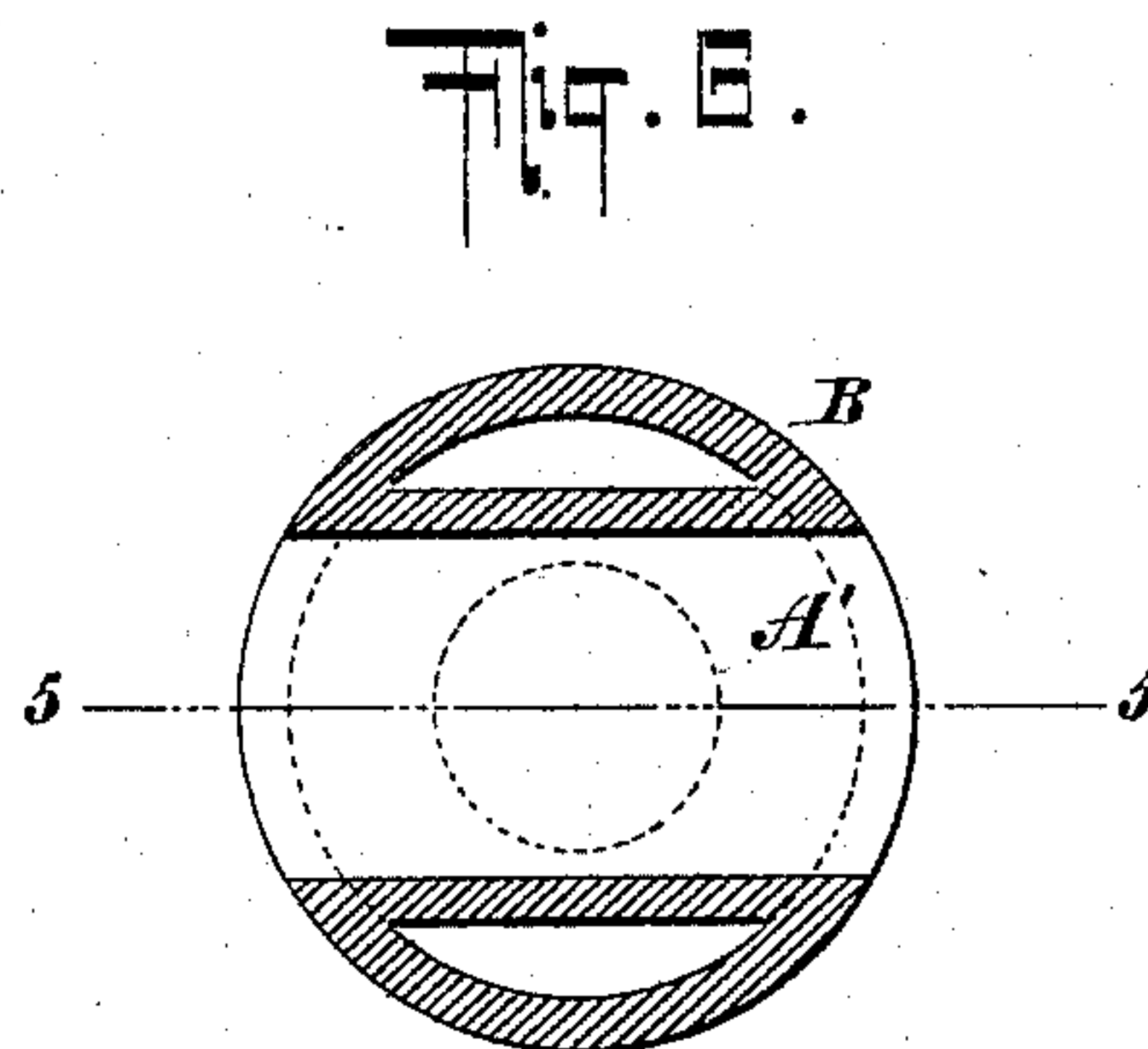
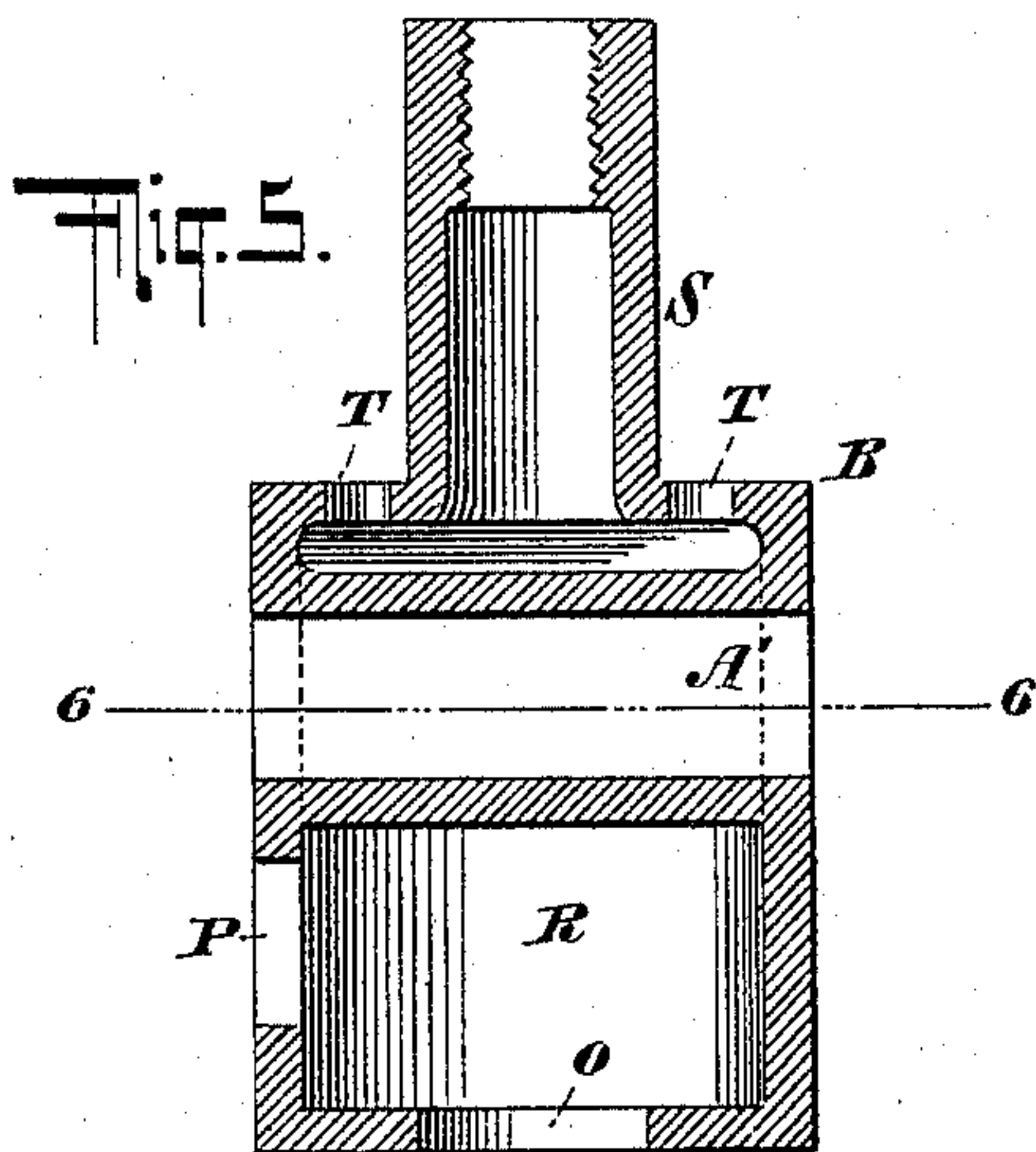
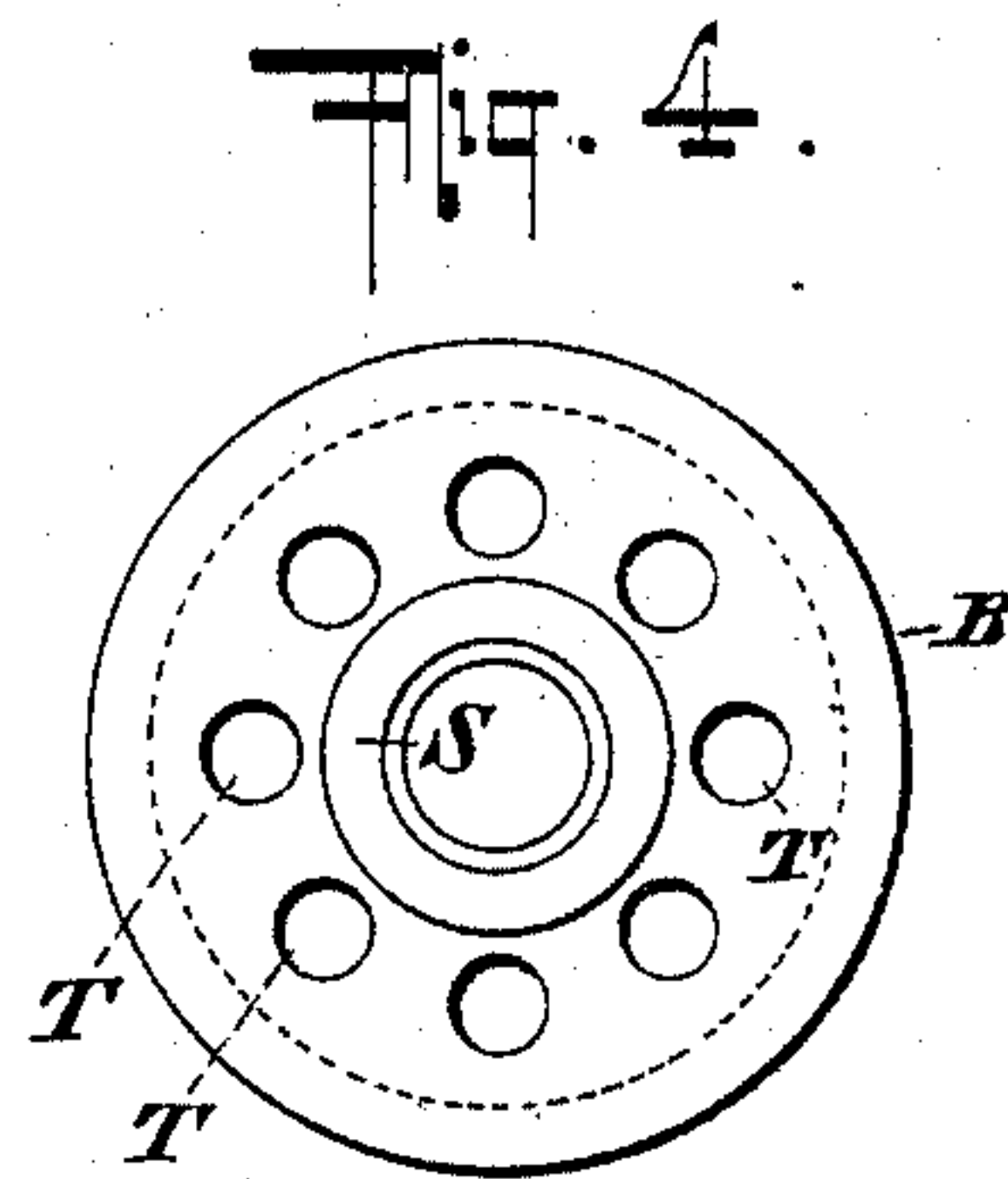
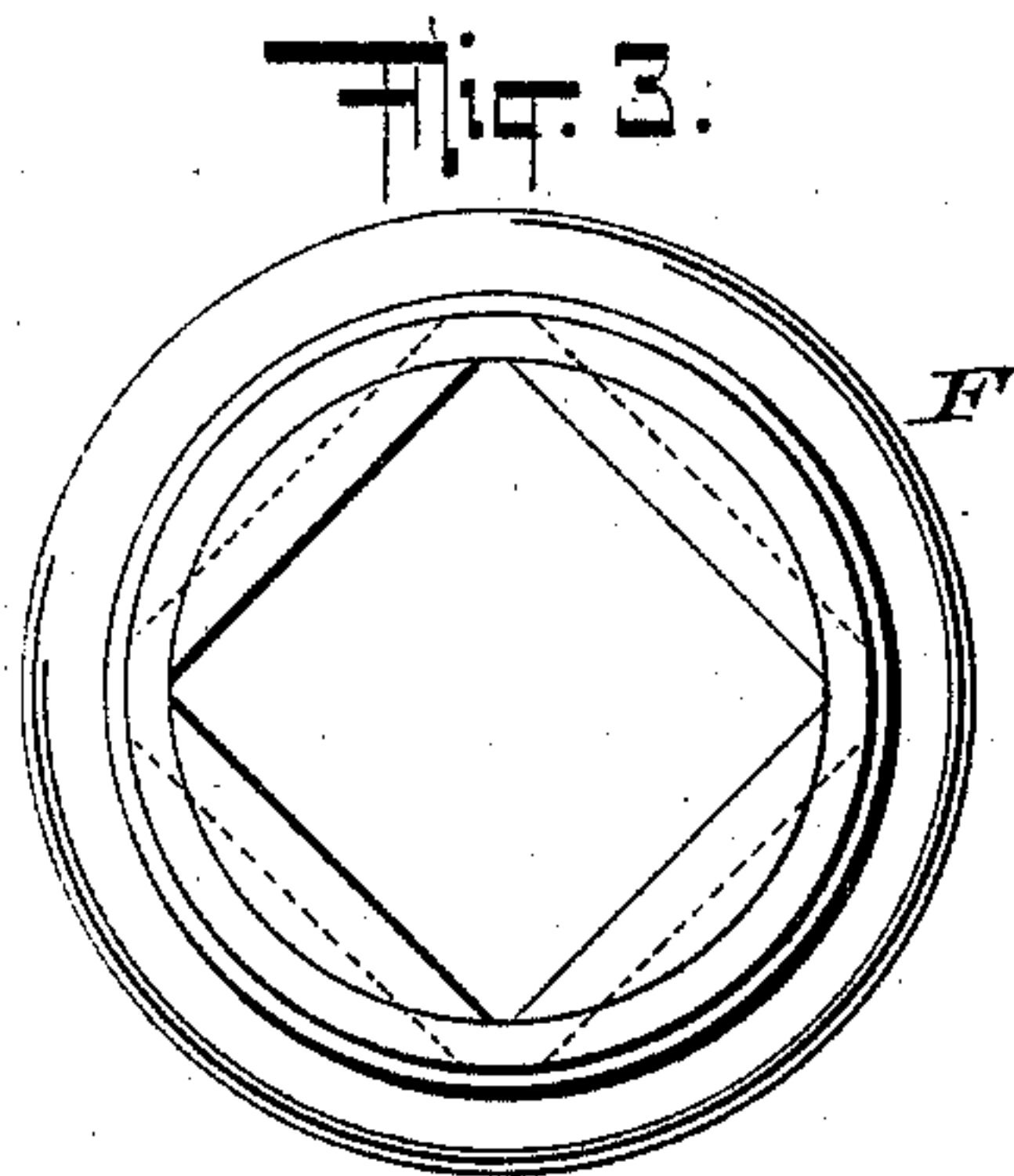
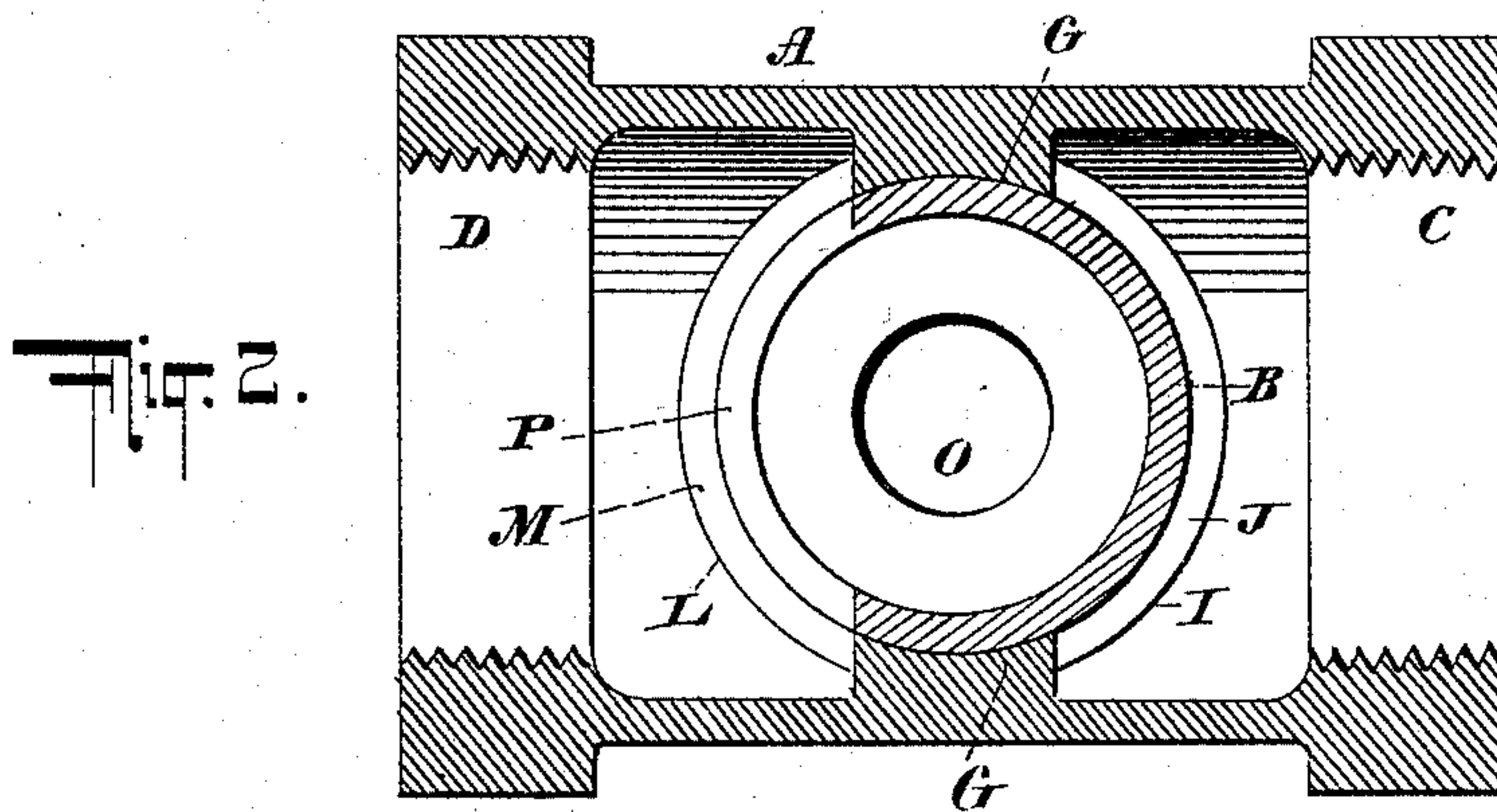
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John Kehlmebeck

INVENTOR
Charles Smith
BY *Chas. C. Gill*
ATTORNEY.

UNITED STATES PATENT OFFICE.

CHARLES SMITH, OF BELLEVILLE, NEW JERSEY, ASSIGNOR TO THE EAST-WOOD WIRE MANUFACTURING COMPANY, OF SAME PLACE.

REDUCING PRESSURE-VALVE.

SPECIFICATION forming part of Letters Patent No. 585,711, dated July 6, 1897.

Application filed June 1, 1896. Serial No. 593,750. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SMITH, a citizen of the United States, and a resident of Belleville, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Reducing Pressure-Valves, of which the following is a specification.

The invention relates to improvements in reducing pressure valves of the class in which a valve is held in a yielding manner and subject to the varying pressure upon the low-pressure side of the valve to close or open it according as the pressure upon said low-pressure side is increased or diminished for the purpose of maintaining a uniform reduced pressure on the low-pressure side, although the pressure on the high-pressure side may fluctuate.

The object of the present invention is to provide such a construction of valve and inclosing casing which will positively insure the maintaining of a uniform pressure upon the low-pressure side of the valve, notwithstanding excessive variations in the pressure on the high-pressure side of the valve. The construction made the subject hereof possesses many advantages, all of which will appear from the detailed description hereinafter presented.

My invention contemplates the employment in connection with the valve-rod of a series of expansible and contractible hollow diaphragms whereby the valve may be held in a yielding manner and rendered sensitive to the action of the steam on the low-pressure side. The said diaphragms, however, are not independently made the subject hereof, and except as to some details are illustrated in Letters Patent of the United States No. 468,129, granted February 2, 1892.

My present invention relates more particularly to the construction of the valve and its casing, which are located below said diaphragms.

Referring to the accompanying drawings, forming a part of this application, Figure 1 is a central vertical longitudinal section through a fluid-pressure regulator constructed in accordance with and embodying the invention, the plug or cylindrical valve be-

ing shown in its upper position. Fig. 2 is a central transverse section of the same on the dotted line 2 2 of Fig. 1. Fig. 3 is a detached top view of the cap at the lower central portion of the valve-inclosing casing. Fig. 4 is a detached top view of the upper end of the valve. Fig. 5 is a detached central vertical section of a modified form of the valve, and Fig. 6 is a transverse section of same on the dotted line 6 6 of Fig. 5 and showing by the dotted line 5 5 the section on which Fig. 5 is taken.

In the drawings, A designates the inclosing casing for the plug or cylindrical valve B, which casing is provided with the usual threaded inlet C and outlet D for connection with the usual steam-pipes. Upon the lower end of the casing A is formed the annular interiorly-threaded flange E, within which is screwed the cap F, having an angular interior chamber of known form, as shown in Fig. 3. Above the cap F the interior of the casing A is cylindrical in cross-section and constitutes a vertical cylinder within which the valve B may have a vertical reciprocating motion.

The form of the interior of the casing A is fully shown in Figs. 1 and 2, in which it will be seen that at the opposite sides of the said casing are formed the continuous vertical concave guides G G and that at the inlet end of the casing are formed the substantially semicircular vertical upper and lower partitions or walls H I, between the facing edges of which is left the inlet-opening J. Adjacent to the outlet end of the casing A there are formed within said casing the upper semicircular vertical partition-wall K, corresponding with the vertical wall H at the opposite end of the casing, and the semicircular band partition or wall L, which, as more clearly shown in Fig. 1, is in line with the vertical wall K, but separated therefrom and also from the lower surfaces of the said casing, whereby there are formed above said band L the outlet-opening M and below said band the inlet-opening N, the latter leading to the lower part of the chamber within the casing A and below the plug or cylindrical valve B. The vertical walls H I at the inlet end of the casing, the concave surfaces G G at the op-

posite sides of the casing, and the vertical wall K and band L at the outlet end of the casing constitute a cylinder within which the valve B, as before mentioned, has a vertical reciprocating motion. The openings J M at the respective ends of the casing A extend from one vertical guide G to the other vertical guide G, as illustrated in Fig. 2, and hence there is ample provision for a very free entrance to and exit from the casing, the vertical guides G interposing between the inlet and outlet openings.

The valve B is in the form of a hollow cylindrical plug having an inlet-opening O at its lower end and an inlet-opening P at the outlet side of the valve-casing, the opening P being substantially coextensive with the outlet-opening M from said casing, as clearly indicated in Figs. 1 and 2. The upper portion of the valve B has formed in it the annular channel Q, which serves at the proper time as the passage through which the steam or other fluid or liquid may pass from the inlet J to the outlet M. The interior of the cylinder-valve B constitutes an interior chamber R, and at its upper end said valve is provided with the vertical hollow stem S and the series of apertures T, the latter being adjacent to the base of said stem S and encircling the same, as indicated in Fig. 4. The apertures T pass entirely through the upper wall of the valve B and form an outlet for steam from the interior or chamber R of said valve.

The upper end of the hollow valve-stem S is provided with the interior thread, which engages the threaded adjusting-rod V in the customary manner, and this adjusting-rod is of the usual form and extends upward a proper distance to receive the stuffing-box W, the series of diaphragms X, and, when desired, the hand-wheel Y, by which said rod may be rotated for the purpose of adjusting the valve B to its initial position in accordance with the pressure desired on the low-pressure side of the valve in comparison with the pressure existing on the high-pressure side thereof. The stuffing-box W and diaphragms X are of the general nature known in this art and a practical illustration of them may be found in the aforesaid Letters Patent No. 468,129. The said stuffing-box W, adjusting-rod V, hand-wheel Y, and diaphragms X constitute no independent part of the present invention. The said diaphragms constitute the yielding support for the valve B and will vary in number, size, and construction, as may be desired. The diaphragms X are each composed of the upper and lower sections lettered *a b*, respectively, and these sections are coupled together by means of the nuts *c d*, respectively, substantially as illustrated in the said Patent No. 468,129. The lower diaphragm X contains the nut *d*, having an elongated downwardly-extending sleeve *f*, which loosely encompasses the vertical hollow stem S of the valve B, and in addition the said lower diaphragm X contains

the nut *g*, having the externally-threaded sleeve, which extends downward within and engages the vertical flange *h*, formed at the top of the valve-casing A. The nut *g* retains the lower section of the lower diaphragm X down against the upper end of the valve-casing A and does not bind against the sleeve *f* of the nut *d*.

The sleeves formed on the nuts *d g* loosely engage one another, and between the sleeve *f* of the nut *d* and the vertical sleeve S of the valve B there is a free space, and this space is in communication with the series of apertures T at the upper end of said valve, whereby the steam may pass upward through said apertures and between the said sleeves *f S* and enter the spaces or chambers formed by the diaphragms X. It has been described above that the lower diaphragm X contains the nuts *d g*, and, as will be seen from an inspection of Fig. 1, the nut *d* is provided with the interior thread, which receives the nut *c* contained within the diaphragm X above the lower diaphragm, whereby said diaphragm is secured in position. The diaphragm above the lower diaphragm also contains the nut *d*, which is free to have a vertical movement within the said nut *c* and contains the interior thread to receive the nut *c* in the second diaphragm above the lower diaphragm. The diaphragms X are each secured by the nuts *c d*, which within each diaphragm engage one another loosely at their sleeve portions in order that the steam-pressure may effect the expansion of the diaphragms and the nuts be permitted to have a vertical movement one upon the other in a well-known manner. The invention is not limited to the construction of the diaphragms X, nor to any special form or construction of the nuts *c d*, but embraces and includes any suitable coupling-nuts and diaphragms. The invention has more especial reference to the features of construction below the diaphragm X, and these features are believed to be broadly new.

In the use of the present invention the supply-pipe will be connected with the inlet C to the casing A and the pipe leading to the heating or other apparatus will be connected with the outlet D of the said casing A. The valve B will by means of the threaded rod V be adjusted to the degree of reduced pressure desired for the apparatus connected with the outlet D from the casing A, and thereafter the operation of the reducing-valve will be automatic. It may be assumed that the steam-pressure at the inlet side C of the valve casing A registers seventy pounds and that the desired steam-pressure at the outlet D of the casing A shall be thirty pounds. The valve B having been adjusted to the thirty pounds pressure, the steam from the inlet C will pass around the annular channel Q and find its outlet through the opening M to the pipe connected with the outlet D, and during this operation the steam on the low-pressure side of the valve will enter through the opening P,

opening N, and opening O and ascend through the chamber R and series of apertures T to the space between the nuts *d g* and sleeve S, and thence ascend between the nuts *c d* and fill all of the chambers formed within the diaphragms X, where it will act to render the valve B sensitive as to its position and yieldingly supported under the pressure of the steam on the low-pressure side of the valve.

As long as the steam-pressure on the low-pressure side of the valve remains at thirty pounds the valve B will be practically stationary; but if for any cause there should be an excess of pressure on the low-pressure side of the valve this excess of pressure will be felt by the diaphragms X, which will immediately expand and draw the valve B upward and cut off a part of the steam-supply, thus restoring the steam-pressure on the low-pressure side of the valve to thirty pounds. The valve B under the action of the steam-pressure on the low-pressure side of the valve is subjected to vertical reciprocation for varying the degree of opening through the valve-casing and thereby maintaining the pounds pressure on the low-pressure side of the valve uniform without regard to fluctuations which may take place in the steam-pressure on the inlet side of said valve. If the pressure at the inlet side of the valve B should be seventy pounds and the desired pressure on the low-pressure side of the valve thirty pounds, any decrease of pressure on the inlet side of the valve, even to the extent of its being reduced to thirty-five pounds from the seventy pounds, will not affect the position of the valve B, since notwithstanding the reduction at the inlet side C the pressure at the outlet side D will maintain the position of the valve B. During the lowering of the valve B from the position shown in Fig. 1 the inlet P therein may become partially closed by the wall L on the valve-casing, but at such time there will be a sufficient inlet for the steam through the unclosed part of the inlet P and unclosed part of the inlet N, and thus the valve B will always at its interior receive enough of the steam at the low-pressure side for supplying the diaphragms X. The interior of the cap F is square in cross-section, as usual.

A very important advantage arising from the cylindrical or plug valve B is that the steam at the inlet side of the valve-casing A exerts no downward or upward pressure whatever upon the valve B when the latter is in its upward position or when it is entirely in its downward position. The construction is such that when the valve B is in what may be termed its "open" position the pressure of the steam at the inlet side of the valve is nicely balanced and does not act to move the valve B in either direction. The steam which does operate to move the valve B is that which enters the same from the low-pressure side thereof and ascends to and operates through the diaphragms X. The valve B is of very advantageous construction throughout, and

its use results in the entire construction being absolutely effectual under all circumstances.

The annular channel Q in the valve B forms the connection between the inlet-opening J and outlet-opening N, formed within the cylindrical inner walls of the valve-casing A; but I do not limit the invention to the annular channel Q, technically passing around the valve B, since if the said channel passed directly through the valve B, as shown in Figs. 5 and 6, the operation would practically be as effectual as that of the valve shown in Fig. 1. In Figs. 5 and 6 the channel Q of Fig. 1 has been omitted and a straight channel A' extends horizontally through the valve B, and the walls of this channel A' are of a form to permit the passage around them of the steam which may enter the valve through the openings O P for the purpose of ascending around the sleeve S to the diaphragms X.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A reducing-valve comprising the exterior casing having the inlet and outlet nozzles and forming directly intermediate said nozzles the vertical cylindrical chamber having in its walls the transverse inlet and outlet openings in line with said nozzles, and the hollow cylindrical valve in said chamber and fitting the walls thereof and having intermediate its ends the transverse passage for the fluid adapted to said inlet and outlet openings, said valve also having an inlet to its interior from the low-pressure side and an outlet from its upper end, combined with the valve-stem carrying said valve, and the diaphragm connected with said casing and communicating with the outlet from the upper end of said valve; substantially as shown and described.

2. A reducing-valve comprising the exterior casing having the inlet and outlet nozzles and forming directly intermediate said nozzles the vertical cylindrical chamber having in its side walls adjacent to said nozzles the transverse inlet and outlet openings, and the hollow cylindrical valve in said chamber and fitting the walls thereof and having intermediate its ends the transverse passage for the fluid adapted to said inlet and outlet openings, said valve also having in its vertical side the inlet-opening from the low-pressure side adapted to the opening on that side in the walls of said cylindrical chamber, and said valve also having the outlet at its upper end, combined with the valve-stem carrying said valve, and the diaphragm connected with said casing and communicating with the outlet from the upper end of said valve; substantially as shown and described.

3. A reducing pressure-valve comprising the exterior casing having the inlet and outlet and formed with the interior walls H, I, K, L, and openings J, M, N, and the hollow cylindrical valve within said casing and having the transverse horizontal passage for the steam or other fluid from the opening J to the

opening M of said casing and also the inlet-
openings O, P, to its interior and outlet open-
ing T at its upper end, combined with the
threaded valve-stem for said valve, and the
5 diaphragms in communication with said
valve; substantially as set forth.

Signed at New York, in the county of New

York and State of New York, this 25th day
of May, A. D. 1896.

CHARLES SMITH.

Witnesses:

CHAS. C. GILL,

E. JOS. BELKNAP.