

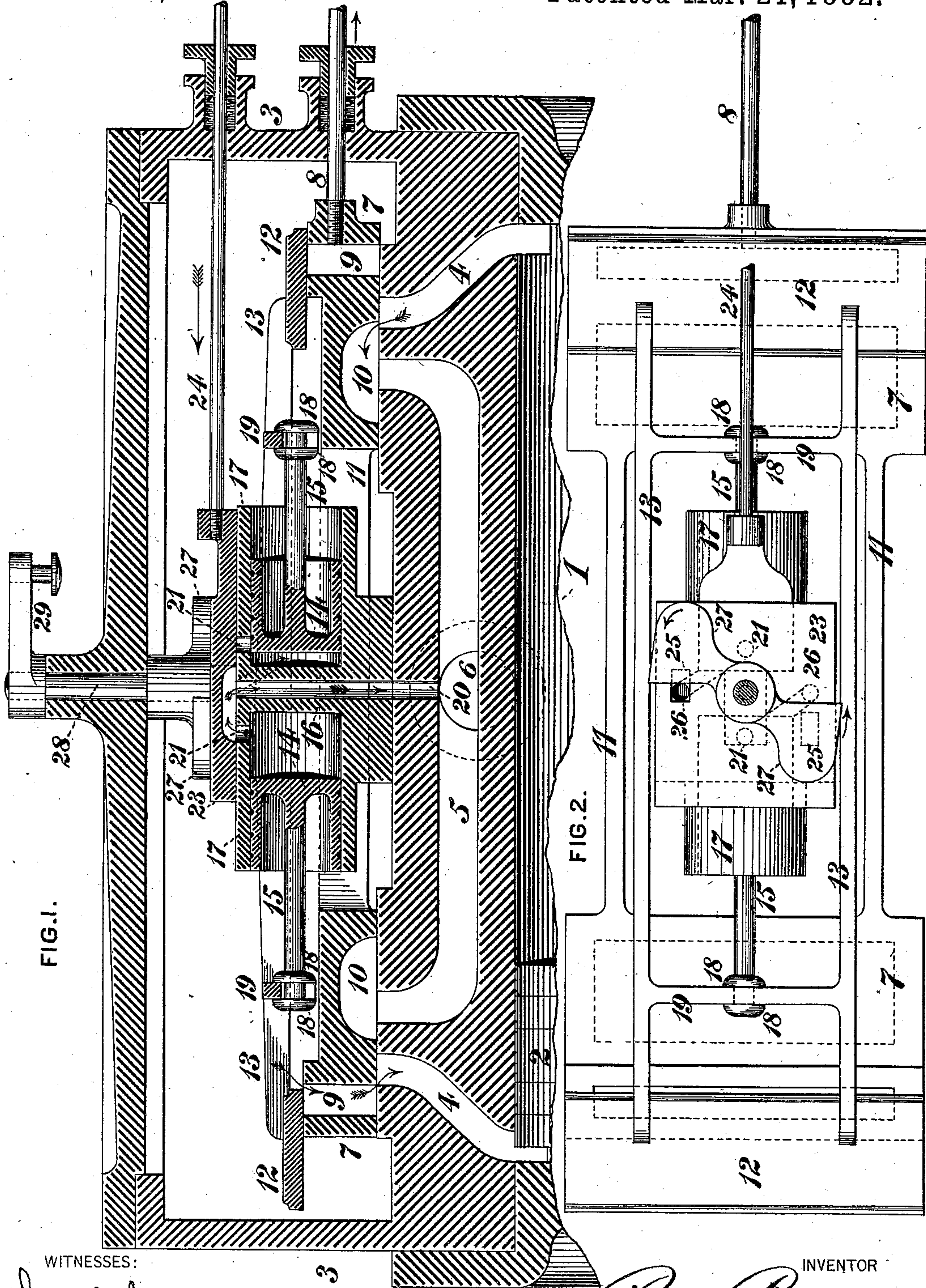
(No Model.)

3 Sheets—Sheet 1.

B. BRAZELLE.
CUT-OFF VALVE.

No. 255,136.

Patented Mar. 21, 1882.



WITNESSES:

Geo. B. Collier.
Geo. T. Kelly.

INVENTOR

Benz. Brazelle,
by Collier & Bell,
attys.

(No Model.)

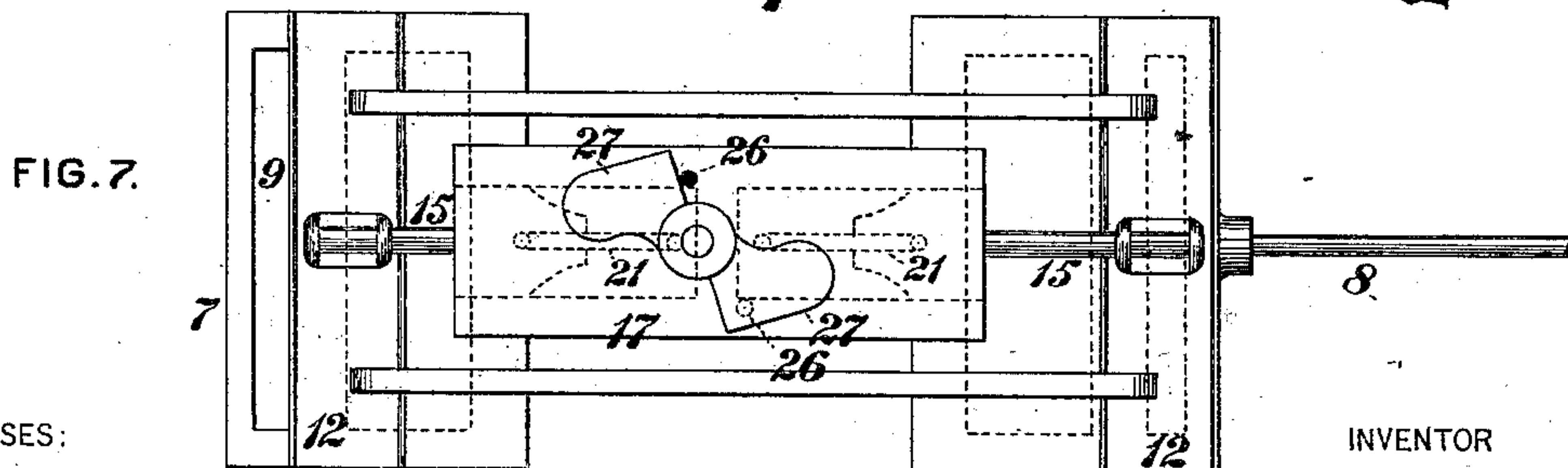
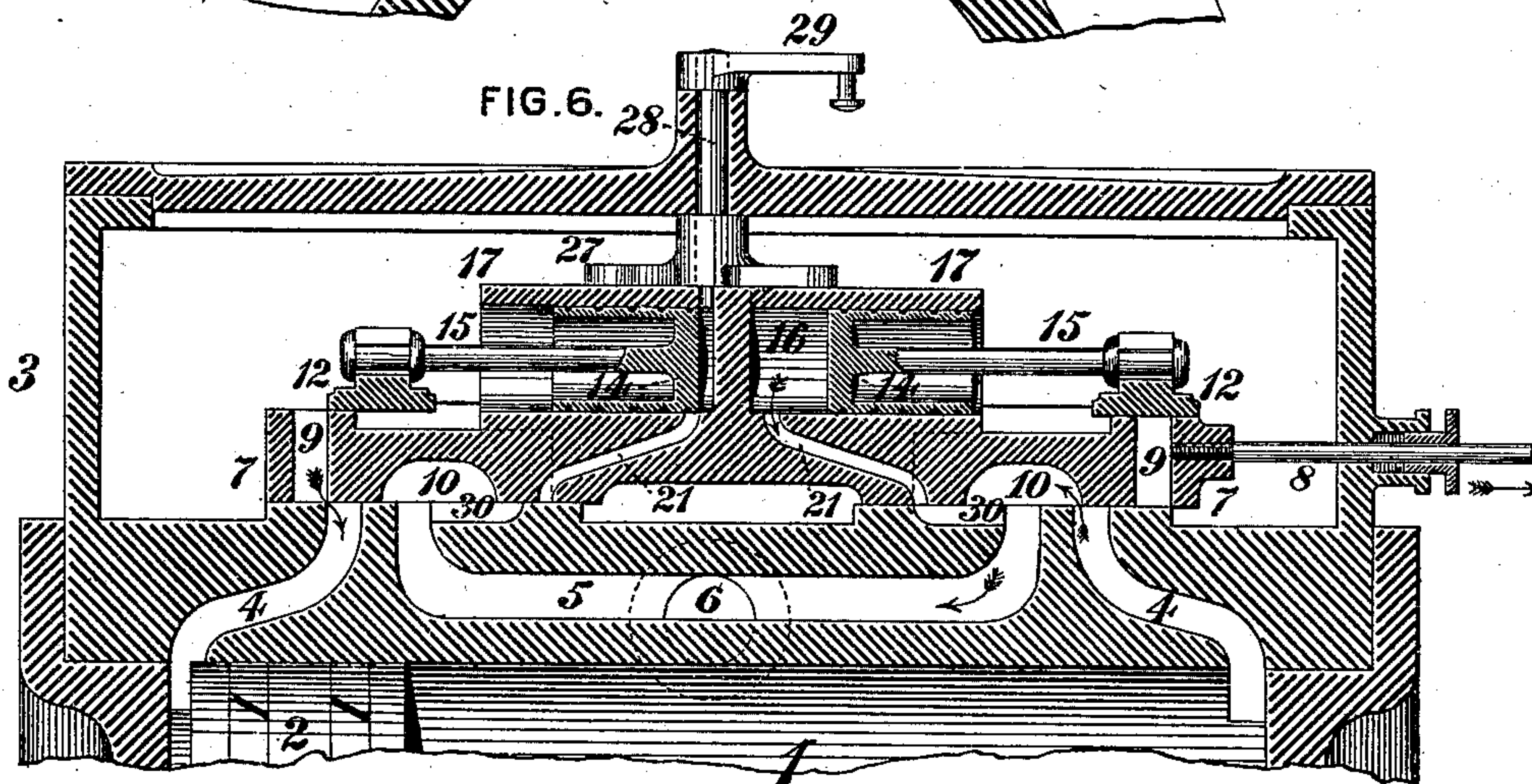
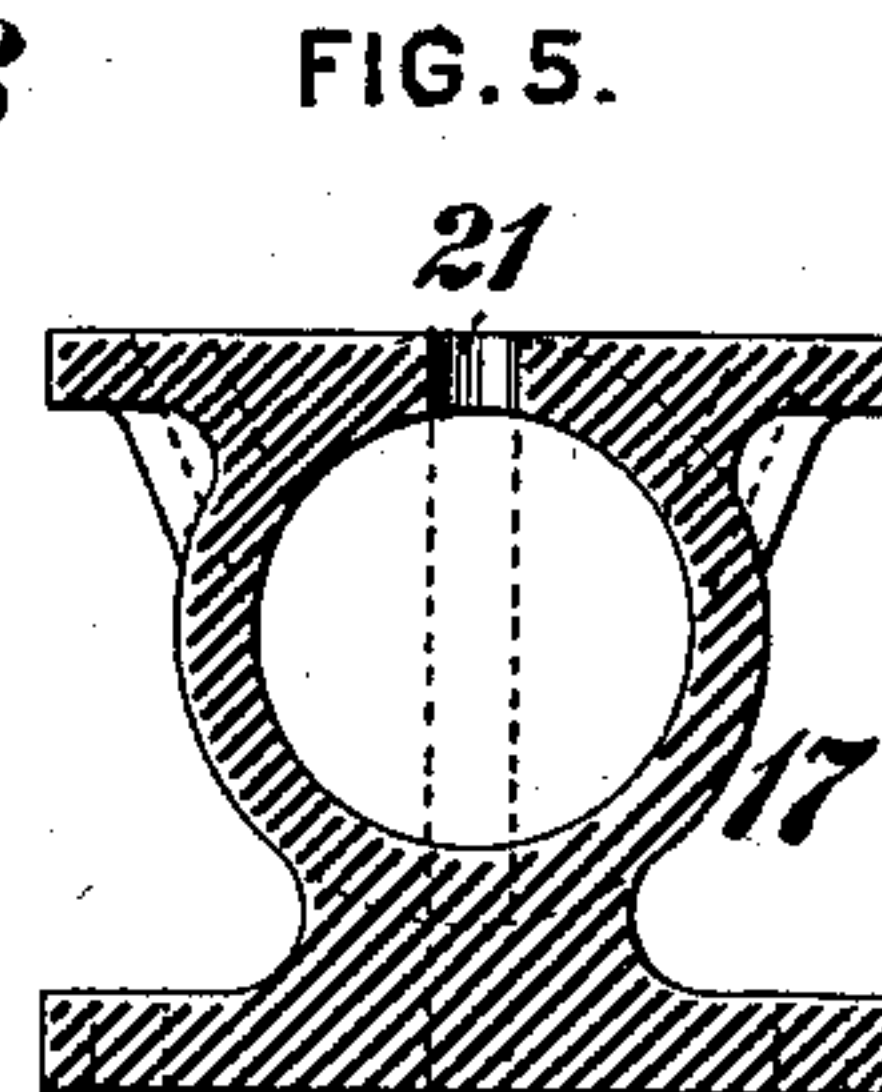
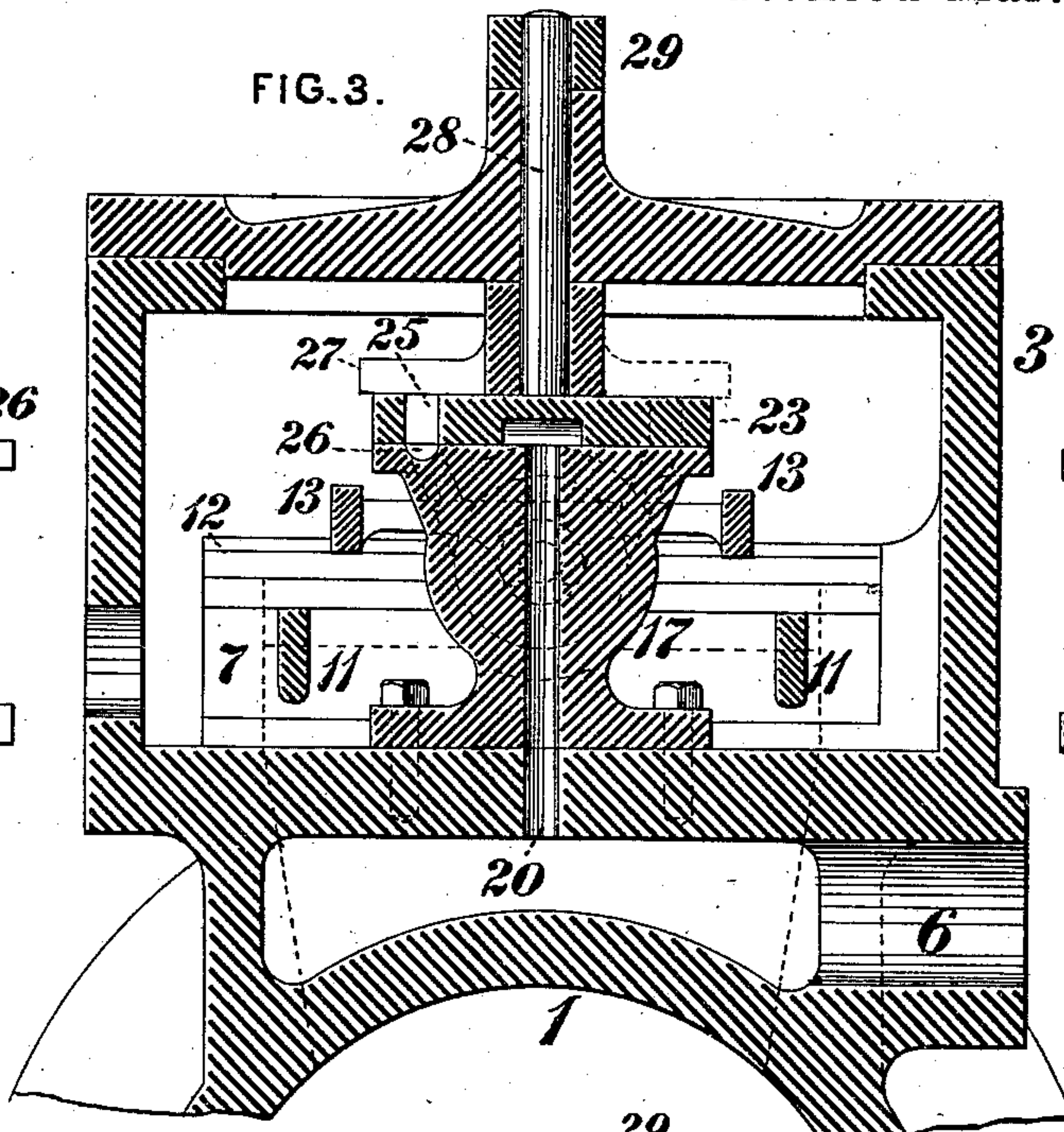
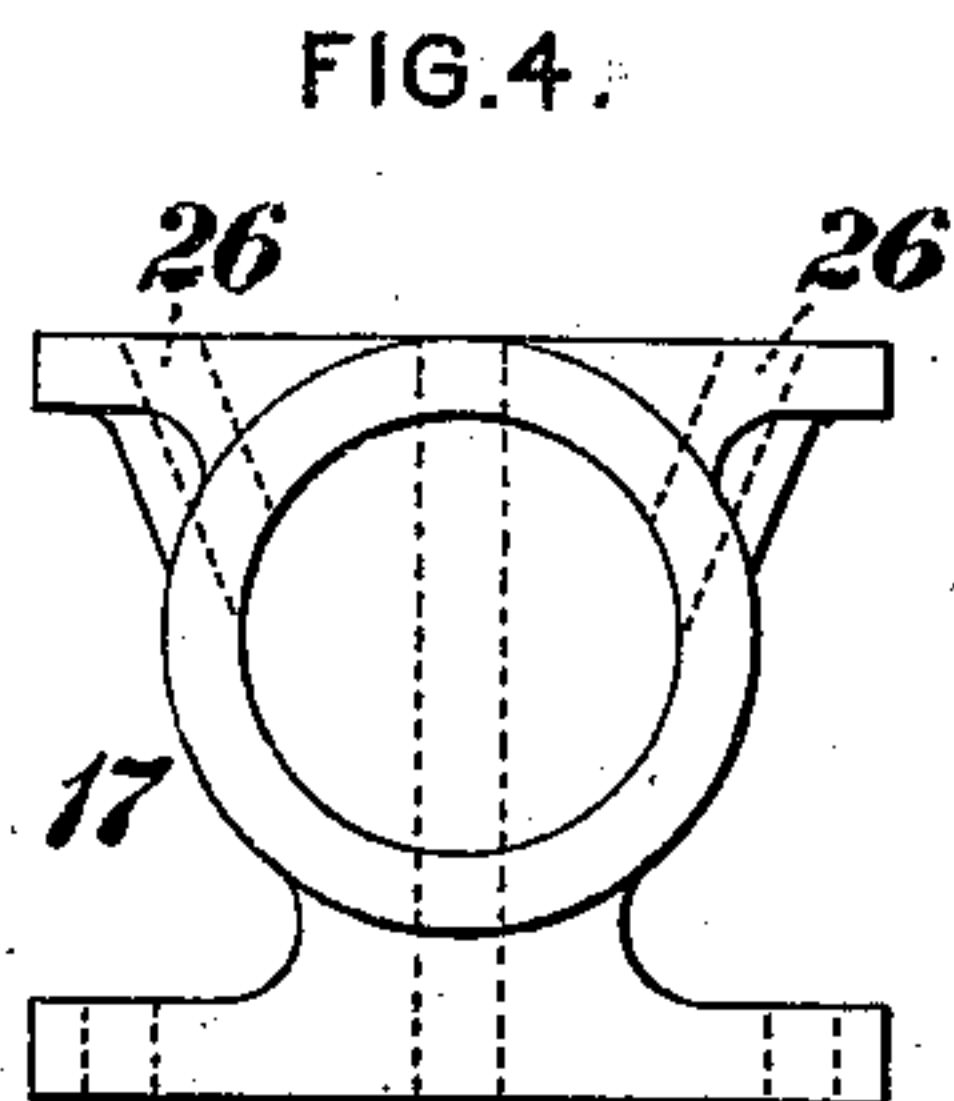
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Geo. B. Collier.
Geo. T. Kelly.

INVENTOR

Benj. Brazelle,
by Collier & Bell,
Attys.

(No Model.)

3 Sheets—Sheet 3.

B. BRAZELLE.
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FIG. 8.

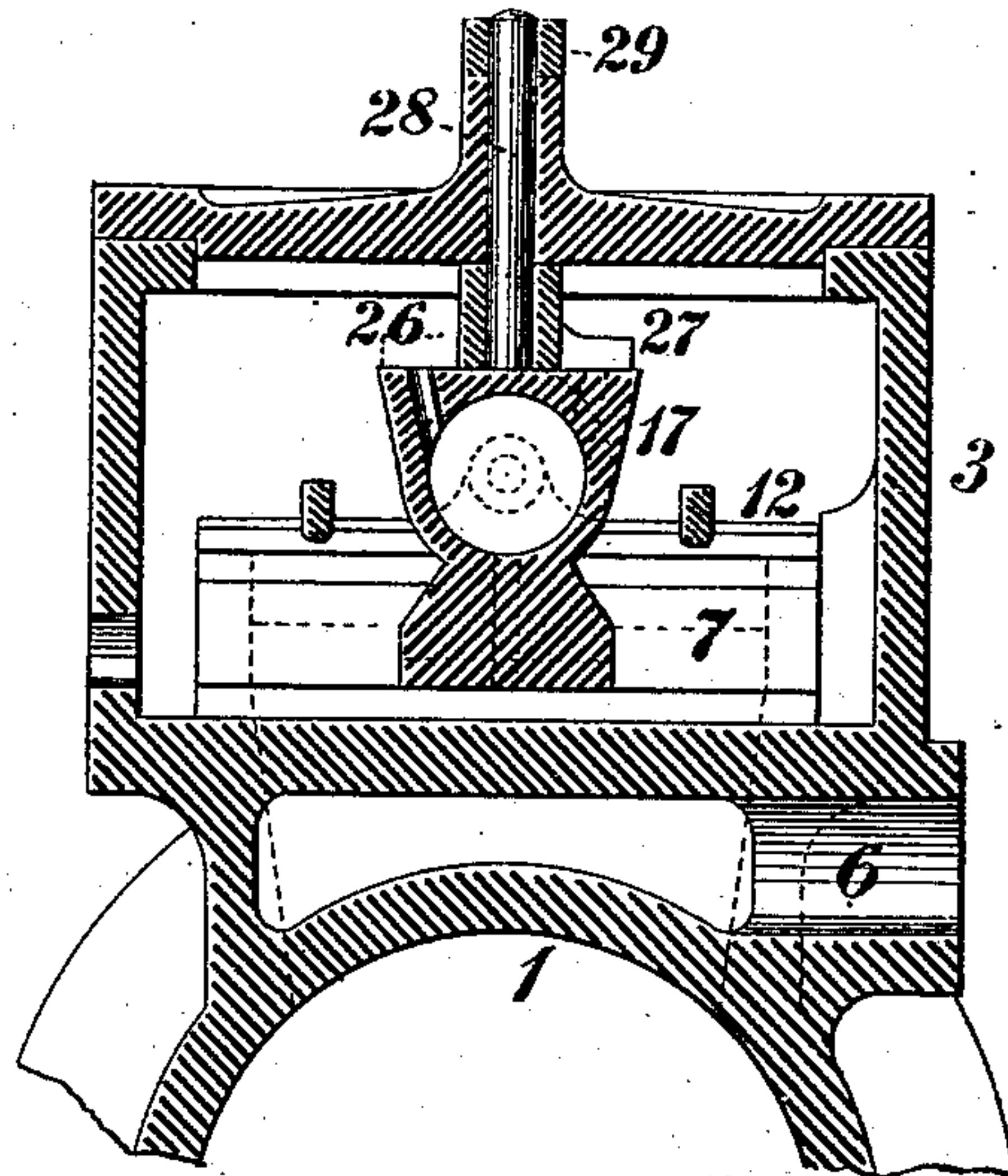


FIG. 9.

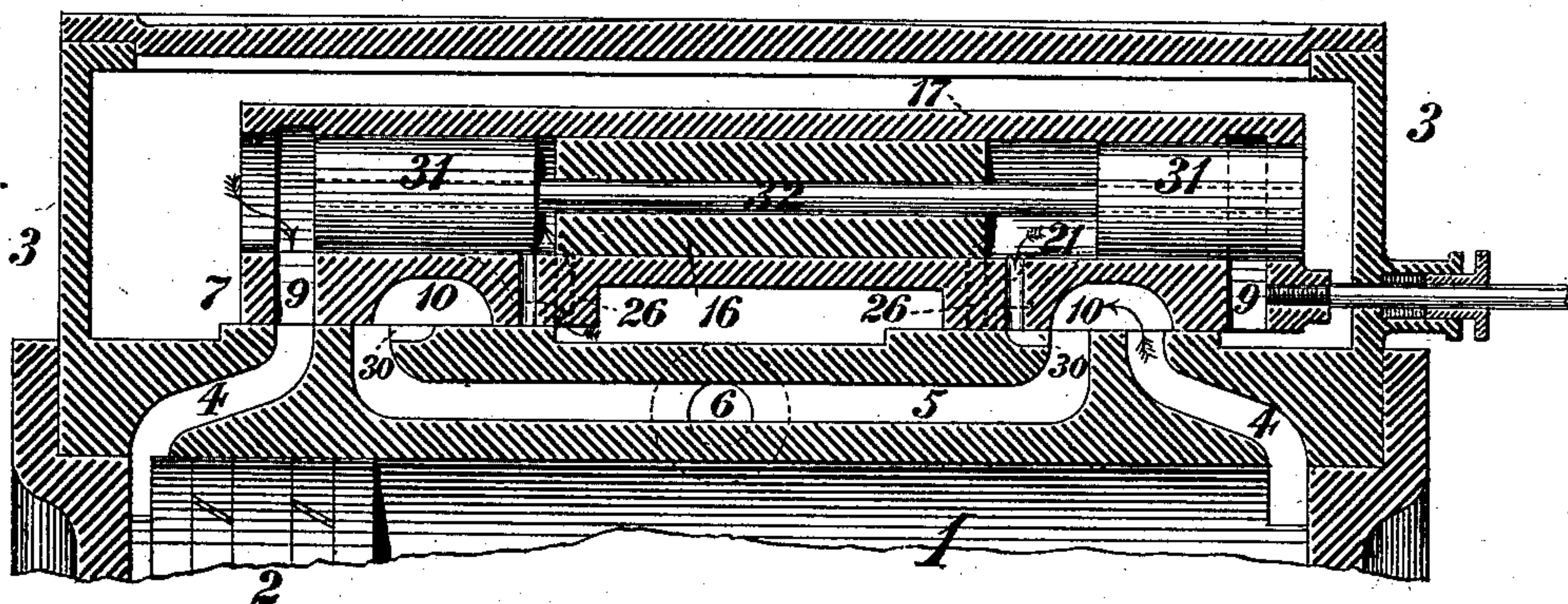
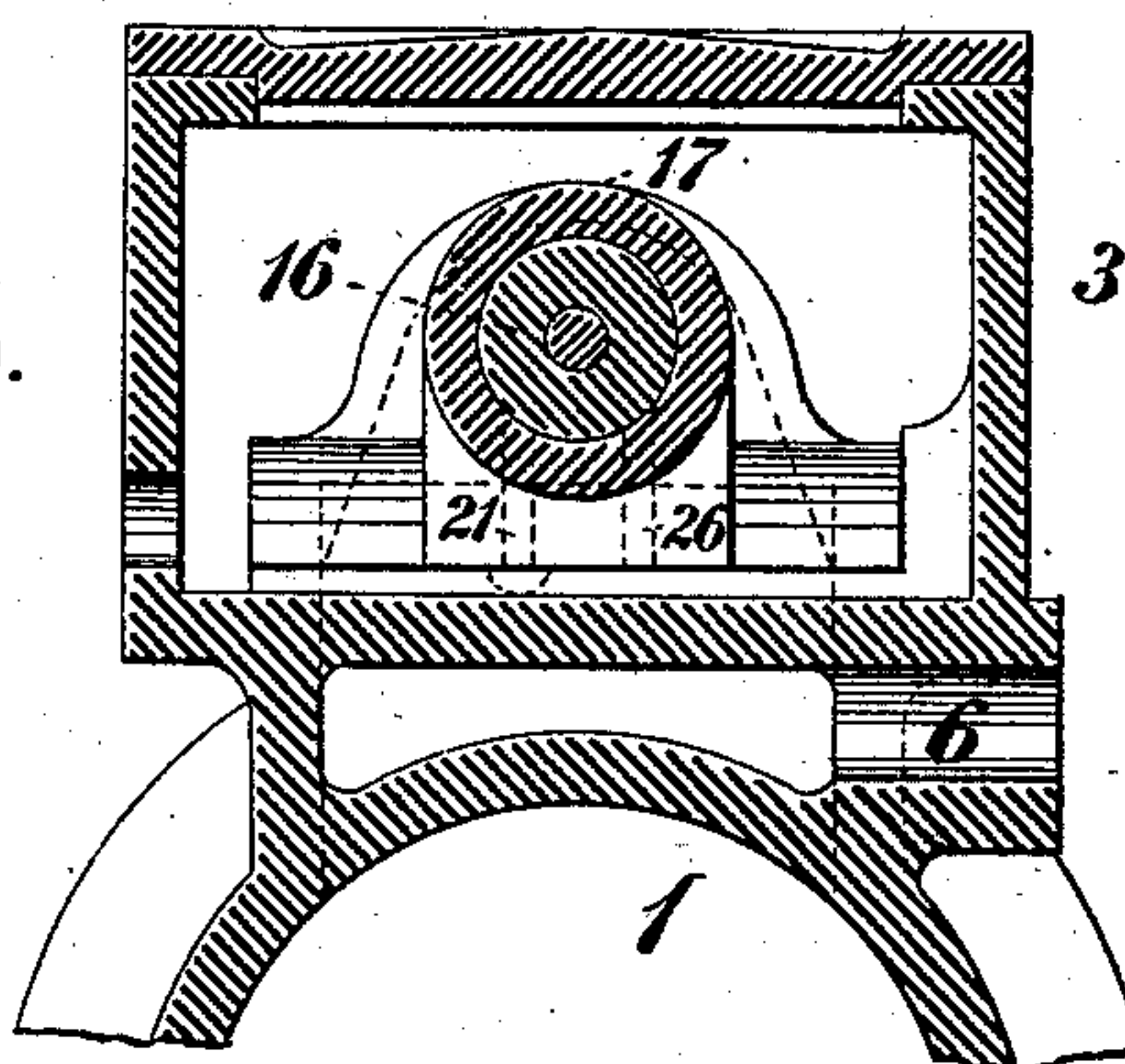


FIG. 10.



WITNESSES:

Geo. B. Collier
Geo. T. Kelly

INVENTOR

Benz. Brazelle
by Collier & Bell
Attys.

UNITED STATES PATENT OFFICE.

BENJAMIN BRAZELLE, OF ST. LOUIS, MISSOURI.

CUT-OFF VALVE.

SPECIFICATION forming part of Letters Patent No. 255,136, dated March 21, 1882.

Application filed December 1, 1881. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN BRAZELLE, of St. Louis, in the county of St. Louis and State of Missouri, have invented certain new and useful Improvements in Cut-Off Valves, of which improvements the following is a specification.

The object of my invention is to simplify and perfect the construction and operation of mechanism for cutting off steam, either automatically through the action of a governor or at determined points in the stroke of the engine-piston; and to this end my improvements consist in certain novel devices and combinations embracing an open-ended cylinder, divided centrally by a partition and located within the steam-chest of the engine, said cylinder having specially-arranged steam and exhaust passages adapted to communicate at proper intervals with the steam-chest and main exhaust-ports, a pair of pistons working in said cylinder and serving to effect the opening and closing of steam-ports in the main distribution-valve, a slide-valve governing the admission of steam to and exhaust from the cut-off cylinder, and a controlling valve, the position of which is regulated either by hand or by the governor, and which serves to regulate the period of admission of steam to the cut-off cylinder.

The improvements claimed are hereinafter more fully set forth.

In the accompanying drawings, Figure 1 is a vertical longitudinal central section through the steam-chest and portion of the cylinder of a steam-engine embodying my invention; Fig. 2, a plan or top view of the valve and cut-off cylinder; Fig. 3, a vertical transverse section at the center of the cut-off cylinder and main exhaust-passage; Fig. 4, an end view, and Fig. 5 a transverse section at the center of one of its exhaust-ports of the cut-off cylinder; Fig. 6, a vertical longitudinal section through a steam-chest and portion of a steam-engine cylinder, showing a modification of my invention; Fig. 7, a plan or top view of the valves and cut-off cylinder of the same; Fig. 8, a vertical transverse section of the same at the center of the main exhaust-port, and Figs.

9 and 10 vertical longitudinal and vertical transverse sections, respectively, through the steam-chest and portion of the cylinder of a steam-engine, showing a further modification of my invention.

My improvements are herein described and shown as applied in a steam-engine having a cylinder, 1, piston 2, steam-chest 3, induction and eduction passages 4 5, and exhaust passage 6, all of the ordinary construction. The main distribution-valve 7 is a double-ported slide, operated by a stem, 8, and composed of two end sections, (each having a steam-port, 9, and exhaust-cavity 10,) united by two longitudinal bars or bridges, 11. The independent cut-off valve, which consists of two plates, 12, connected by longitudinal bars 13, rides upon the back of the main valve 7, and performs the function of cutting off steam at desired points by correspondingly closing the steam-ports 9 of the main valve, the cut-off valve being reciprocated for this purpose by pistons working in an independent cut-off cylinder. Such reciprocation may be effected either automatically, as determined by the governor, or in conformity with a fixed grade of expansion, and arrangements of the parts suited to either case are shown in the drawings, and will be hereinafter described.

Referring to Figs. 1 to 5, inclusive, in which my improvements are shown as adapted to automatic cut-off, with range of expansion from zero to a late period of the stroke, the cut-off valve 12 is operated by two pistons, 14, each formed with or connected to a rod, 15, and fitting, in line one with the other, on opposite sides of a central partition or division, 16, in an open-ended cut-off cylinder, 17, secured within the steam-chest 3 midway between the faces over which the main valve 7 works. Each of the piston-rods 15 has a pair of collars, 18, at and adjacent to its outer end, between which collars is fitted a cross-bar, 19, connecting the longitudinal bridges 13 of the cut-off valve 12, thereby coupling the pistons and valve together, and thus securing their simultaneous longitudinal movements. The pistons 14, being exposed to equal pressure on their outer faces, are perfectly balanced, and

will consequently be moved together in one or the other direction upon the admission of steam behind either of them, respectively.

An exhaust-passage, 20, is formed in the central partition, 16, of the cut-off cylinder 17, establishing communication between the space above the upper side thereof and the main exhaust-passage 6 of the cylinder 1, and exhaust-ports 21 are formed in the cut-off cylinder on each side of the partition 16, and at a sufficient distance therefrom to provide space for the cushioning of the pistons 14 when at the inner extremity of their stroke, the ports 21 affording exit for the steam on the inner sides of the pistons and admitting of the escape thereof through the central passage, 20. The cut-off cylinder 17 is flattened and widened upon its top for the major portion of its length, forming a face over which works a slide-valve, 23, connected to a stem, 24, and reciprocated thereby from a suitable eccentric or rock-shaft. The exhaust-recess of the valve 23 serves to establish communication between the central exhaust-passage, 20, and one or the other alternately of the exhaust-ports 21, and steam is admitted alternately behind one or the other of the pistons 14 through elongated ports 25, located in the slide-valve 23 adjacent to its sides, and extending in opposite directions on each side of its transverse center line. The ports 25 in the traverse of the valve 23 cover and uncover steam-supply passages 26, the upper ends of which are located in line transversely upon the top of the cut-off cylinder 17, and which extend in opposite directions and terminate within the cylinder 17, one on each side of the central partition, 16.

It will be obvious that according as the steam-passages 26 are opened earlier or later in the stroke by the valve 23, so will the degree of expansion effected by the closing of the supply-ports of the main distribution-valve through the movement of the pistons 14 and cut-off valve 12 be greater or less, as the case may be. Such variation is effected by a controlling-valve, 27, which is secured upon a shaft, 28, fitted so as to be capable of axial movement in a bearing in the steam-chest cover, concentrically with the central exhaust-passage of the cut-off cylinder. The controlling-valve 27 is formed of a central hub or boss and two laterally-projecting arms, the lower surfaces of which are faced truly and fit over the correspondingly-faced upper surface of the slide-valve 23. The position of the valve 27 is shifted, as required for different points of cut-off, by means of an arm, 29, on the outer end of the shaft 28; and by connecting the arm 29 with the governor of the engine the speed of the engine is regulated by the automatic cut-off thereby effected. The valve 27 may be shifted by hand where automatic cut off is not deemed necessary.

It will be seen that according as the arms of the controlling-valve 27 are moved nearer to the transverse center line of the cut-off

cylinder in the direction of the arrows, Fig. 2, so will the period during which steam is admitted to the main cylinder 1 be lengthened, as steam will in such case be admitted later to the cut-off cylinder 17 through the slide-valve 23. Conversely, the farther the arms of the controlling-valve are moved from the transverse center line the earlier will the cut-off valve be moved and the point of cut-off effected. The ports 25 in the slide valve 23 are elongated for the purpose of keeping the valve in communication with the cylinder-port when the controlling-valve 27 is advanced for the later grades of cut-off, and the exhaust-recess in the valve 23 is correspondingly elongated.

Two sets of ports—to wit, one steam and one exhaust—for each end of the cut-off cylinder are essential, for the reason that when the piston has closed the exhaust-port to provide for cushion steam cannot enter by said port and a separate steam-port must be provided in line with or close to the central partition. By the location of the exhaust-ports in such relation to the central partition as to provide space between their inner sides and the faces of said partition a simple and inexpensive cushion is provided, preventing jar or shock at the ends of the stroke of the pistons and dispensing with the air cylinders, dash-pots, and similar appliances ordinarily used. The employment of the open-ended cut-off cylinder enables stuffing-boxes to be dispensed with, with the beneficial result of avoiding the friction thereof, the necessity of correct alignment, and the inconvenience of maintaining stuffing-boxes located in a steam-chest where ready and convenient access to them would be impracticable.

The modification of my improvements shown in Figs. 6 to 8, inclusive, is designed more particularly for engines of small power, where economy in construction is an object. In this case the range of variation of the point of cut-off is more limited than in the instance first described, not extending farther than to about one-third of the stroke of the main piston. The cut-off cylinder 17 is here made part of and travels with the main distribution-valve 7, and the slide-valve 23 is dispensed with, the controlling-valve 27 fitting directly over the flattened upper surface of the cut-off cylinder and effecting the opening and closure of the steam supply passages, 26, (which as in the previous instance, lead into the cut-off cylinder on opposite sides of its central partition) by the traverse of the cut-off cylinder beneath it. The central exhaust-passage of the cut-off cylinder is likewise dispensed with, the exhaust-passages 21 extending through the main valve and terminating on its lower working-face, where they communicate at the proper intervals, regulated by the movements of the main valve 7, with channels 30, formed in the cylinder-valve face and leading into the education-passage 5. The independent cut-off valve 12 is connected to and reciprocated by the pis-

tons 14 of the cut-off cylinder in the manner hereinbefore described.

A further modification of my improvements, adapted for a cut-off fixed at about one-third the stroke, and likewise designed particularly with a view to effect economy in cost of construction, is shown Figs. 9 and 10. The cut-off cylinder 17 is, as last above described, cast in a piece and travels with the main valve 7. The steam-ports 9 of the main valve are closed to effect the cut off, and opened thereafter for the succeeding admission of steam by pistons 31, secured upon a rod, 32, which passes through the long central partition, 16, of the cut-off cylinder. The exhaust-passages 21 of the cut-off cylinder are, as before, located on each side of the central partition and communicate with channels 30 in the cylinder valve-face, leading to the eduction-passage 5. The steam-passages 26 of the cut-off cylinder lead from the spaces at each end of the partition 16 to the working-face of the main valve, and are uncovered at the proper intervals to admit steam to each of the pistons, respectively, by the movement of the main valve over its working-faces upon the cylinder. The construction shown is adapted only for a fixed cut-off, and a throttling-governor is required for regulation; but automatic regulation may, if desired, be provided by causing the steam-supply passages 26 to open upon the top of the cut-off cylinder, and using in connection therewith a controlling-valve, 27, as hereinbefore described.

I am aware that an auxiliary cylinder and piston combined with and employed to operate the main or the cut-off valve of a steam-engine have been heretofore known and used, as exemplified in the patents of W. Shepherd, Jr., No. 23,885, May 3, 1859, and Babcock and Willcox, No. 54,090, April 24, 1866, and such therefore I do not broadly claim.

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

1. The combination, substantially as set forth, of an open-ended cylinder having a central division or partition and a steam and an exhaust port on each side thereof, a pair of pistons fitted to said cylinder on opposite sides

of its central partition, and a stationary controlling-valve which fits over the steam-ports of the cylinder and is adjustable, so as to regulate the period of admission of steam thereto.

2. The combination, substantially as set forth, of an open-ended cylinder having a central division or partition and a steam and an exhaust port on each side thereof, a pair of pistons, each fitted to said cylinder on one side of said partition, a slide-valve effecting the opening and closing of the steam and exhaust ports, and an adjustable controlling-valve regulating the period of admission of steam through said slide-valve.

3. The combination, substantially as set forth, of a double-ported slide distribution-valve, an open-ended cylinder connected to said valve and having a central division or partition, a pair of steam-supply ports leading into said cylinder on opposite sides of said partition, a pair of exhaust-ports extending from said cylinder through the distribution-valve to its working-face on opposite sides of said partition, and a valve-face upon the main steam-cylinder having channels or grooves leading to its eduction-passages, with which channels the exhaust-ports in the distribution-valve leading to the open-ended cylinder are adapted to be alternately brought into communication by the reciprocation of the valve.

4. The combination, substantially as set forth, of a double-ported slide distribution-valve, an open-ended cylinder having a central division or partition and a steam and an exhaust port on each side thereof, a pair of pistons fitted to said cylinder on opposite sides of the central partition, a cut-off valve connected to the rods of said pistons and governing the ports of the distribution-valve, a slide-valve governing the ports of the open-ended cylinder, and an adjustable controlling-valve regulating the admission of steam through said slide-valve to said ports.

BENJAMIN BRAZELLE.

Witnesses:

CORNELIUS V. CHAPIN,
ELIAS F. GILBERT.