

No. 618,839.

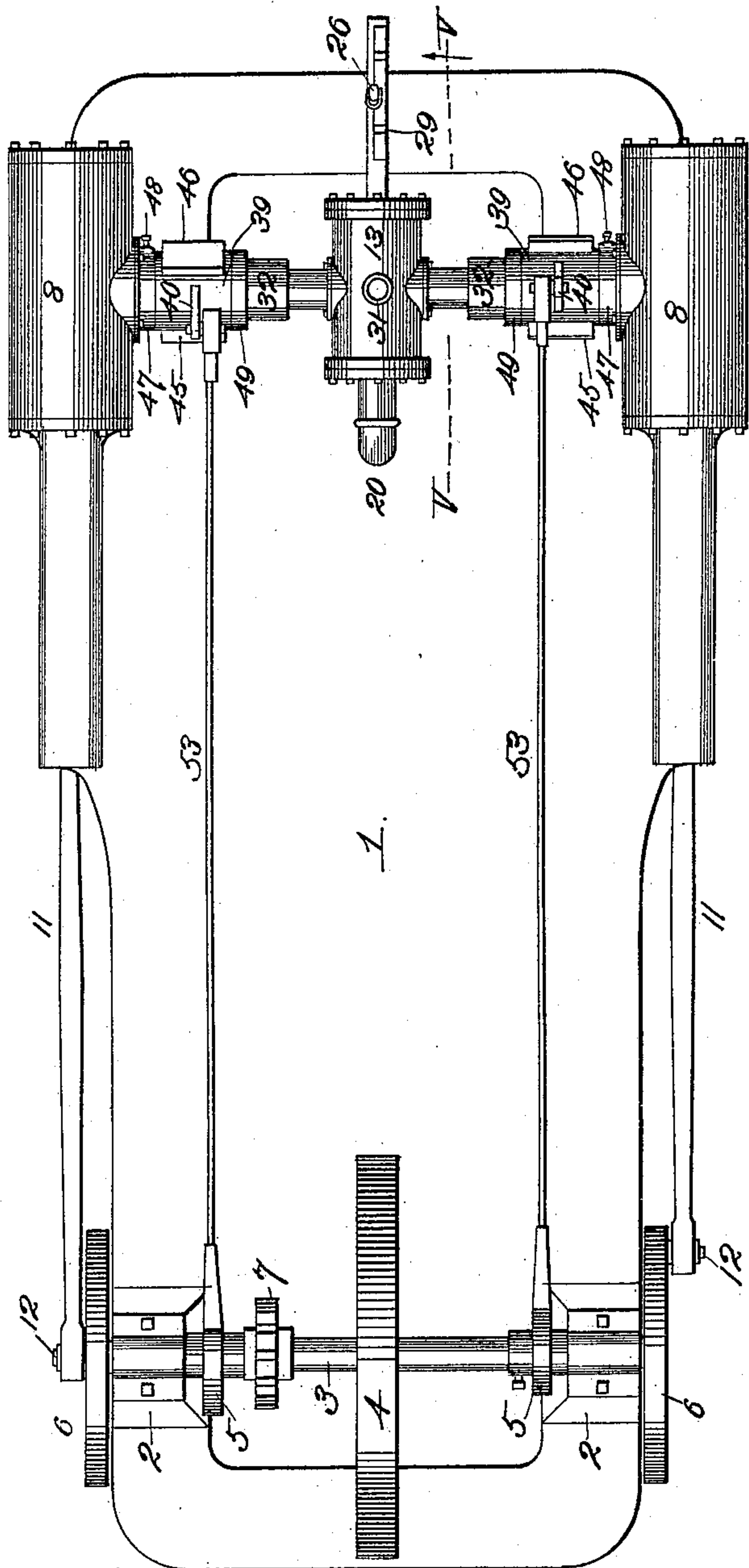
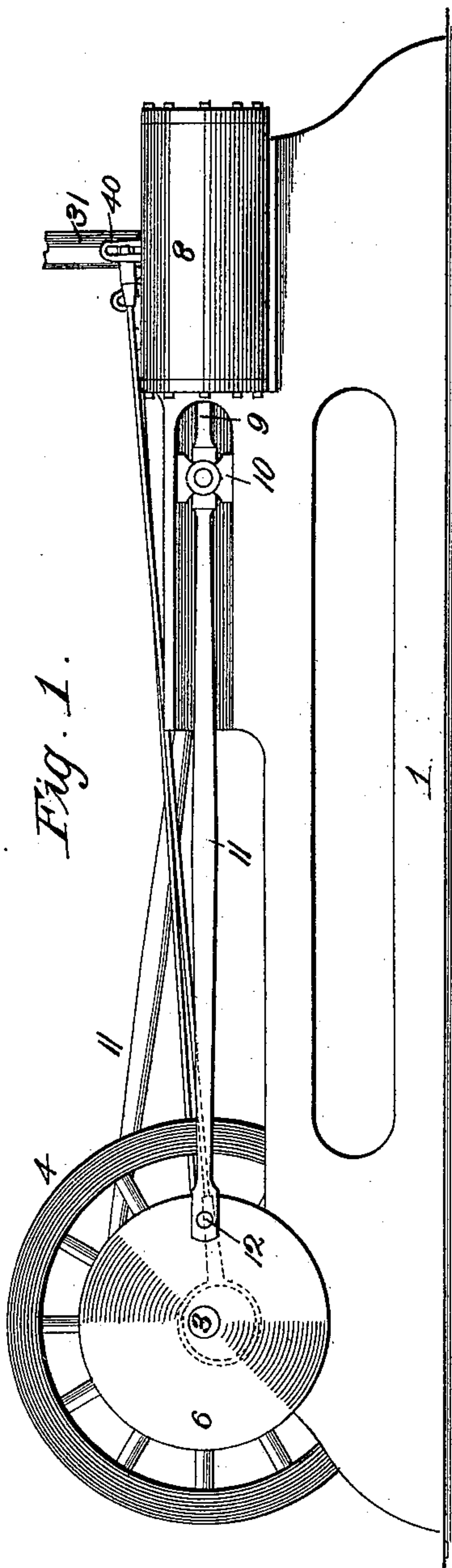
Patented Feb. 7, 1899.

S. M. COFFMAN.
STEAM ENGINE REVERSING VALVE.

(Application filed May 28, 1898.)

(No Model.)

3 Sheets—Sheet 1.



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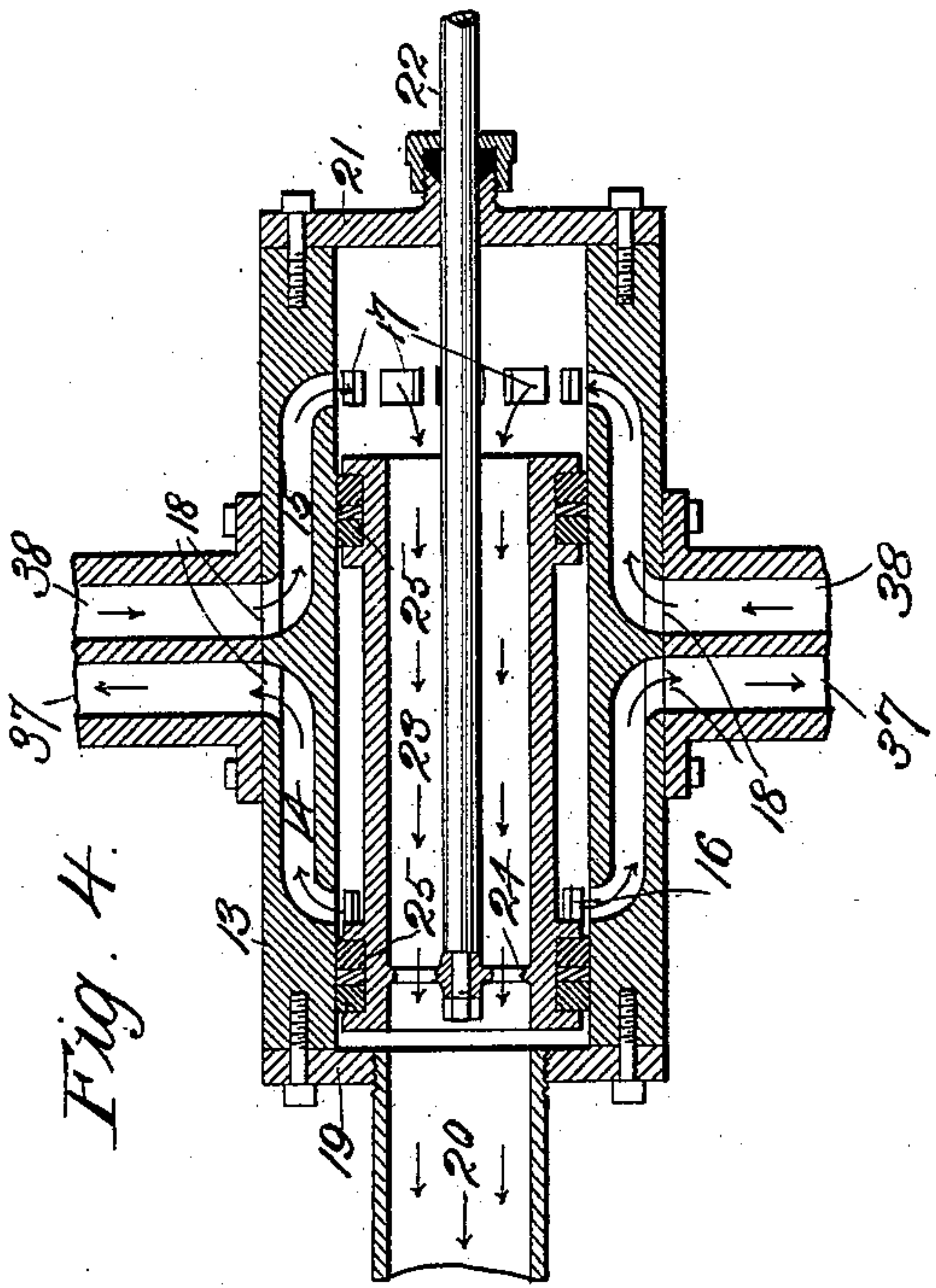


Fig. 4.

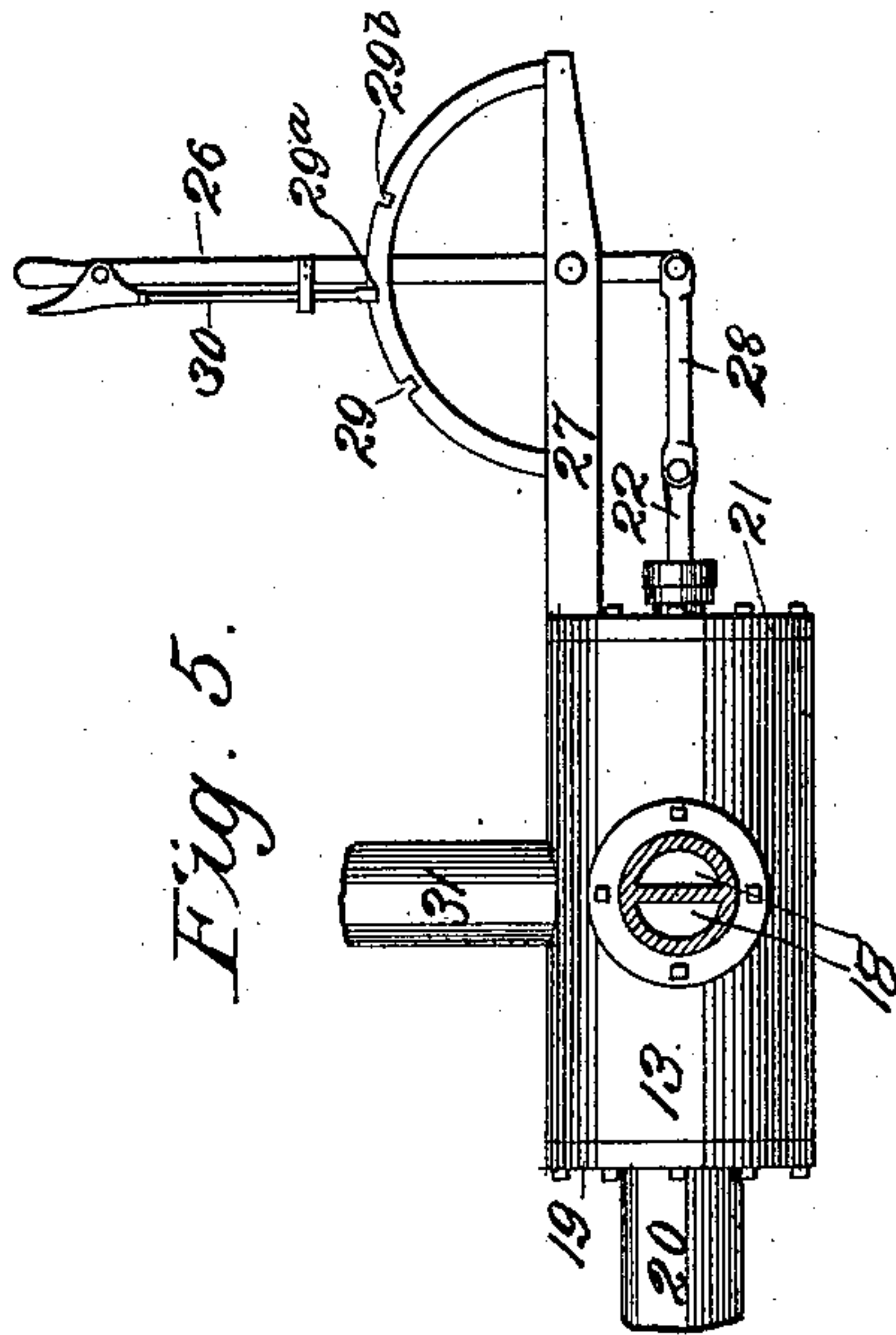


Fig. 5.

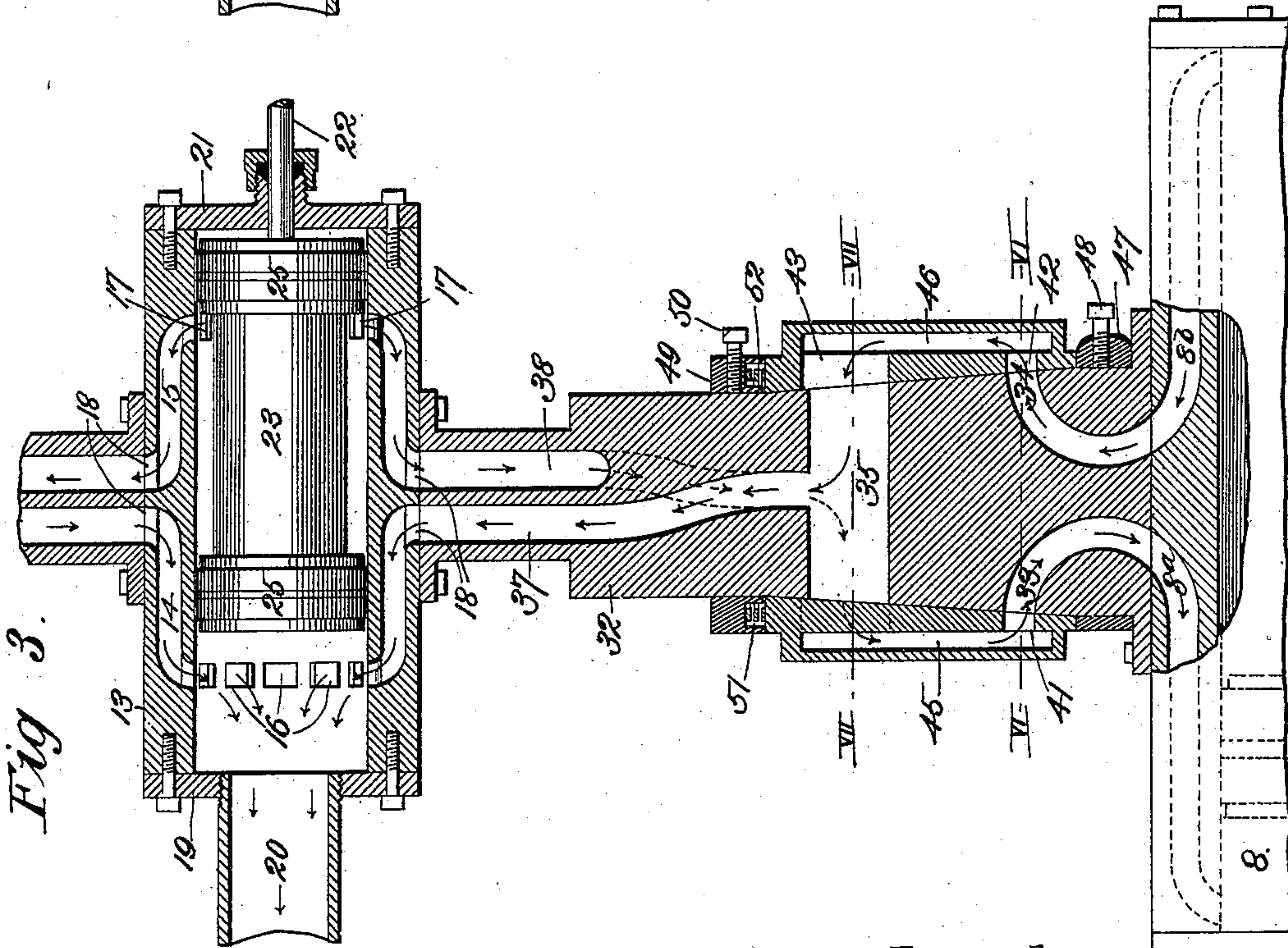


Fig. 3.

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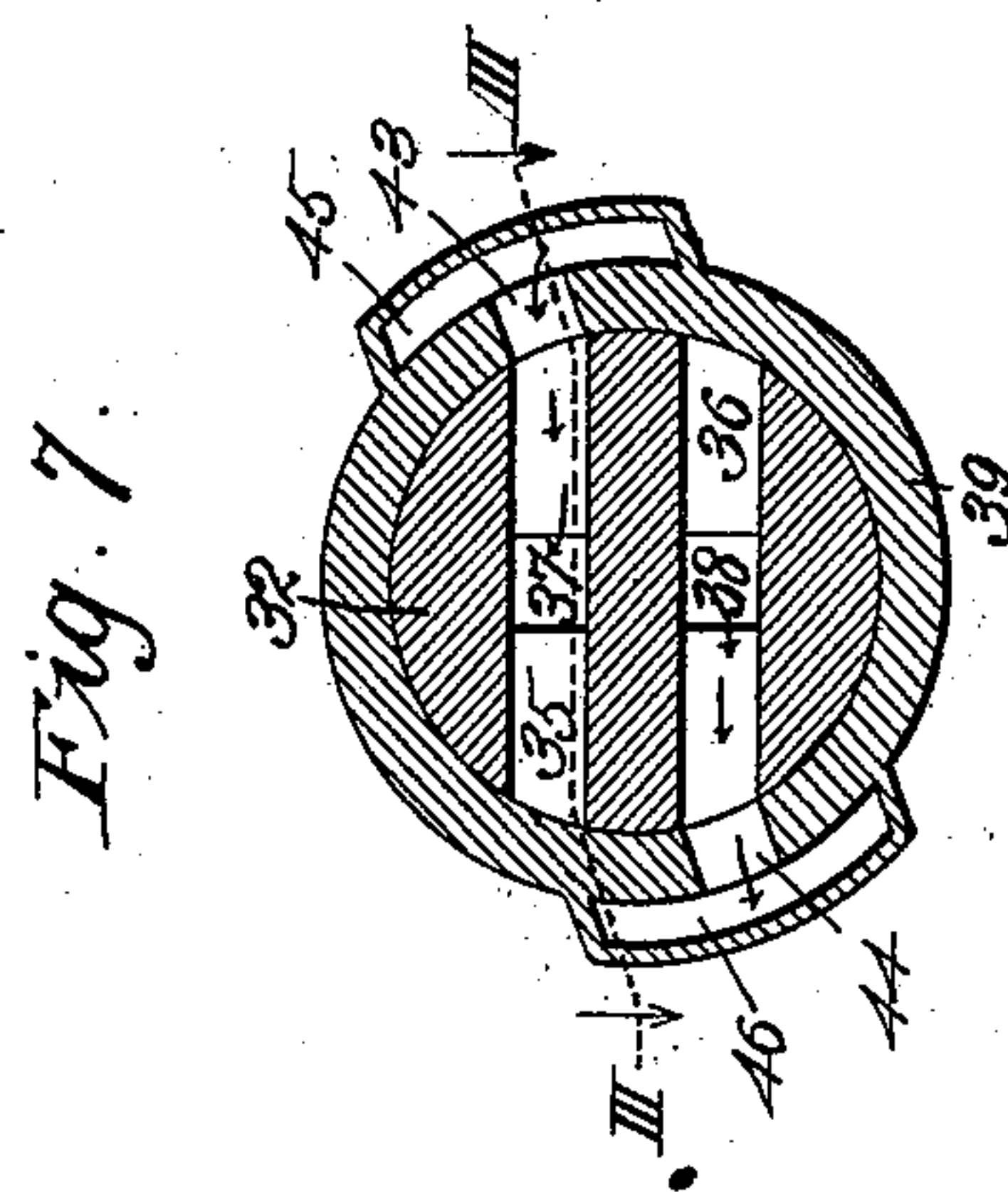
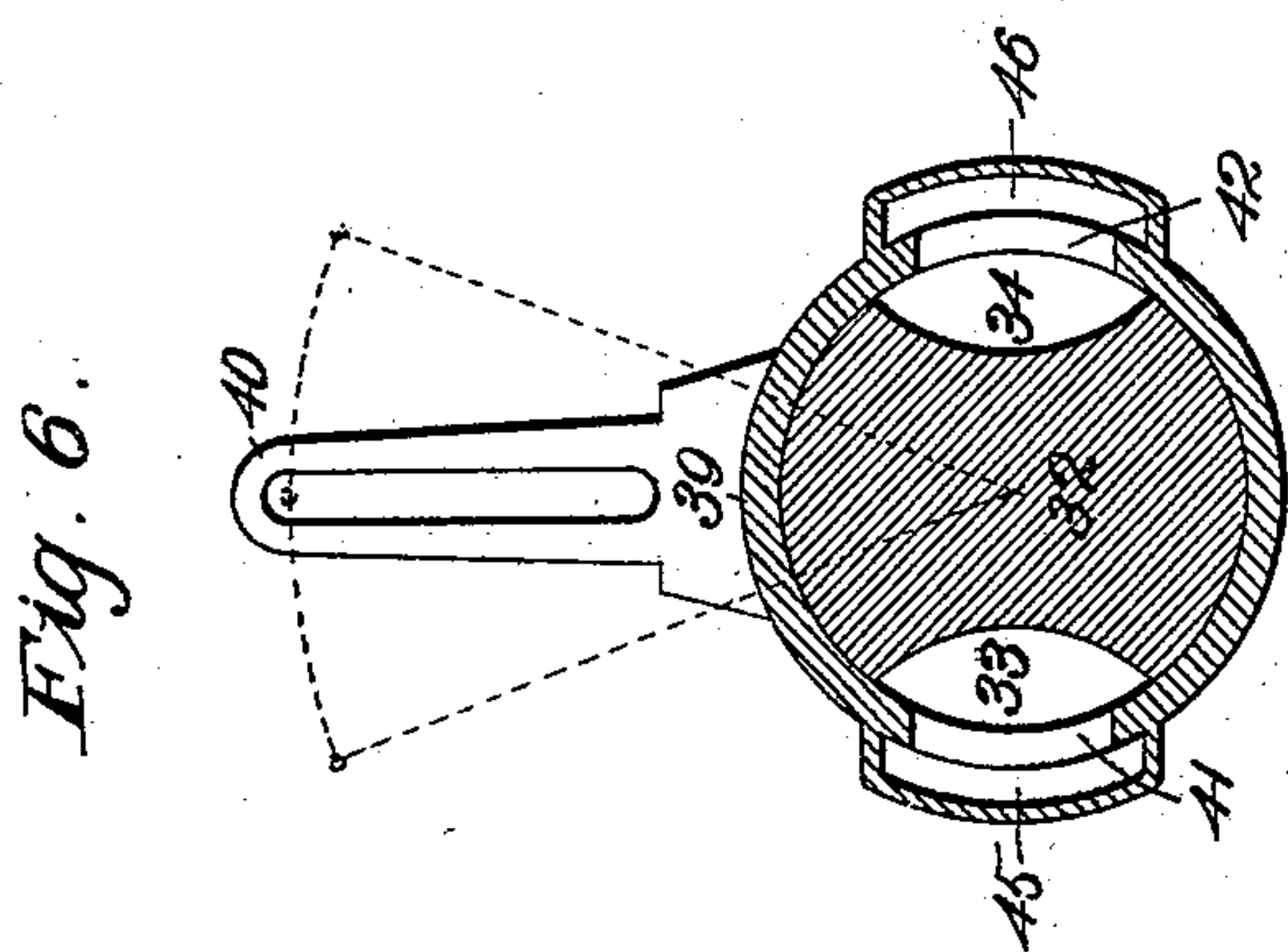
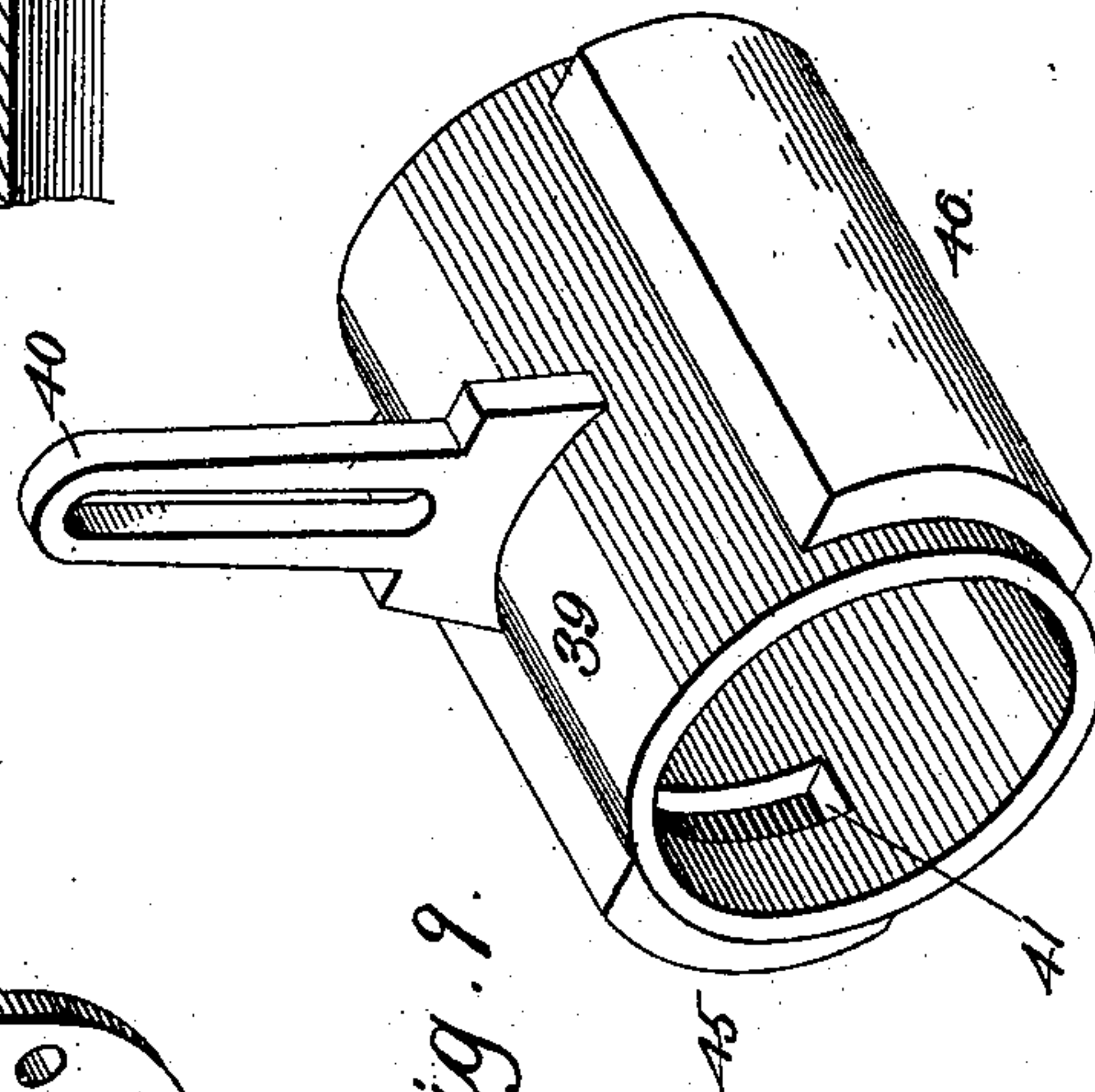
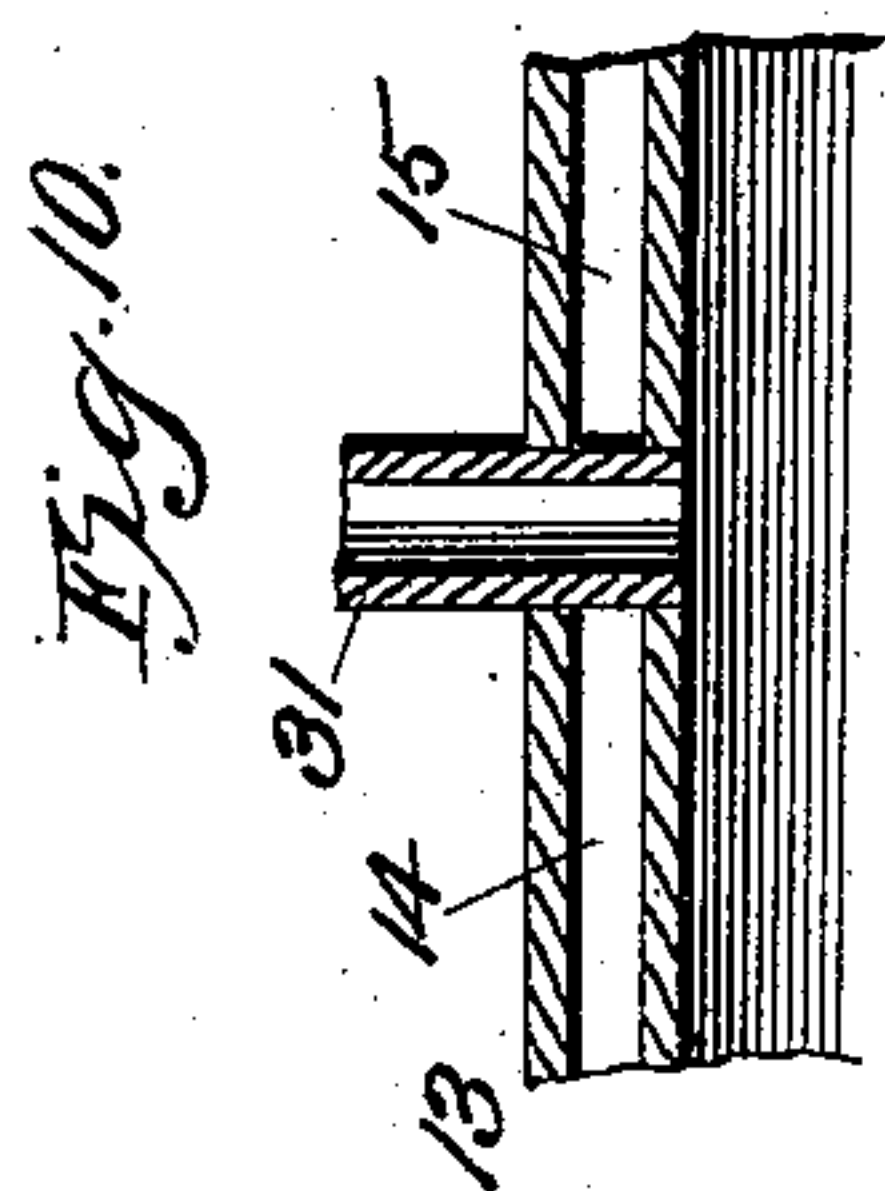
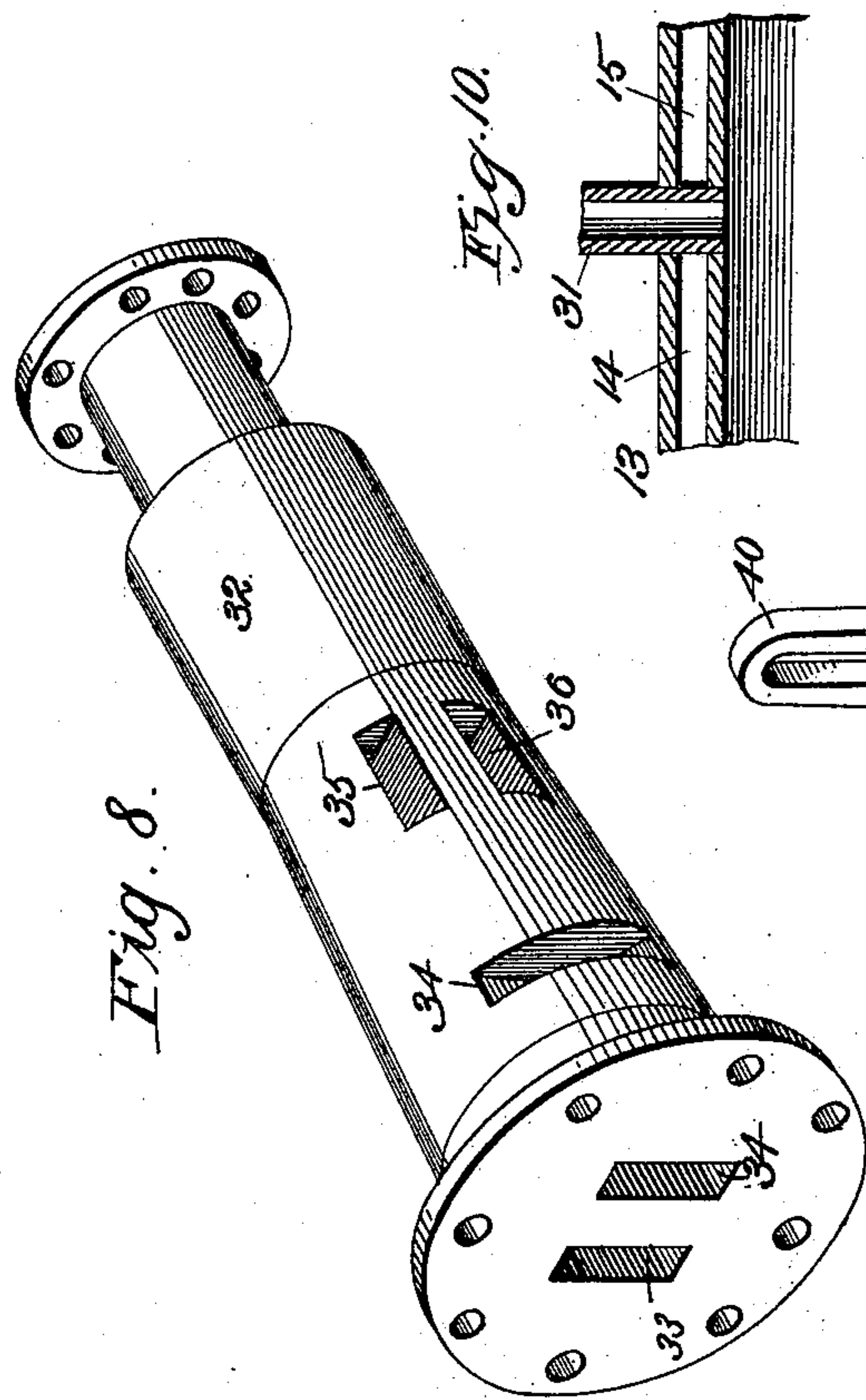
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UNITED STATES PATENT OFFICE.

SAMUEL M. COFFMAN, OF BRAYMER, MISSOURI, ASSIGNOR OF ONE-HALF
TO JAMES H. COOK, OF CARTHAGE, MISSOURI.

STEAM-ENGINE REVERSING-VALVE.

SPECIFICATION forming part of Letters Patent No. 618,839, dated February 7, 1899.

Application filed May 28, 1898. Serial No. 682,085. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL M. COFFMAN, of Braymer, Caldwell county, Missouri, have invented certain new and useful Improvements in Steam-Engine Reversing-Valves, of which the following is a specification.

My invention relates to steam-engines; and my object is to produce a reversible engine without the link-motion which is comparatively simple, compact, and durable in construction.

Other advantages of the invention will hereinafter appear and be pointed out in the appended claims, and in order that it may be fully understood reference is to be had to the accompanying drawings, in which—

Figure 1 represents a side elevation of an engine embodying my invention. Fig. 2 is a plan view of the same. Fig. 3 is a horizontal section taken centrally through the reverse and throttle valve mechanism and on line III III of Fig. 7. Fig. 4 is a longitudinal section of the reverse and throttle valve mechanism with the slide-valve in a different position. Fig. 5 is a sectional view taken on the line V V of Fig. 2. Fig. 6 is a vertical cross-section taken on the line VI VI of Fig. 3. Fig. 7 is a vertical cross-section taken on the line VII VII of Fig. 3. Fig. 8 is a detailed perspective view of the ported connection between the reversing and throttle valve and the cylinder. Fig. 9 is a detailed perspective view of the cut-off valve. Fig. 10 is a vertical section to illustrate the point of communication between the steam-supply pipe and the valve-casing.

Referring now to the drawings in detail, where like reference-numerals refer to corresponding parts, 1 designates the base of the engine, provided with opposite bearings 2 for the crank-shaft 3.

4 designates the fly or balance wheel; 5, a pair of eccentrics; 6, the disks or crank-arms of the shaft, and 7 a cog-wheel or its equivalent for engagement with the gearing (not shown) of a hoisting apparatus or any other mechanism to be operated by the engine.

8 designates the cylinders of the engine, and 9 the piston-stems, said stems being connected to the sliding cross-heads 10 in the customary or any preferred manner. The cross-

heads are connected, as shown, by the pitman-rods 11, pivotally mounted at their rear ends upon the wrist-pins 12 of the disks or cranks 6, said wrist-pins being preferably set quatering to each other in the customary manner.

Referring now to the construction of the reversing and throttle valve mechanism, 13 designates a cylindrical casing provided with two annular but separate and distinct channels 14 and 15, which communicate at their outer ends at suitable distances apart with the interior of the casing by means of a series of slots or holes 16 and 17, respectively, of requisite size and arrangement, and at their inner ends the passages 14 and 15 communicate with the diametrically opposite openings 18. The inner or rear end of the casing is closed by a head 19, and communicating with the interior of the casing through said head is the exhaust-pipe 20, which may lead to any desired point. The opposite end of the casing is closed by a head 21, through which extends the valve-stem 22. The valve 23 is in the form of a cylindrical tube open from end to end and provided with a skeleton or open-work partition 24, to which the stem 22 is secured. It is also provided externally near its ends with annular grooves, in which are seated the self-adjustable packing-rings 25 of a type in general use. This valve is of such proportion that it may simultaneously close all of the apertures 16 and 17 or may partition the space between said apertures and permit the steam entering the interior of the cylinder by way of the set of apertures which happens to be beyond the end of the valve to escape by way of the exhaust-pipe 20, as shown clearly in Figs. 3 and 4. This valve is manually adjusted by means of the lever 26, mounted upon the arm 27, projecting from the casing or any other suitable point and connected to the stem 22 of the valve by means of the link 28. A sector mounted upon the arm 27 is provided with three notches 29, 29^a, and 29^b, and a dog 30, carried by the lever and under control of the operator, is adapted to engage one or the other of said notches. It engages the notch 29 and holds the valve in the position shown in Fig. 3 to cause the engine to run in one direction. To reverse the engine, the valve is shifted to the position

shown in Fig. 4, and then the dog engages the notch 29^b to maintain the valve in its new position. To throttle the engine, the valve is moved to its central position, so as to close the apertures 16 and 17 simultaneously. To accomplish this, the dog must engage the notch 29^a, as shown in Fig. 5.

31 designates the supply-pipe for connection with the boiler. (Not shown.) Said pipe extends through the casing and communicates solely with the interior of the casing.

32 designates the ported connection for the reversing and throttle valve and cylinder. They are of suitable configuration to snugly embrace at their ends the opposing sides of the steam-cylinders 8 and the valve-casing 13 and for about half their length are preferably of slightly-conical form, and at their outer ends are each provided with a pair of substantially quadrant-shaped passages 33 and 34, which communicate at their outer ends with the ports 8^a and 8^b of the cylinders 8, and at their inner ends said passages are preferably flared, as illustrated clearly in Figs. 6 and 7, for a purpose which will presently be explained.

Inward of the passages 33 and 34 each ported connection is provided with the parallel passages 35 and 36, extending from side to side, and such passages are connected, respectively, by the channels 37 and 38 with the openings 17 of the annular passages 14 and 15 of the valve-casing.

Each cut-off valve is in the form of a cylinder 39 and embraces the conical portion of the corresponding ported connection and is provided with a slotted arm 40. Said valve is provided near its outer end and at opposite points with the elongated passages or slots 41 and 42, which register with the flaring mouths of the passages 33 and 34, respectively, irrespective of the position of the valve, this purpose being effected by reason of the flaring of the inner ends of said passages 33 and 34. The cut-off valve is also provided with a pair of openings 43 and 44, which are caused by the eccentric (as hereinafter described) to alternately register with said passages—that is to say, when the eccentric completes one revolution the openings 43 and 44 are respectively in communication with the passages 35 and 36, and when the eccentric completes the next revolution the opening 43 is in communication with the passage 36 and the opening 44 with the passage 35, in order that the steam may be caused to enter first one end of the cylinder and then the opposite end.

In order that the steam may be conducted properly between the openings 41 42 and 43 44, the cut-off valve 39 is provided with a pair of chambers 45 and 46, the chamber 45 connecting openings 41 and 44 and the chamber 46 connecting passages 42 and 43.

A ring 47 is secured by a set-screw 48 upon the outer end of each ported connection, and the ring 49 is secured to the same near its inner end by means of a set-screw 50, the last-

named ring being provided in its outer edge with an annular groove 51, wherein is seated the expansive spring 52, which by pressure upon the cut-off valve has a tendency to compensate for wear by automatically adjusting said valve outward upon the conical portion of the ported connection, to the end that steam-tight joints shall always be maintained.

The cut-off valves are connected to the eccentric 5 by means of the usual link-rods 53.

Supposing the reversing and throttle valve to be situated as shown in Fig. 3, it is obvious that the steam enters the valve-casing via pipe 31 at a point between the packing-rings 25, and consequently escapes through the apertures 17, passage 15, and openings 18 in communication therewith into channels 38 of the ported connection. It thence passes by way of passages 36, openings 44, chambers 45, openings 41, and passages 33 into ports 8^a of the cylinders and forces the pistons forward, the forward movement of the pistons of course forcing the exhaust-steam in advance back through passages 8^b 34, openings 42, chambers 46, openings 43, and passages 35 and 37 into the passage 14 of the valve-casing, and thence through apertures 16 to the exhaust-pipe 20, through which it escapes. At the moment the pistons respectively complete their forward strokes the eccentrics rock the cut-off valves 39, so as to compel the steam, instead of passing from passages 36 through openings 44 and the connecting-passages and openings to the rear ends of the cylinders, to pass from passages 36 through the openings 43, chambers 46, openings 42, passages 34, and ports 8^b to the front end of said cylinders, and consequently force the pistons in the opposite direction and the exhaust-steam in rear of the pistons through the exhaust-pipe 20 via ports 8^a, passages 33, openings 41, chambers 45, openings 44, passages 45 and 37, and annular passage 14, and apertures 16 of the valve-casing. When the piston reaches its limit of rearward movement, said eccentrics rock the cut-off valves back to their original positions and compel the steam to again force the pistons forward, as originally described. This and all future operations are repetitions of those first described.

When it is desired to reverse the engine and cause it to run in the opposite direction, the lever is thrown forward until the dog 30 engages notch 29^b, and the slide-valve is locked in the position shown in Fig. 4. When so arranged, the apertures 16 become the points of steam-supply and the apertures 17 the points of steam-discharge, as indicated by the arrows, and to stop or throttle the engine completely the valve is thrown so that both the apertures 16 and 17 are closed, as hereinbefore explained.

From the above description it will be apparent that I have produced a reversing engine which may be used for hoisting or any other purpose and which embodies the features of advantage enumerated as desirable in the

statement of invention, and it will be noticed that by uncoupling one of the pitmen and disk-cranks and loosening the tap connecting the link-rod 53 with the corresponding cut-off valve and shifting said cut-off valve to such position that the openings 43 and 44 do not register with the passages 35 and 36 one cylinder of the engine may be rendered inoperative in order that repairs may be made.

It is to be understood, of course, that various minor changes may be made without departing from the spirit and scope or sacrificing any of the advantages of the invention.

Having thus described the invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a steam-engine, a cylinder, a ported connection having two passages in communication with the points of supply and exhaust, cross-passages connecting with those first named and passages connecting with the ports of the cylinder, and a cut-off valve mounted upon the connection and provided with openings in communication at all times with the last-named passages of the said connection, with openings alternately connected with the adjacent ends of the cross-passages, and with chambers connecting the first-named and last-named openings, substantially as described.

2. In a steam-engine, a cylinder, a connection between the cylinder and valve having two passages in communication respectively with the points of supply and exhaust, cross-passages connecting with those first named, and passages connecting with the ports of the cylinder, a valve mounted upon the said connection and provided with openings in communication at all times with the last-named passages of the said connection, with openings alternately connected with the adjacent ends of the cross-passages, and with chambers connecting the first-named and last-named openings, and a valve for reversing the points of connection of the first-named passages of said connection, that is to say to place the passage formerly in communication with the point of supply in communication with the point of exhaust, and the passage formerly in communication with the point of exhaust in communication with the point of supply, substantially as described.

3. In a steam-engine, a cylinder, a ported connection having two passages in communication respectively, with the points of supply and exhaust, cross-passages connecting with

those first named, and passages connecting with the ports of the cylinder, a valve mounted upon the ported connection and provided with openings in communication at all times with the last-named passages of the said connection, with openings alternately connected with the adjacent ends of the cross-passages, and with chambers connecting the first-named and last-named openings, and a valve for throttling the engine by cutting off all connection between the points of supply and exhaust with the first-named passages of the ported connection, substantially as described.

4. In a steam-engine, a rotating shaft, an eccentric thereon, a cylinder provided with a piston connected to said shaft, a ported connection having passages in connection with the points of supply and exhaust, cross-passages connecting with the first-named passages and segmental passages connecting with the ports of the cylinder, and a valve provided with an arm linked to said eccentric, with openings always in communication with said segmental passages with openings which alternately connect with the adjacent ends of said cross-passages, and with chambers connecting said openings, substantially as described.

5. In a steam-engine, a ported connection of conical form and provided with passages in communication with the points of supply and exhaust, with cross-passages connected thereto, and with segmental passages in communication with the ports of the cylinder, a valve fitting snugly upon the conical portion of the ported connection, and provided with openings always in connection with said segmental passages with openings alternately in connection with the adjacent ends of the cross-passages and with chambers connecting said openings, a ring upon the ported connection at one end of the valve, a grooved ring upon said connection at the opposite end of the valve, and an expansive spring mounted in the last-named ring and pressing the valve toward the base or outer end of the conical portion of the ported connection, substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

SAMUEL M. COFFMAN.

Witnesses:

G. P. SMITH,
C. C. MILLER.