

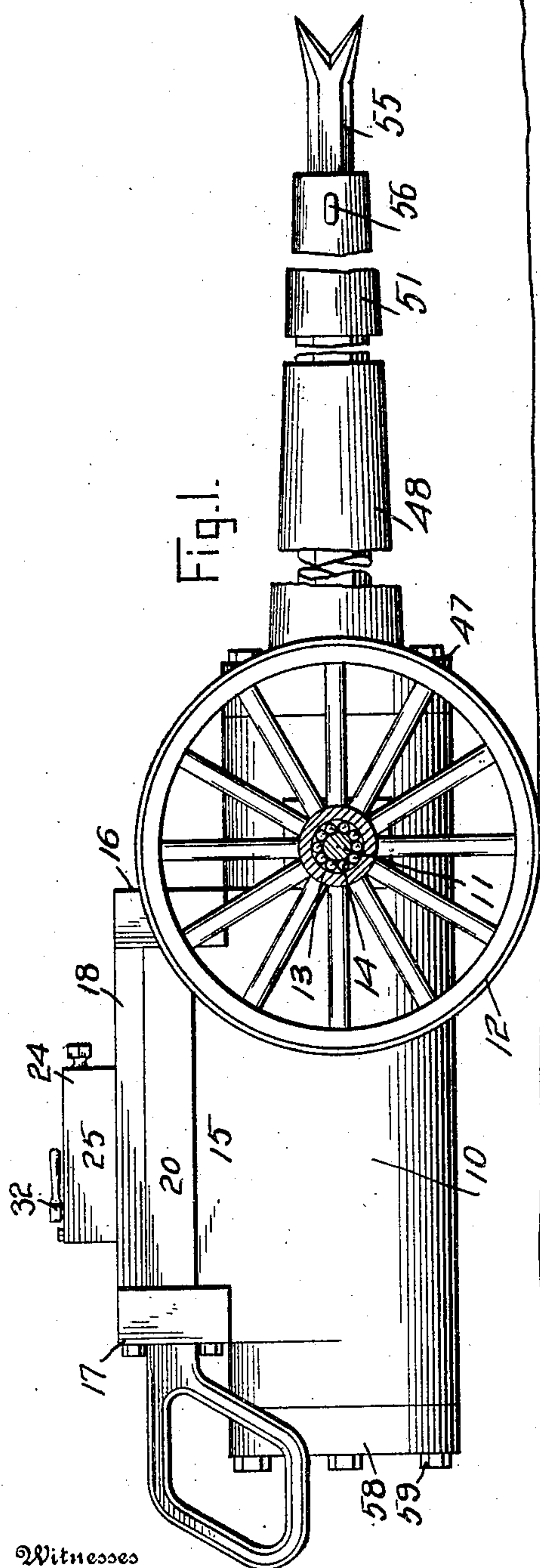
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PATENTED JAN. 28, 1908.

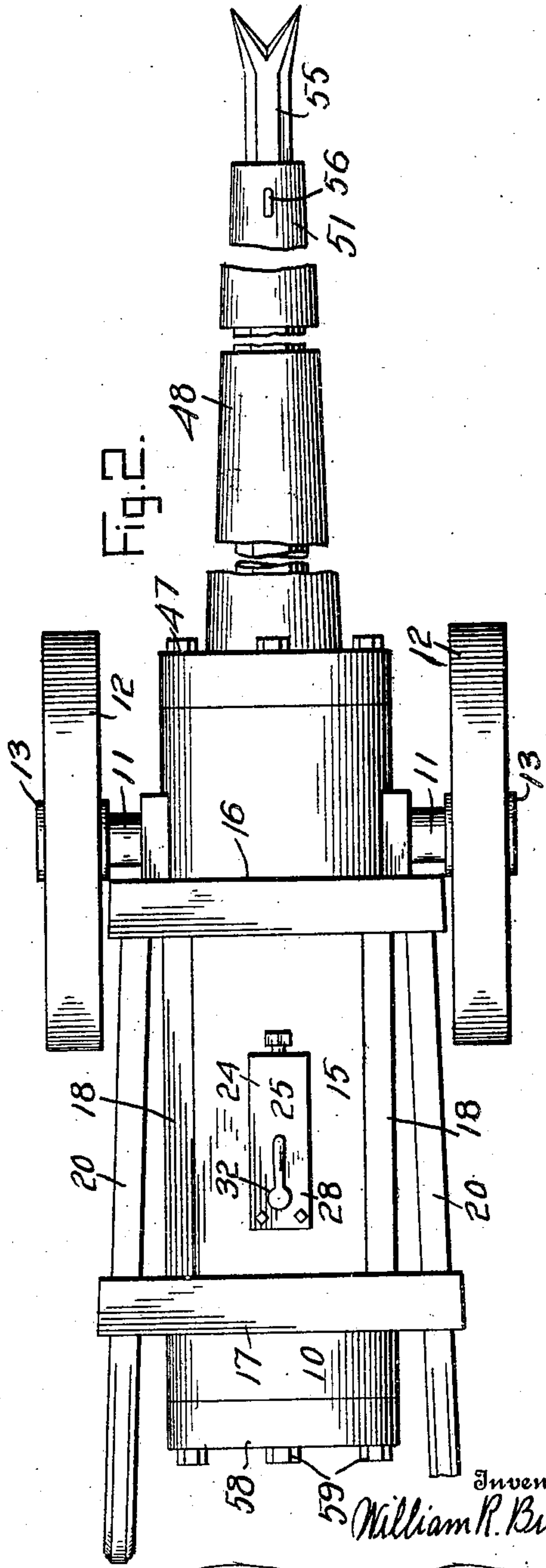
W. R. BUTTS.
PNEUMATIC MINING MACHINE.

APPLICATION FILED JUNE 8, 1907.

4 SHEETS—SHEET 1.



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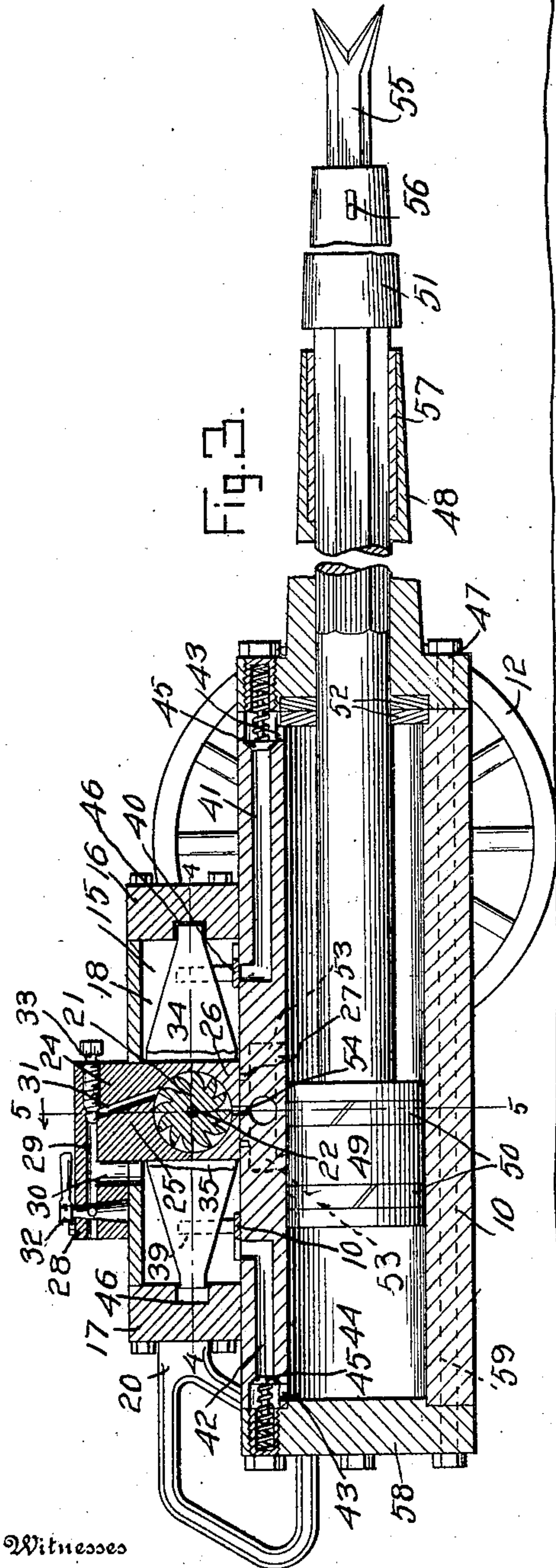


Fig. 3.

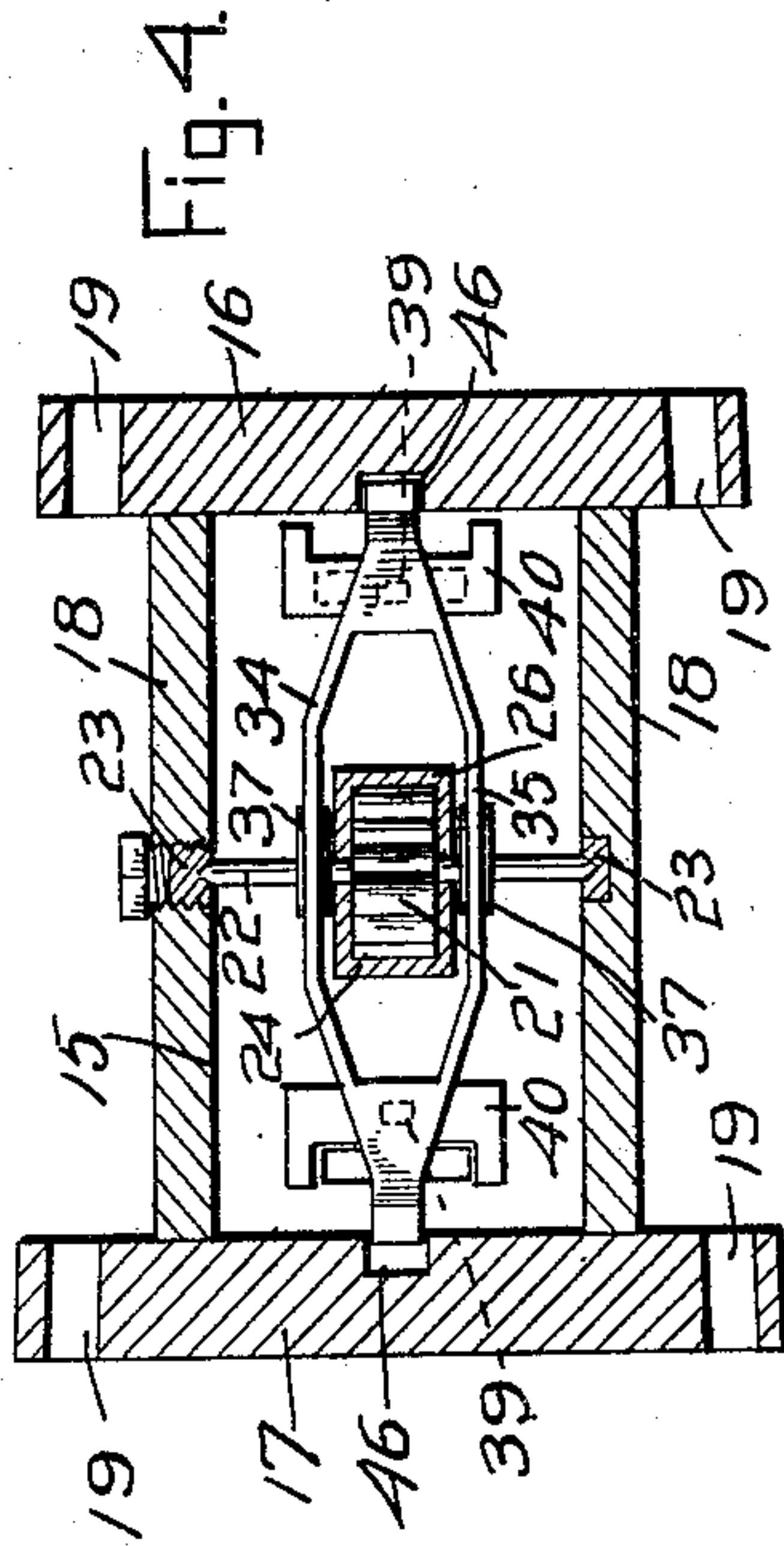


Fig. 4.

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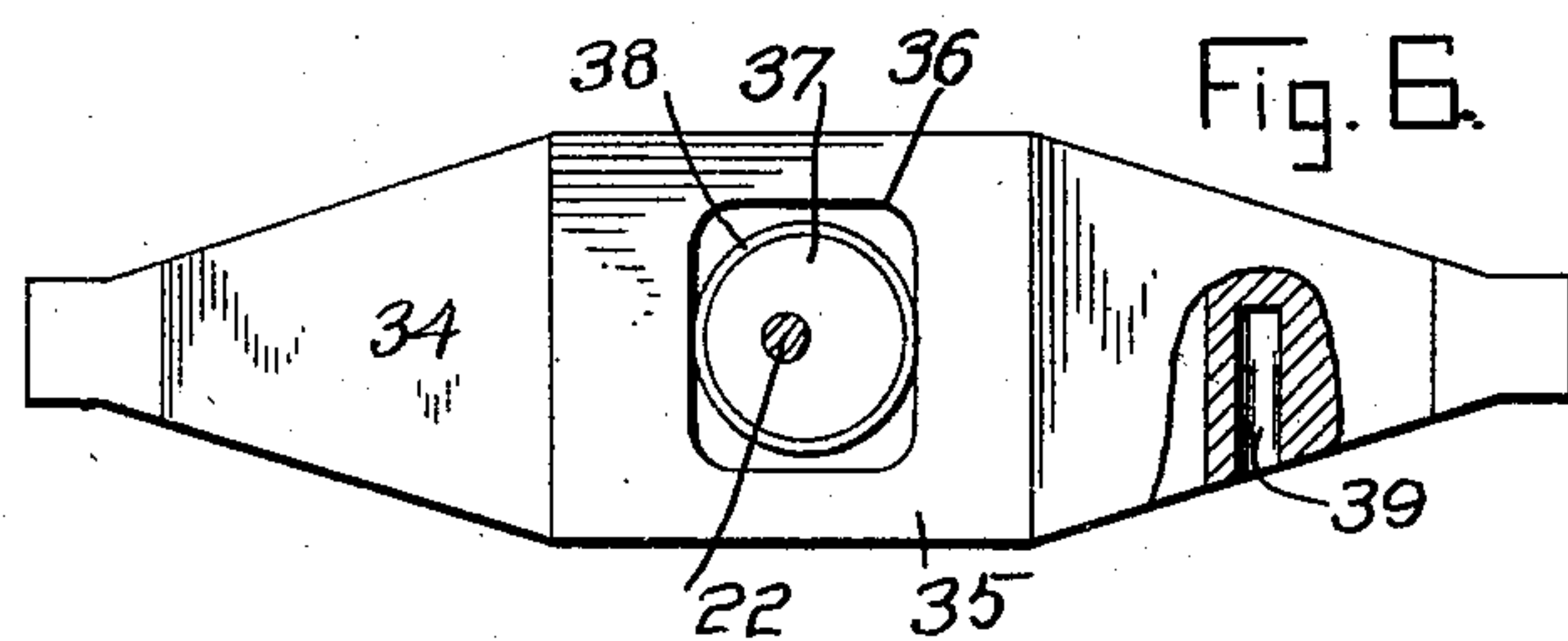
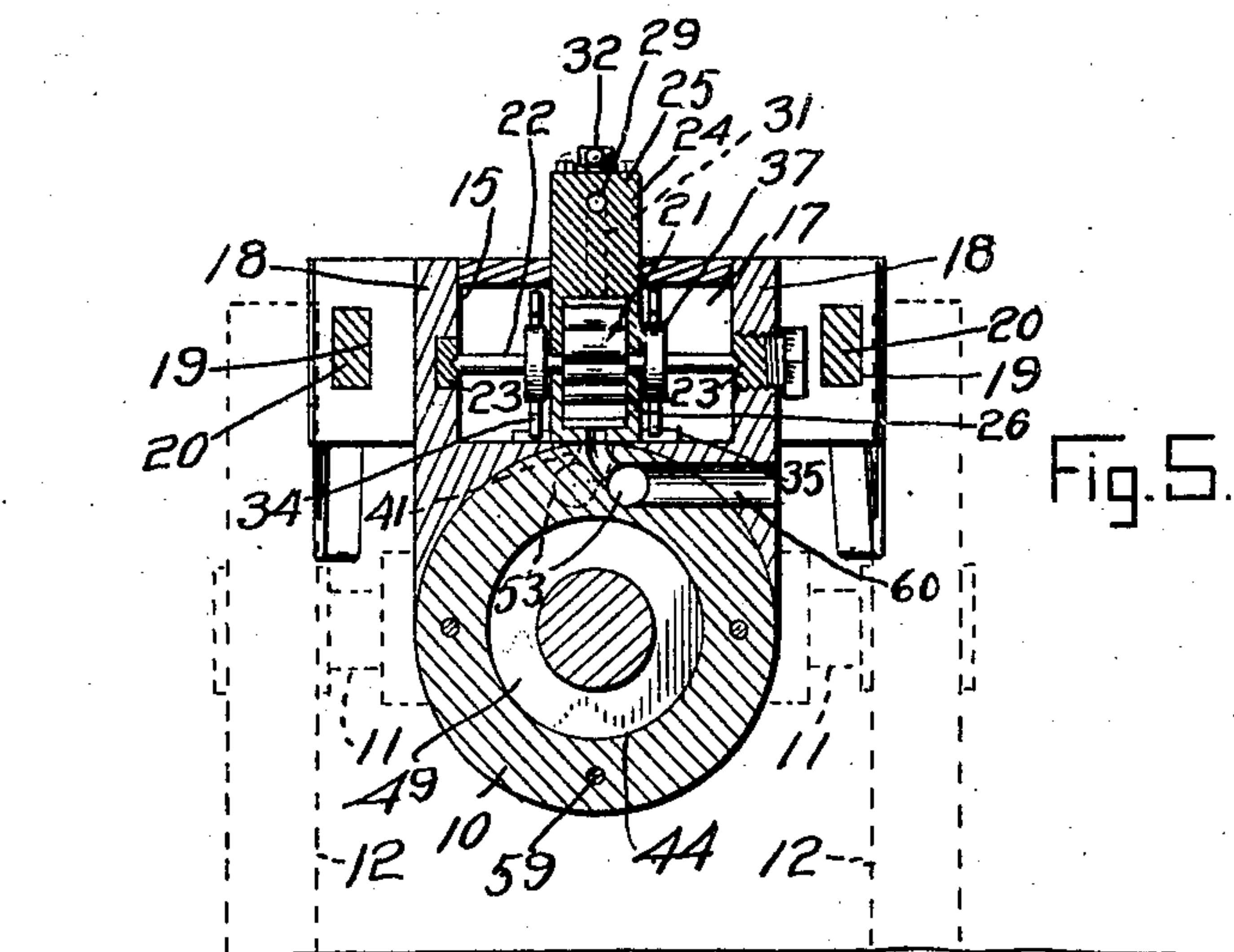
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4 SHEETS—SHEET 3.



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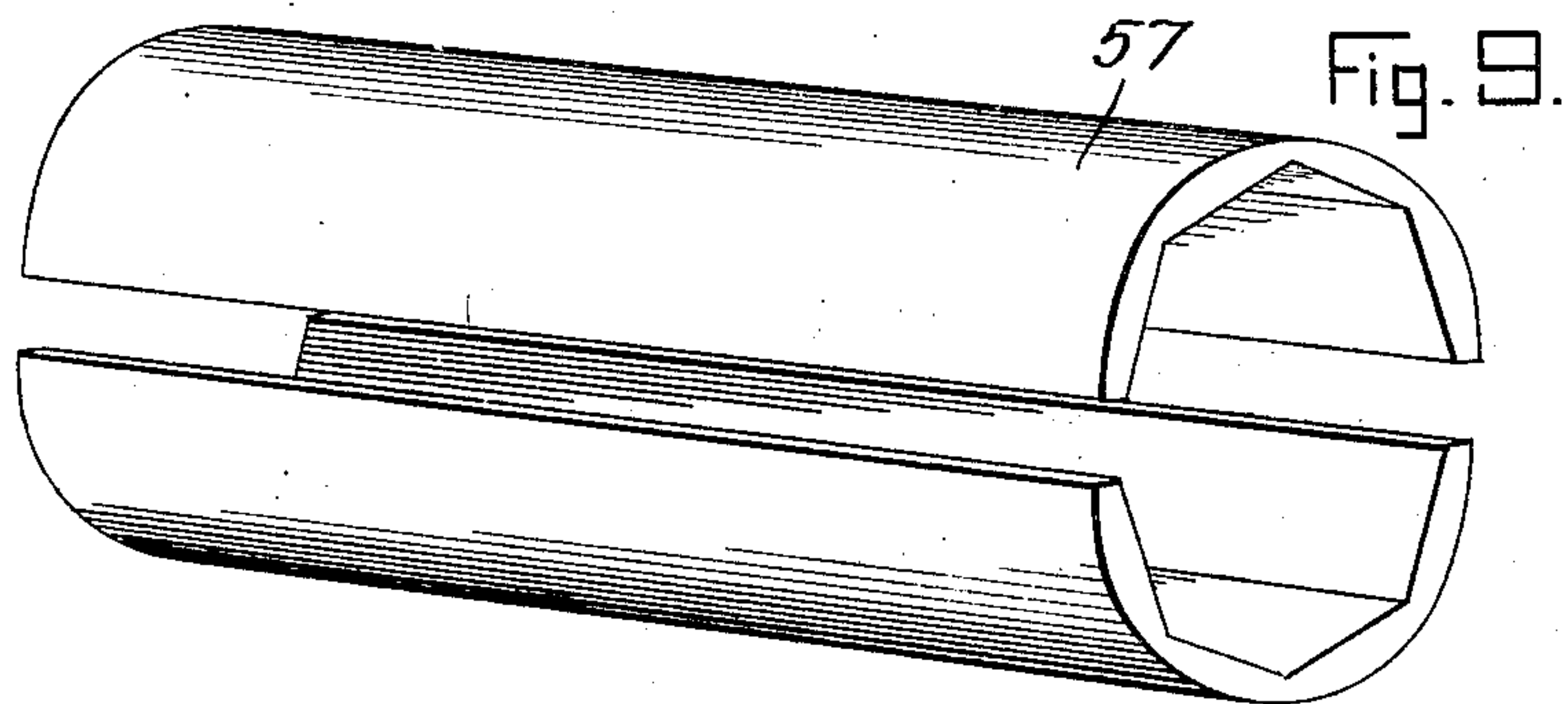
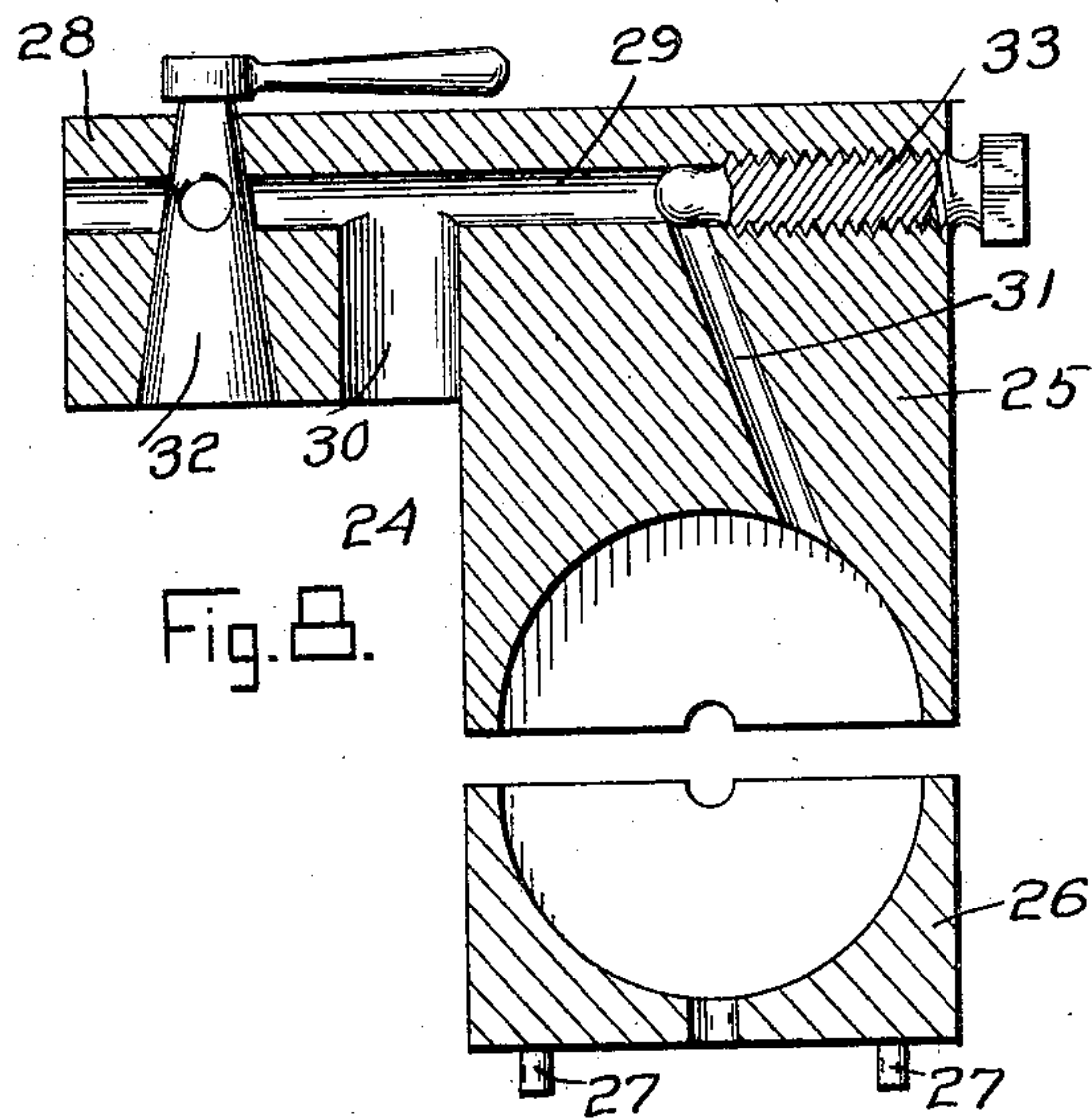
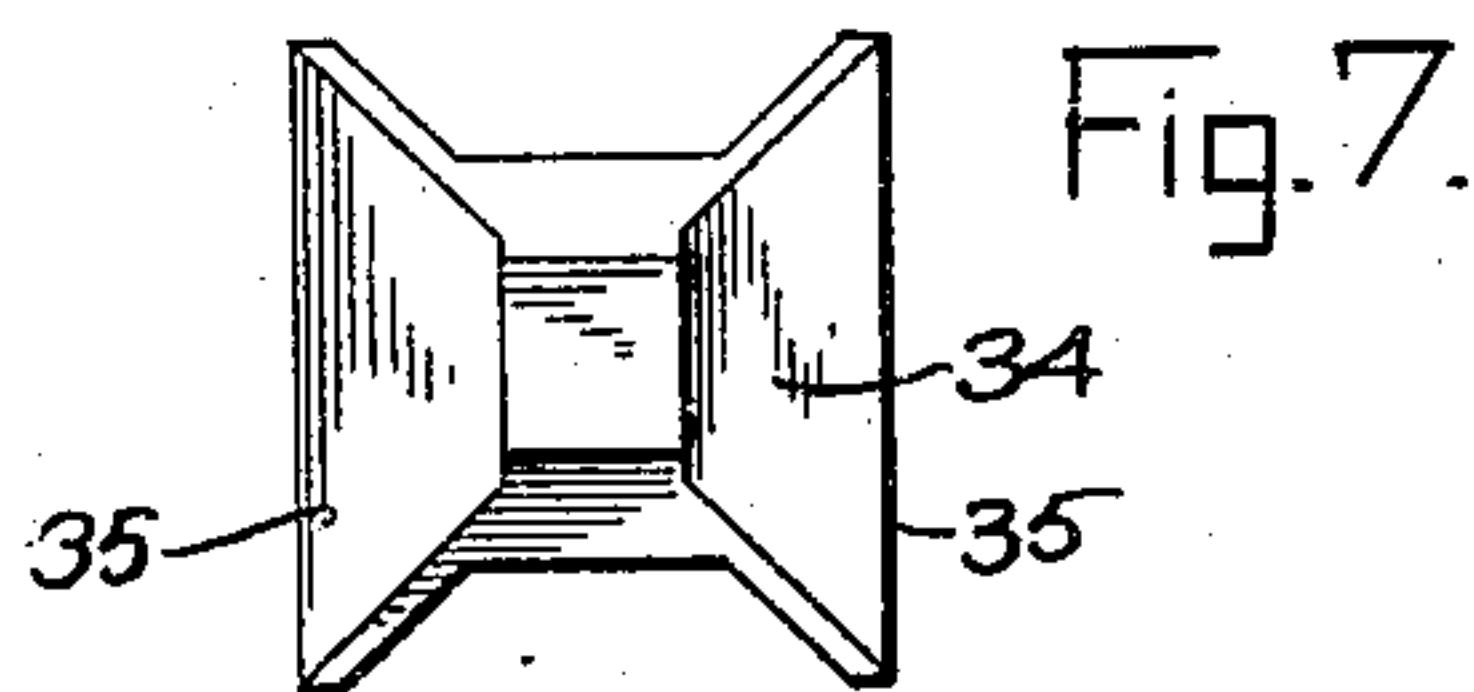
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UNITED STATES PATENT OFFICE.

WILLIAM R. BUTTS, OF NEW PHILADELPHIA, OHIO, ASSIGNOR OF FOUR-FIFTHS TO FORDYCE C. LOOMIS, EDWARD GEISER, CHARLES N. GEISER, AND WILLIAM J. WISE, OF NEW PHILADELPHIA, OHIO.

PNEUMATIC MINING-MACHINE.

No. 877,883.

Specification of Letters Patent.

Patented Jan. 28, 1908.

Application filed June 8, 1907. Serial No. 377,956.

To all whom it may concern:

Be it known that I, WILLIAM R. BUTTS, a citizen of the United States, residing at New Philadelphia, in the county of Tuscarawas, State of Ohio, have invented certain new and useful Improvements in Pneumatic Mining-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to improvements in pneumatic mining machines, and it aims, broadly, to provide a machine of that type which, while equally durable and efficient, is much less complicated and is, in consequence, operated with greater readiness and ease than similar machines now in use.

More particularly, the invention resides in the provision of a pneumatic mining machine, in which the movement of the plunger valve mechanism is effected by a turbine, which, with its housing is disposed within the steam chest located upon the upper face of the main cylinder, the turbine shaft carrying a pair of eccentrics incased in the walls of the valve.

The invention further resides in the provision of a two-part bushing fitted removably in the outer end of the sleeved extension of the cylinder, in which extension the plunger has its movement, this particular formation of the bushing enabling it to be quickly removed and a worn part either filed down to the proper degree or replaced by a new part.

A still further object of the invention consists in the provision of a pneumatic mining machine in which, in the first place, the dead air controlled by the piston follow-head is forced out from the main body of the piston cylinder through openings formed in the outer wall thereof, rather than directed back into the steam-chest through cut-off valves, and, in the second place, the recoil is decreased by the use of anti-friction bearings in connection with the wheels.

With the above and other ends in view, the invention consists in the construction, combination, and arrangement of parts, all as hereinafter more fully described, specifically claimed, and illustrated in the accompanying drawings, in which like parts are designated by corresponding reference numerals in the several views.

Of the said drawings—Figure 1 is a side elevation of the present invention. Fig. 2 is a top plan view thereof. Fig. 3 is a longitudinal vertical section taken through Fig. 2. Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 3. Fig. 5 is a transverse section taken on the line 5—5 of Fig. 3. Fig. 6 is an enlarged side elevation of the plunger valve. Fig. 7 is an end elevation thereof. Fig. 8 is a collective view, in section, of the members of the turbine housing. Fig. 9 is a perspective view of the two-part bushing showing the members thereof slightly separated.

In Fig. 1 a portion of the traction wheel appearing therein is shown in section, to illustrate the position of the anti-friction bearings carried thereby.

Referring more particularly to the drawings, the numeral 10 designates the main cylinder of the machine, 11 the trunnions on opposite sides thereof, and 12 the wheels carried by the trunnions and rotatable thereupon, the hub 13 of each wheel having a ball race formed in the axial opening through which the reduced ends of the trunnions extend, anti-friction bearings 14 of any conventional type being arranged in each race.

Mounted upon the upper face of the main cylinder and bolted thereto at its several corners is a rectangular steam chest 15, whose front and rear end walls 16 and 17, which are bolted to the side walls 18, extend at opposite ends beyond the corresponding sides of the cylinder the rear wall being provided at such points with alining vertical slots 19, through which the handle-bars 20 extend, said bars being connected at their forward ends to the front wall, as shown.

Disposed centrally within the steam chest is a turbine wheel 21, which is mounted upon a horizontal shaft 22 arranged transversely of the steam chest and having its opposite ends received in socketed bearings 23 fitted removably in threaded openings formed through the side walls 18, the turbine wheel being incased by a two-part housing 24 comprising an upper member 25 and a lower member 26, the latter being provided upon its under face with a series of pins 27, which fit in openings formed in the upper face of the cylinder 10. The upper member of the housing is provided at its top with a web or flange 28, which is perforated for the reception of the bolts by means of which said

member is attached to the top of the steam chest. The upper member 25 is further provided with a steam inlet passage 29, with which an inlet port 30 and a second passage 31 communicate, the former leading to the interior of the steam chest and the latter to the turbine wheel. Admission of steam to the inlet passage 29 is controlled by a throttle valve 32, and to the passage 31 by a threaded plug 33.

Disposed centrally within the steam chest is the plunger valve 34, which is in the shape of a double yoke (or of a pair of yokes oppositely arranged with respect to each other). Through the vertical space between the yoke arms 35 extends the housing of the turbine, the distance between the inner faces of the yoke arms being slightly greater than the width of said housing, thus permitting a free endwise movement of said plunger valve. To effect such movement the valve sides (or yoke arms) are provided intermediate their ends with alining openings 36, in each of which is seated an eccentric 37, which is keyed or otherwise fixed to the turbine shaft 22, each eccentric having a strap 38 secured thereto.

Towards its opposite ends, the plunger valve is provided with a pair of inwardly-extending openings 39, formed on its under face, each opening forming a seat into which the vertical stem of a slide valve 40 projects, said slides being adapted to cover and uncover the alining L-shaped channels 41 and 42 respectively, arranged adjacent the front and rear ends of the cylinder 10, each channel having at its outer end a downward extension 43 communicating with the plunger chamber 44 in said cylinder. Disposed normally within each of such extensions, however, is a spring-pressed valve 45, whose stem extends through a bushing seated in a horizontal opening formed in the adjacent cylinder head, the projecting end of each valve stem carrying a collar or bur. It will therefore be apparent that the admission of steam to the housing 24 and the consequent rotation of the turbine wheel incased therein will effect an endwise backwards and forwards movement of the plunger valve 34 owing to the rotation of the eccentrics seated in the openings formed in the valve sides, such movement of the valve causing the slides 40 carried thereby to alternately cover and uncover the inlet channels 41 and 42, as will be obvious. The end walls of the steam chest are provided upon their inner faces with seats 46, in which the opposite ends of the plunger valve are adapted to be received, according as said valve is moved in one direction or the other.

The front head 47 of the cylinder is provided with an extension or sleeve 48, which is formed integral therewith, the bore of said sleeve communicating with the plunger chamber 44. Disposed within said chamber

is the plunger 49, whose head is provided with the usual rings 50, while its stem extends through the axial opening in the cylinder head 47 and through the sleeve 48 and projects therebeyond at its forward end, being provided at such point with a pick socket 51. The inner face of the cylinder head above referred to is undercut to provide a seat for a pair of packing plates 52.

The dead air forced into the plunger chamber through the channels 41 and 42 is exhausted therefrom through a pair of channels 53 formed in the upper wall of the cylinder. The channels 53 meet at their inner ends and they likewise communicate at such point with an outlet channel 54 formed in the lower member 26 of the turbine housing and with an exhaust channel 60 which is also formed in the upper wall of the cylinder and disposed transversely thereof.

The pick or other cutting tool 55 has its stem fitted in the pick socket 51 and is retained in place by a drift-key 56 of the usual type. The forward end of the plunger stem is polygonal in cross-section, as shown in Fig. 3, and the split or two-part bushing 57, which is removably fitted in the forward end of the sleeve 48 has its inner face similarly shaped, thus preventing any rotation of the plunger during its backward and forward movement. The bushing above referred to is formed, as stated, in two parts, so that either may be removed from its seat in the sleeve end when worn and filed to the proper degree or replaced by a new part, thus enabling either part to be repaired quickly and cheaply where the wear is slight, without the necessity of purchasing a new bushing complete. The plunger will therefore be reciprocated backwards and forwards under the steam admitted into the plunger chamber through the channels 41 and 42, the valves 40, which cover and uncover said channels, being moved in one direction or the other by the reciprocating valve member 34, which latter is actuated by the rotation of the eccentrics 37 on the turbine shaft 22, as will be understood.

The recoil of the cutting tool upon striking the coal or other mineral to be mined is largely absorbed and lessened to a great extent by the provision of the anti-friction bearings disposed in the ball races formed in the wheel hubs.

The rear cylinder head 58, the cylinder, and the front head 47 are connected together by bolts 59, which extend through longitudinal openings formed in the cylinder walls, and are provided at their opposite ends with nuts. The bolts which connect the end and side walls of the steam chest are similarly disposed.

Further description of the machine, its component parts, and its operation, is deemed unnecessary in view of the foregoing.

It is to be understood that the machine may be operated with equal facility by the use of compressed air and that the element numbered 15 and termed a steam chest is 5 equally adapted for use as a compressed air tank; such term is therefore not intended to strictly limit said element. It has been thought unnecessary to illustrate any source of supply of the operating fluid upon the 10 drawings, as it will be understood that the supply pipe connects with the inlet passage 29 formed in the upper member of the turbine housing.

What is claimed, is—

15 1. In a fluid operated mining machine, a cylinder provided with a plunger chamber and having inlet and outlet channels communicating therewith; a reciprocatory plunger disposed within said chamber and provided 20 with a cutting tool; a fluid chest mounted upon said cylinder in communication with said inlet channels; an endwise reciprocatory member disposed within said chest; slide valves carried by said member and adapted 25 to cover and uncover said inlet channels, to control the admission of fluid to said chamber; a housing disposed within said chest, said housing having an outlet passage communicating with the cylinder outlet channel 30 and having an inlet passage in common with said chest; and a rotary turbine disposed within said housing and operatively connected with said member.

2. In a fluid operated mining machine, a 35 cylinder provided with a plunger chamber and having inlet and outlet channels communicating therewith; a reciprocatory plunger disposed within said chamber and provided with a cutting tool; a fluid chest mounted 40 upon said cylinder in communication with said inlet channels; an endwise reciprocatory member disposed within said chest, said member having a lining openings formed in its opposite sides, and inwardly directed 45 seats formed in its under face at opposite ends thereof; a pair of slide-valves carried by said member and having their stem portions projecting into said seats, said valves being adapted to cover and uncover said inlet chan- 50 nels, to control the admission of fluid to said chamber; a rotatory turbine disposed within said chest; and a pair of eccentrics carried upon the turbine shaft and disposed within the openings in said member for operating the 55 latter.

3. In a fluid operated mining machine, a cylinder provided with a plunger chamber and having inlet and outlet channels communicating therewith; a reciprocatory plunger disposed within said chamber and provided with a cutting tool; a fluid chest mounted upon said cylinder in communication with said inlet channels; an endwise reciprocatory member disposed within said chest; slide valves carried by said member and 65 adapted to cover and uncover said inlet channels, to control the admission of fluid to said chamber; a two-part housing disposed within said chest and consisting of an upper member and a lower member, said upper 70 member having a fluid inlet passage in common with said chest, and said lower member having an outlet passage communicating with the outlet channel of said cylinder; and a rotatory turbine incased by said housing 75 members and operatively connected with said reciprocatory member.

4. In a fluid operated mining machine, a cylinder provided with a plunger chamber and having inlet and outlet channels communicating therewith; a reciprocatory plunger disposed within said chamber and provided with a cutting tool; a fluid chest mounted upon said cylinder in communication with said inlet channels; an endwise reciprocatory member disposed within said chest 85 and having openings formed in its opposite sides; slide valves carried by said member and adapted to cover and uncover said inlet channels to control the admission of fluid to 90 said chamber; a two-part housing disposed within said chest and consisting of an upper member and a lower member, said upper member having a fluid inlet passage in common with said chest, and said lower member 95 having an outlet passage communicating with the outlet channel of said cylinder; a rotary turbine incased by said housing members; and a pair of eccentrics carried by the turbine shaft and disposed within the 100 openings in said reciprocatory member for operating the latter.

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

WILLIAM R. BUTTS.

Witnesses:

J. P. GREENE,
JESSIE B. AXX.