

No. 822,544.

PATENTED JUNE 5, 1906.

J. F. MURPHY.

STEAM ENGINE.

APPLICATION FILED JULY 10, 1905.

2 SHEETS—SHEET 1.

FIG. 1.

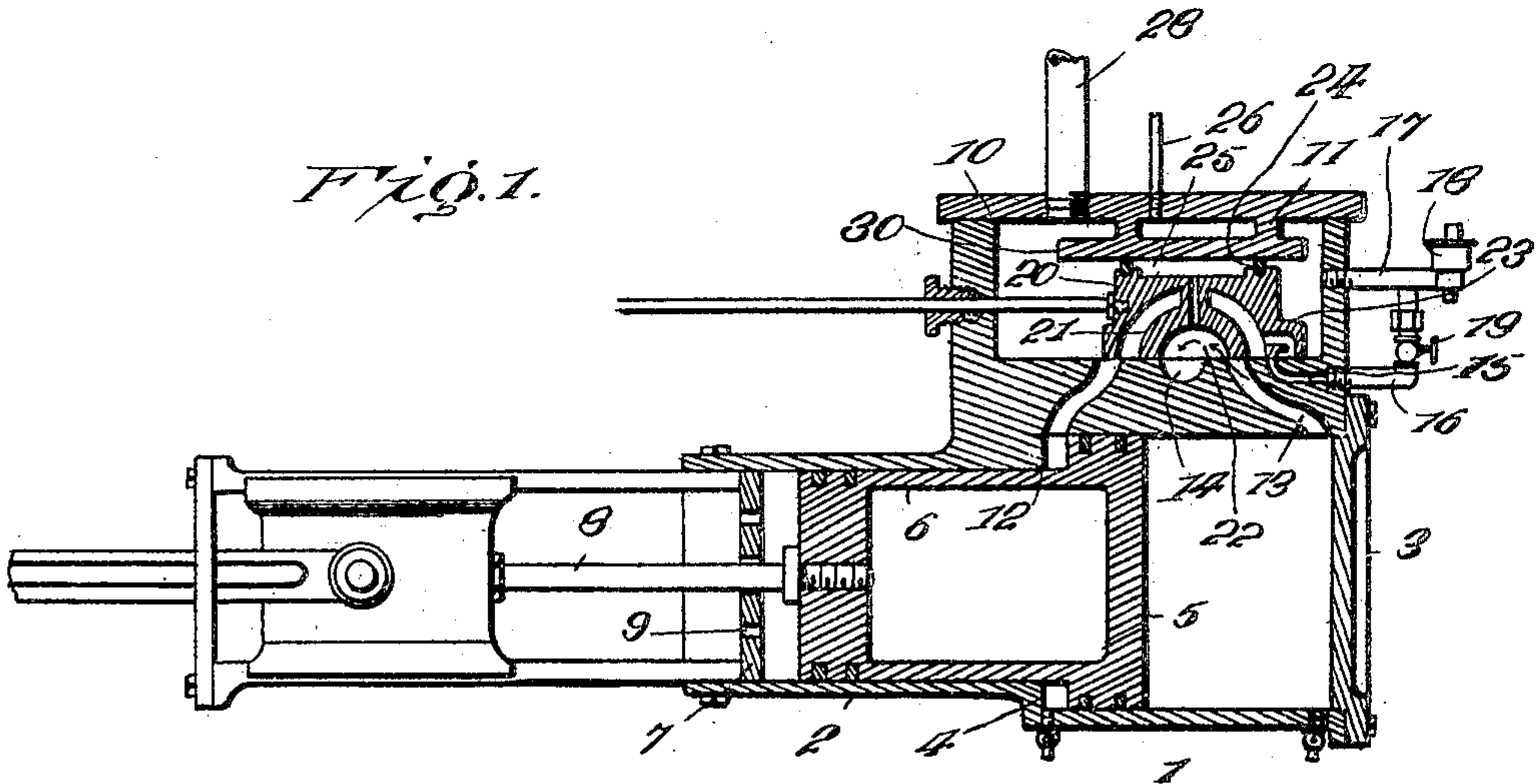
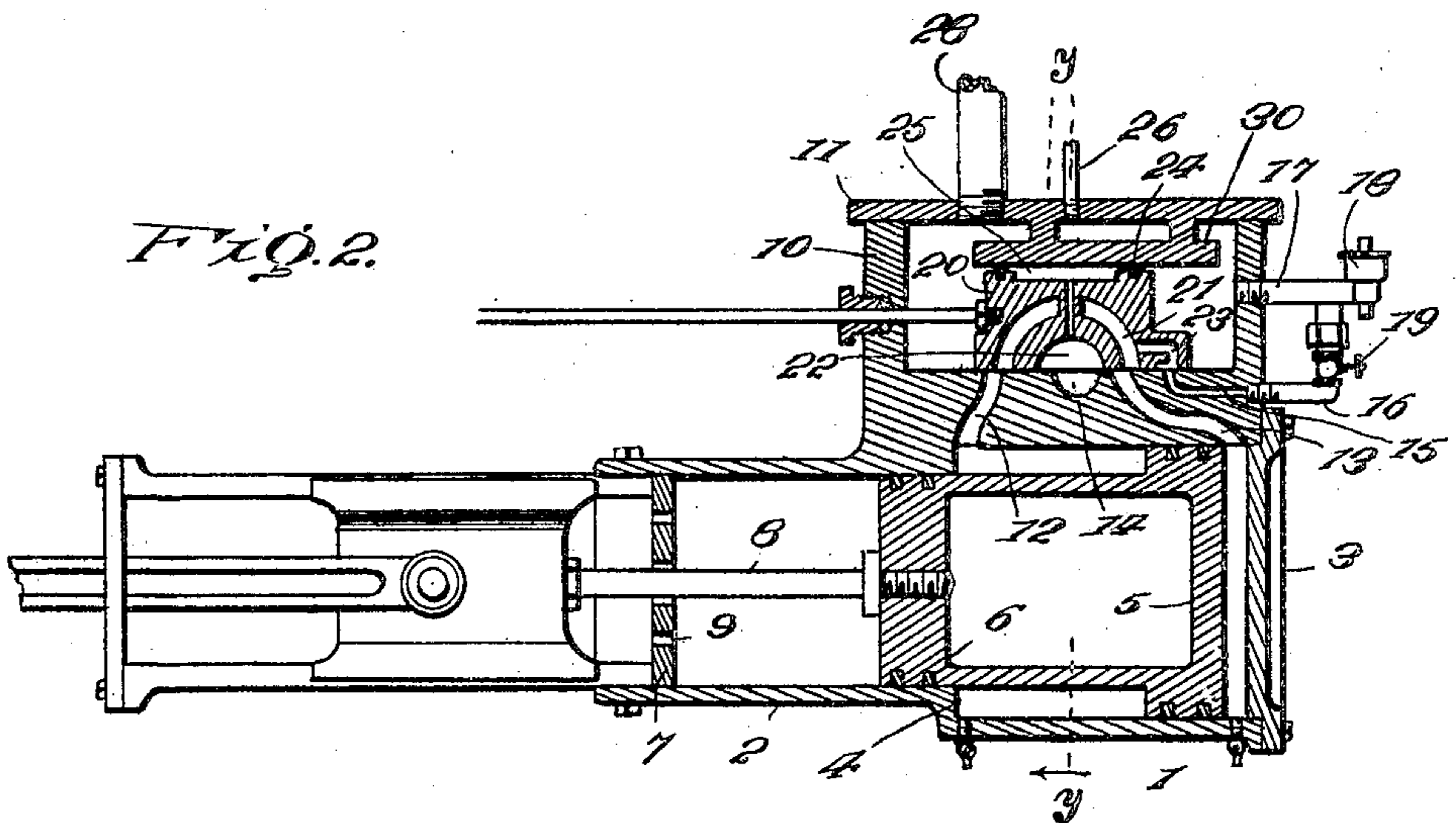


FIG. 2.



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2 SHEETS—SHEET 2.

FIG. 3.

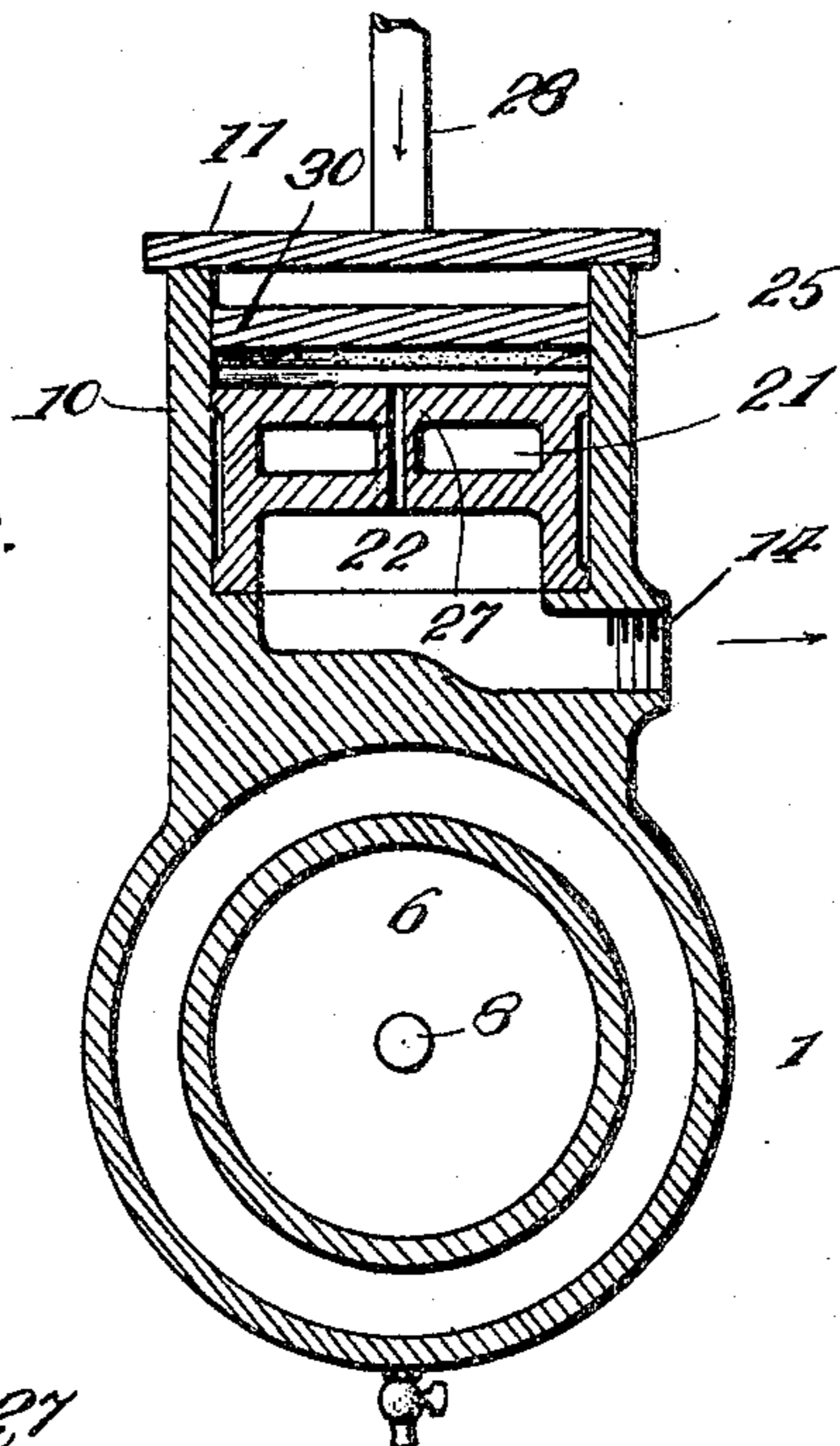


FIG. 4.

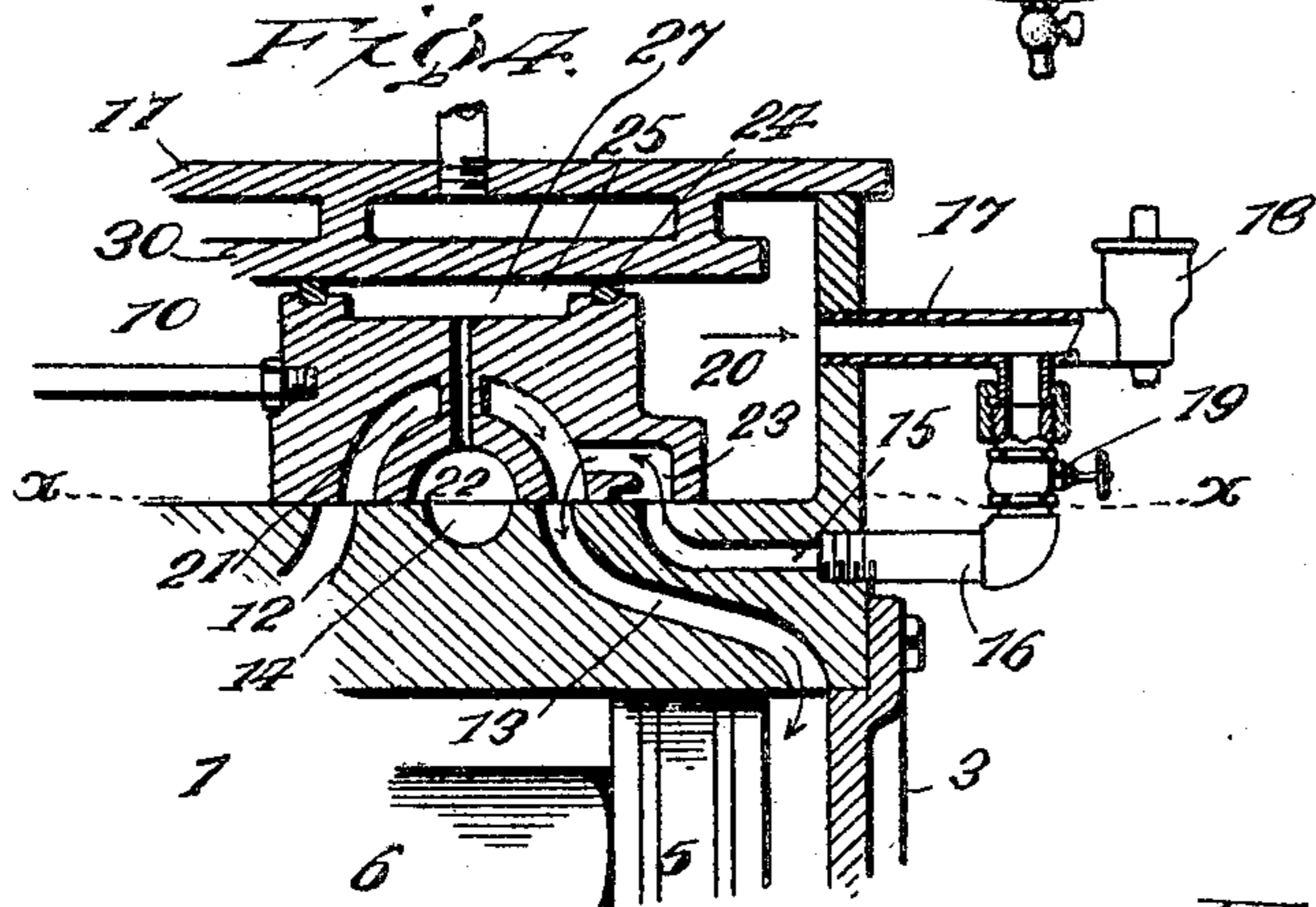


FIG. 6.

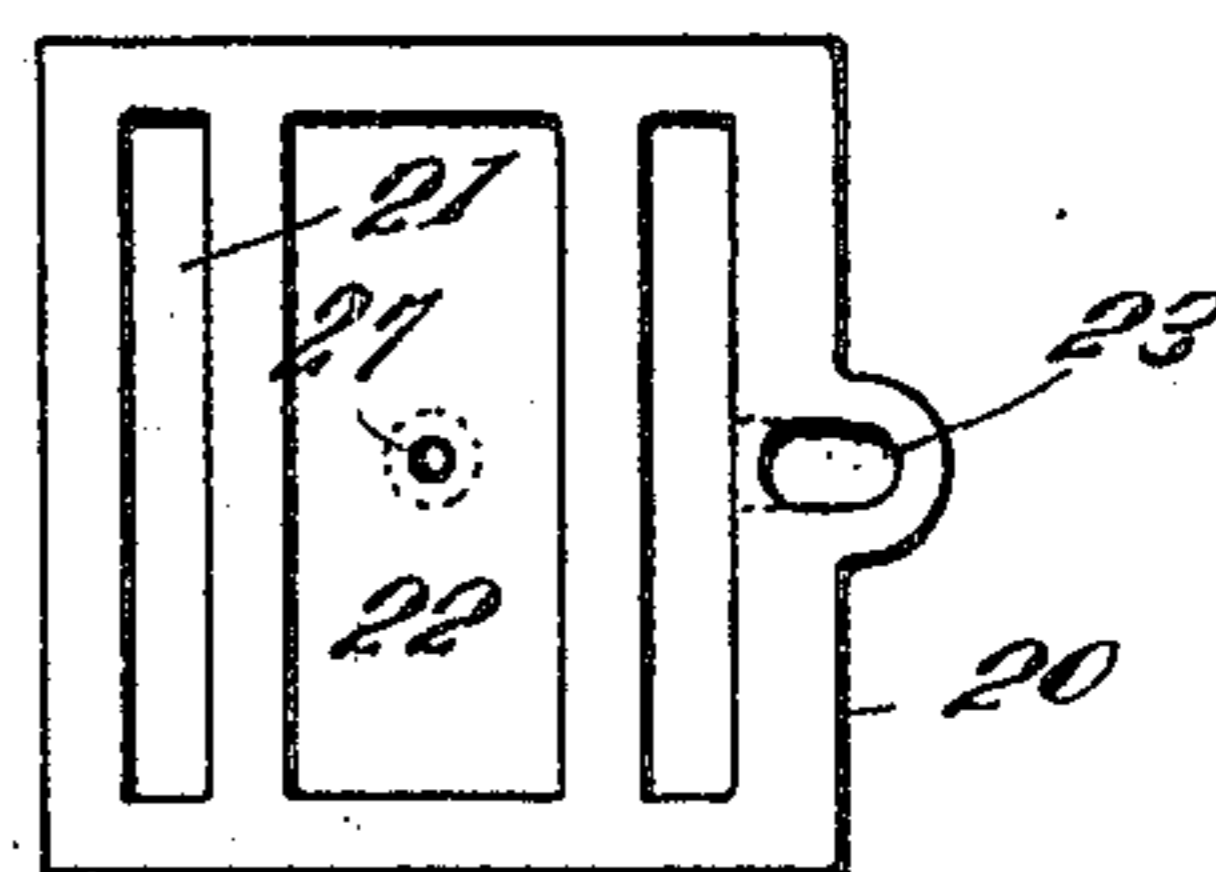
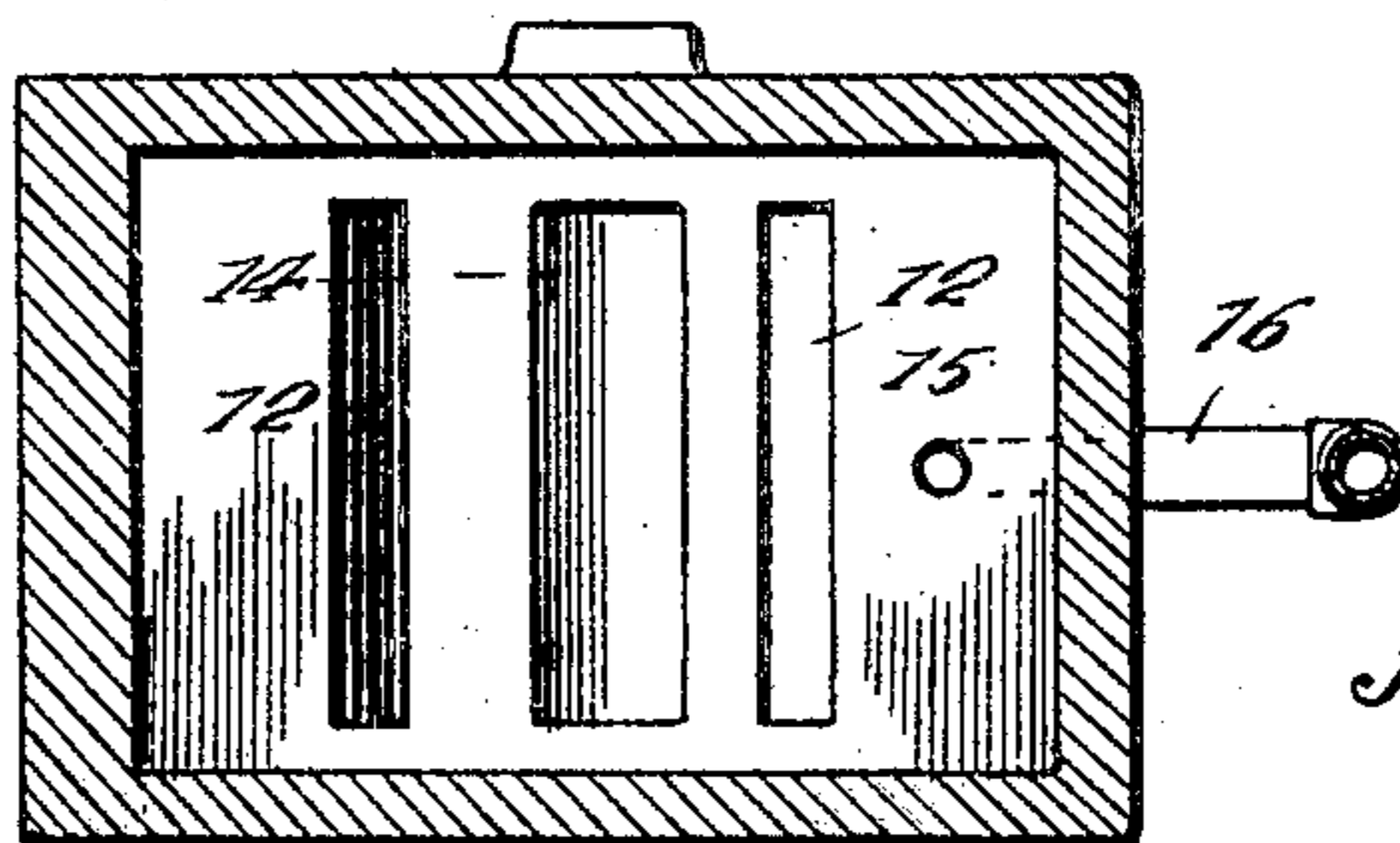


FIG. 5.



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# UNITED STATES PATENT OFFICE.

JOSEPH F. MURPHY, OF ENNIS, TEXAS.

## STEAM-ENGINE.

No. 822,544.

Specification of Letters Patent.

Patented June 5, 1906.

Application filed July 10, 1905. Serial No. 269,090.

*To all whom it may concern:*

Be it known that I, JOSEPH F. MURPHY, a citizen of the United States, residing at Ennis, in the county of Ellis and State of Texas, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

The purpose of the present invention is to devise a novel form of engine for utilizing effectually the expansive force of steam without discharging the same into a receiver and leading it therefrom to an engine operated solely by means of low pressure or the force resulting from the expansion of the steam in said receiver.

In accordance with this invention the cylinder utilizes high-pressure steam at one end and low-pressure steam at the opposite end, the construction being such as to transmit the steam from the high-pressure end to the low-pressure end of the cylinder during each complete stroke of the piston.

Among the many advantages resulting from the invention may be mentioned a minimum loss of steam by condensation, a material reduction of the working parts, and the necessity for having only one head of the cylinder made steam-tight. Provision is had for supplementing the action of the low-pressure steam by admitting high-pressure steam into the low-pressure end of the cylinder in the event of the engine being heavily loaded or when it is required to start the piston from the low-pressure end of the cylinder toward the high-pressure end.

For a full description of the invention and the merits thereof and also to acquire a knowledge of the details of construction of the means for effecting the result reference is to be had to the following description and accompanying drawings.

While the invention may be adapted to different forms and conditions by changes in the structure and minor details without departing from the spirit or essential features thereof, still the preferred embodiment is shown in the accompanying drawings, in which—

Figure 1 is a vertical central longitudinal section of a steam-engine embodying the invention, showing the relation of the parts when the piston is at the high-pressure end of the cylinder. Fig. 2 is a view similar to Fig. 1, showing the relation of the parts when the piston is at the low-pressure end of the cylinder. Fig. 3 is a transverse section of the

complete engine on the line *y y* of Fig. 2, showing the parts on a larger scale. Fig. 4 is a sectional detail view of a portion of the cylinder, steam-chest, and valve, showing the parts on a larger scale and illustrating the passage of high-pressure steam into the low-pressure end of the cylinder by arrows. Fig. 5 is a plan section on the line *x x* of Fig. 4. Fig. 6 is a detail view of the slide-valve as seen from its lower face.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

The engine-cylinder 1 is provided with an extension 2 coaxially therewith and is closed at one end by means of a steam-tight head 3, a shoulder 4 being provided at the juncture of the hollow extension 2 with the cylinder 1. The piston 5, arranged to operate in the cylinder 1, has an extension 6, which is arranged to operate in the cylinder extension 2, the part 6 being hollow for the sake of lightness and packed at its outer end to provide a steam-tight joint with the inner walls of said cylinder extension 2. A plate 7 closes the outer end of the cylinder extension 2 and is formed centrally with an opening through which the piston-rod 8 passes and with other openings 9 to admit of air having ready ingress to and egress from the cylinder extension in the operation of the engine.

A steam-chest 10 is provided at one side of the cylinder 1 and may be of any construction and is closed at its outer side by means of a cap-plate 11. The part of the cylinder intervening between the steam-chest and the space in which the piston 5 operates is made thicker than the remaining portion and is provided with ports 12, 13, and 14. The port 12 is the high-pressure inlet, the port 13 the low-pressure passage, and the port 14 the exhaust. A passage 15 is formed in the base portion of the steam-chest adjacent to the port 13 and communicates at one end with the steam-chest and has its outer end connected by pipe 16 with a pipe 17 in communication with the steam-space of the steam-chest. A relief-valve 18 of any ordinary construction is coupled to the pipe 17, and a valve 19 is provided in the length of the pipe 16 to establish communication between the pipes 16 and 17 when it is required to admit high-pressure steam into the low-pressure end of the cylinder either for starting the engine or to assist in carrying the load.

The slide-valve 20 has a passage 21 and a depression 22, the latter serving to establish communication between the ports 13 and 14 when the piston is moving from the left-hand end of the cylinder, as shown most clearly in Fig. 1. The passage 21 establishes communication between the ports 12 and 13 when the piston is at the right-hand end of the cylinder, thereby permitting the steam from the left-hand end of the cylinder to have unobstructed passage to the right-hand end of the cylinder to drive the piston to the left by low pressure or expansive force. A passage 23 is formed in an end portion of the slide-valve 20 to establish communication between the passages 15, 21, and 13 when the piston is at the right-hand end of the cylinder, as shown most clearly in Figs. 2 and 4. A packing 24, applied to the outer side of the slide-valve, closes a space 25 and maintains a steam-tight fit between the valve 20 and pressure-plate 30, interposed between the valve and cap-plate 11. An oil-pipe 26 connects with the cap-plate 11 and supplies a lubricant for oiling the slide-valve and cylinder, the lubricant finding its way into the cylinder through either or both of the ports 12 and 13.

Steam is supplied to the space of the steam-chest in any ordinary way, as by means of a pipe 28, and escapes from the cylinder through the exhaust 14 after it has expended its energy in driving the piston. When the piston is at the limit of its stroke in one direction, as shown in Fig. 1, steam at boiler-pressure passes into the left-hand end of the cylinder through the port 12 and drives the piston to the right, and when said piston reaches the limit of its stroke at the right-hand end of the cylinder the slide-valve is shifted to the left, so as to cover the port 12 and establish communication between the ports 12 and 13 through the passage 21, thereby permitting the steam to pass from the left-hand end of the cylinder into the right-hand end to drive the piston to its first position by low pressure or expansive force. When the piston reaches the limit of its movement at the left-hand end of the cylinder, the slide-valve is shifted to the right, thereby establishing communication between the ports 13 and 14 and uncovering the port 12, when the operation just described is repeated. Should it be required from any cause to supplement the action of the low-pressure steam, the valve 19 may be opened more or less, thereby permitting steam under boiler-pressure to pass through the pipes 17 and 16 and the passages 15, 23, 21, and 13 into the right-hand or low-pressure end of the cylinder. The valve 19 may be operated in any convenient way, according to its location and the special type of engine embodying the invention. Should it be required to start the engine, when the port 12 is covered and the ports 12 and 13 in communication through the passage 21 it is neces-

sary to open the valve 19 to admit steam from the space of the chest into the right-hand end of the cylinder, and after the engine has been started said valve 19 may be closed, if it be required to operate the piston in one direction solely by means of low-pressure steam.

An engine constructed in accordance with this invention embodies all the advantages of a compound engine and is far more simple in its organization, since the number of working parts are materially reduced and the steam is used to better advantage, since the chance for condensation is transferred directly from one end of the cylinder to the other without being expanded in an intermediate receiver.

Having thus described the invention, what is claimed as new is—

1. In a steam-engine, the combination of a cylinder provided with an exhaust and high and low pressure ports, a piston working therein and having opposite faces of different area, a steam-chest, a passage leading from said steam-chest, a relief-valve in communication with said passage, and a slide-valve controlling the said exhaust, the high and low pressure ports and the said passage leading to the relief-valve.

2. In a steam-engine, the combination of a cylinder provided with an exhaust and high and low pressure ports, a piston working therein and having opposite faces of different area, a steam-chest, a passage 15 leading from said steam-chest, a pipe 17 leading from the steam-chest and having a relief-valve, a valved pipe connecting pipe 17 with the passage 15, and a slide-valve controlling the said exhaust, the high and low pressure ports and the passage 15.

3. A steam-engine comprising a cylinder having high-pressure, low-pressure and exhaust-ports, a piston working in the cylinder, a steam-chest, a slide-valve having a passage to register with said high and low pressure ports during the stroke of the piston in one direction, and having a depression for establishing communication between the exhaust and low-pressure ports at each stroke of the piston in the opposite direction, and having a second passage to establish communication between the low-pressure port of the cylinder and an inlet in communication with the space of the steam-chest for supplying steam at boiler-pressure to the low-pressure end of the cylinder when required.

4. In a steam-engine, the combination of a cylinder provided with an exhaust, a high-pressure and a low-pressure port, a steam-chest, a valved connection between the steam-chest and its base or seat, and a slide-valve having a depression and a passage, the latter adapted to establish communication between the high and low pressure ports of the cylinder and said valve provided with a sec-

ond passage to register with the aforesaid valved connection, whereby high-pressure steam may be admitted into the low-pressure end of the cylinder when required.

5 5. An engine comprising a cylinder having a hollow extension and provided with an exhaust, a high-pressure and a low-pressure port, a piston arranged to work in said cylinder and provided with an extension working in the cylinder extension, a slide-valve  
10 having a depression, a passage 21 to register with the high and low pressure ports of the cylinder and with a passage 23, a pipe lead-

ing from the steam-chest and provided with a relief-valve, and a valved connection between said pipe and the seat of the slide-valve to register with said passage 23, whereby high-pressure steam may be admitted into the low-pressure end of the cylinder when required. 15 20

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

JOSEPH F. MURPHY. [L. S.]

Witnesses:

S. H. BOND,

J. H. STORY.