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VALVE MECHANISM FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED NOV. 17, 1908. RENEWED NOV. 11, 1909.

966,367.

Patented Aug. 2, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

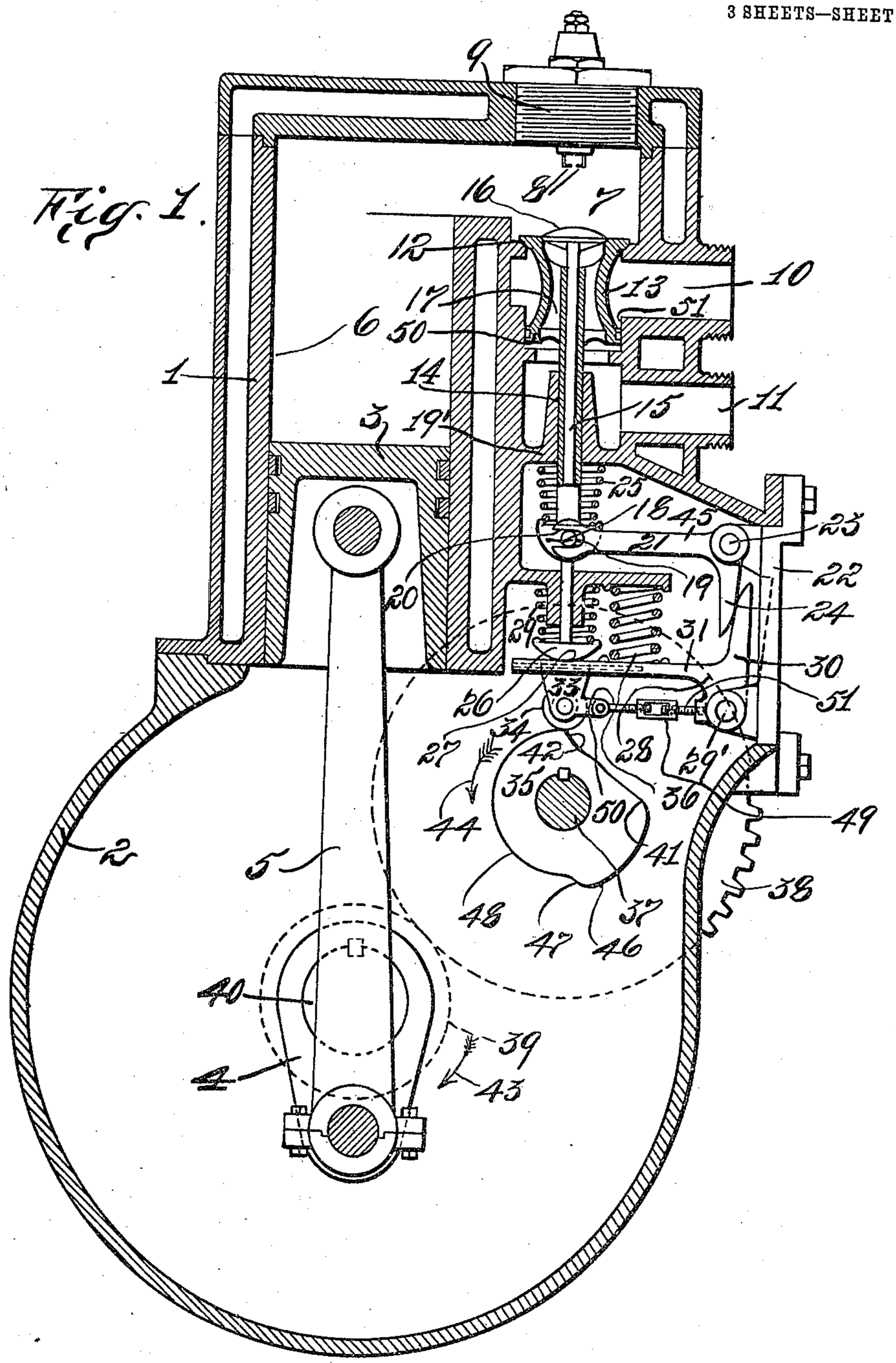
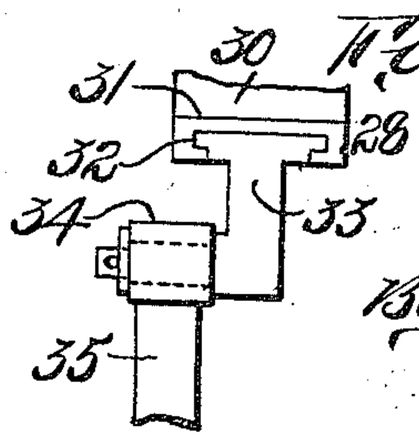


Fig. 2.



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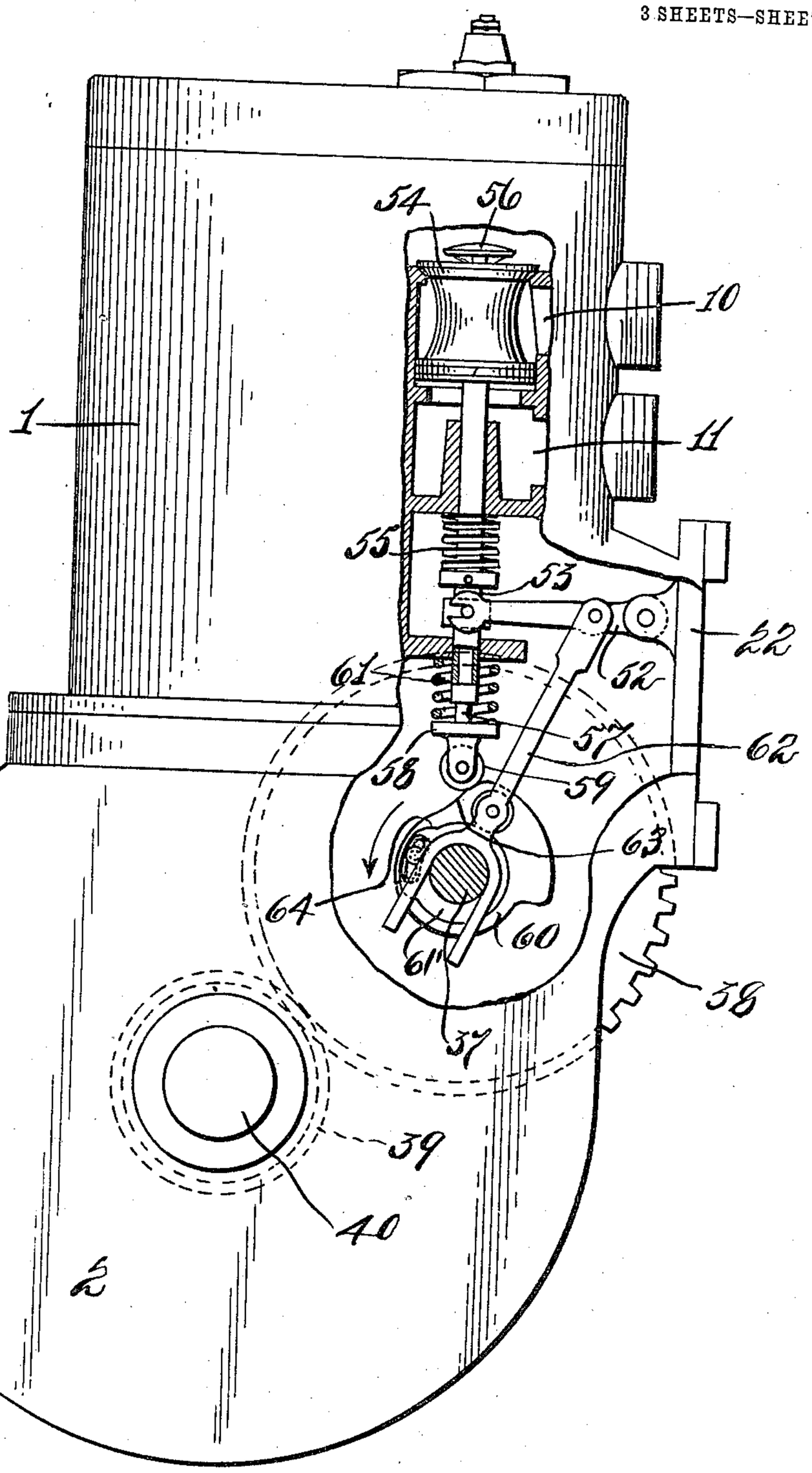

Fig. 3.

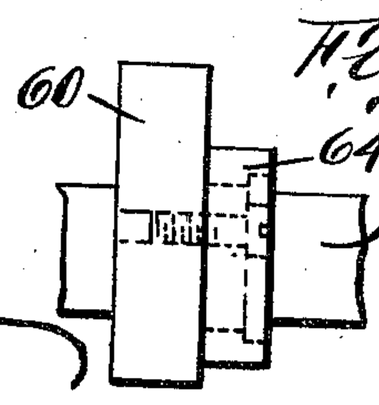

Fig. 4.

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3 SHEETS—SHEET 3.

Fig. 5.

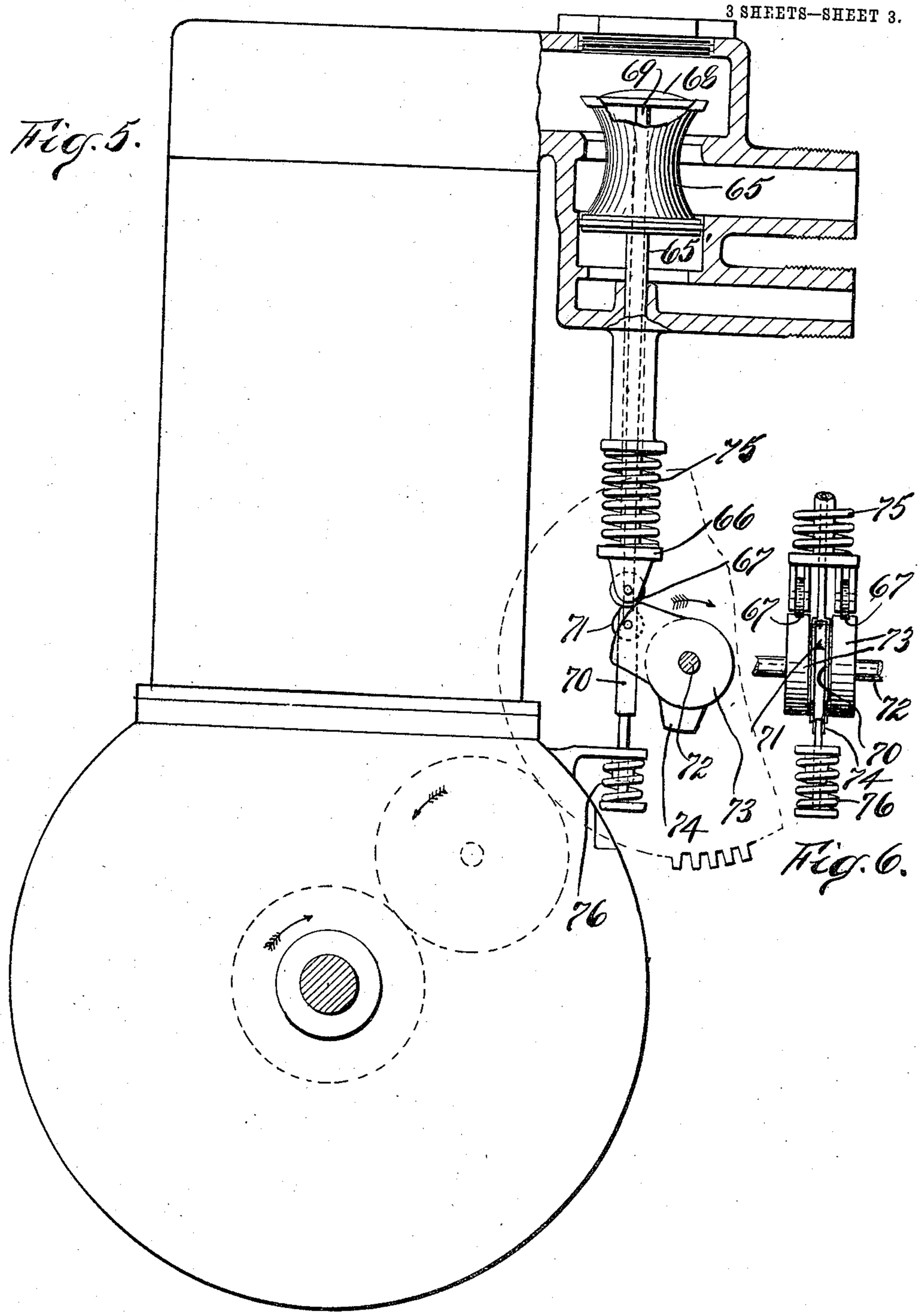

Fig. 6.

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UNITED STATES PATENT OFFICE.

HERMANN STEINGASSNER, OF NEW YORK, N. Y., ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO ALFRED HUTTER, OF NEW YORK, N. Y.

VALVE MECHANISM FOR INTERNAL-COMBUSTION ENGINES.

966,367. Specification of Letters Patent. Patented Aug. 2, 1910.

Application filed November 17, 1908, Serial No. 463,079. Renewed November 11, 1909. Serial No. 527,576.

To all whom it may concern:

Be it known that I, HERMANN STEINGASSNER, a citizen of the United States, residing in the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Valve Mechanism for Internal-Combustion Engines, of which the following is a clear, full, and exact description.

This invention relates to a valve mechanism for internal combustion motors, the object being to provide a valve mechanism that is simple but positive in action.

A further object of this invention is to provide a valve mechanism, comprising an inlet and an exhaust valve, the action of which is controlled by a single element, which in turn is operated by the crank- or power-shaft of the motor, whereby a multiplicity of parts are obviated; suitable means being provided to regulate the action of said valves relative to the movement of the motor piston.

I will now proceed to describe my invention, the novel features of which I will finally claim, reference being had to the accompanying drawings, forming part hereof, wherein—

Figure 1 illustrates a vertical central section of a motor equipped with my improved valve mechanism, certain parts being shown in elevation; Fig. 2 is a fragmentary detail end view of the valve mechanism controlling lever, a portion of the operating cam being also shown; Fig. 3 is a side view of a motor broken away to show another form of valve operating mechanism; Fig. 4 is an enlarged detail view of the operating cams therefor; Fig. 5 is a side elevation, partly in section, showing another form of valve operating mechanism; and Fig. 6 is a detail fragmentary end view of the operating cams and coöperating parts.

Referring to the drawings, 1 indicates the cylinder of a motor, to which a crank-casing 2 is secured. Within the cylinder 1 a piston 3 is adapted to operate, in the usual manner, the said piston being connected to a crank 4 by a connecting-rod 5. The bore 6 of the cylinder 1, at the upper end thereof, communicates with a firing-chamber 7, within which the points 8 of a spark-plug 9 are positioned as shown. An exhaust passage 10 communicates with the chamber 7, as does also an inlet duct 11. It will be of course understood that the passage 11 will be connected with a suitable mixing device for the air and combustible element, such a device not being shown.

At the point 12, where the chamber 7 and exhaust passage 10 meet, I place an exhaust-valve 13, which is provided with a hollow-stem 14, through which the stem 15 of an inlet valve 16 is adapted to freely pass. It will be seen that the exhaust-valve 13 is open or hollow, as at 17, the said opening at the upper end thereof being normally closed by the inlet valve 16, as shown. It will be also seen that the opening 17 in the valve 13 is in communication with the inlet passage 11; therefore to get the firing mixture into the cylinder 1, the said mixture must pass through the opening 17 in the exhaust-valve 13.

As can be seen in Fig. 1, the lower end of the hollow-stem 14 of the valve 13 carries a spring-seat 18, which is provided with studs 19 (one only being shown), the said studs being engaged by the jaw 20 in the end of the bell-crank lever 21. The lever 21 is pivotally secured to a removable cap 22, as at 23, and is provided with a downwardly extending arm 24. Between the seat 18 and portion 19′ of the motor casing, I place a spring 25, the function of which is to re-seat the valve 13 after it has been opened to permit the burned gases to escape.

The lower end of the stem 15 of the inlet valve 16 is provided with a spring-seat 26 having a convex surface 27, the said spring-seat being kept in contact with the bell-crank lever 28 by a spring 29. The lever 28 is pivotally secured to the cap 22, as at 29′, and carries an upwardly extending arm 30, which is normally adapted to impinge the arm 24 of the lever 21. The arm 31 of the lever 28 is provided with a guide-way 32 (see Fig. 2), within which a block 33 is adapted to slide, the said block being provided with a roller 34, which is kept in contact with the periphery of the cam 35 by a spring 36. The cam 35 is carried by an auxiliary shaft 37 having mounted thereupon a gear 38, the said gear being operated by a pinion 39 mounted on the crank-shaft 40. The purpose of slidably mounting the roller 34 is to adapt the said roller to be moved longitudinally of the lever-arm 31; so that the position of the said roller

can be altered relative to the operating faces of the cam 35, in order to regulate the opening of the valves 13 and 16 relative to the stroke of the piston 3. The operating faces of the cam referred to are indicated by 41 and 42, the face 41 being adapted to open the valve 16, and the face 42 being adapted to allow the spring 36 to force the arm 31 downwardly, whereby the exhaust-valve 13 is opened. The mechanism operates as follows: In the position shown in Fig. 1, the piston 3 is about to rise and force the products of combustion out of the cylinder 1. As is indicated, the crank 4 is on its lower dead center and the roller 34 about to lower. If the shaft 40 is revolving in the direction of the arrow 43, the cam 35 will revolve as per the arrow 44, and as the crank 4 leaves the dead center the cam 35 will be moved around and allow the roller 34 to fall, whereby the arm 30 of the lever 28 will move inwardly and force the arm 45 of the lever 21 upwardly, whereby the valve 13 will open and stay open until the crank 4 approaches the upper dead center. At about the time that the said crank reaches the upper center, the valve 13 will have closed, and the valve 16 will have been quickly opened by the cam face 41. As the piston 3 then comes downwardly, a charge of air and fuel will be drawn in through the opening 17 in the valve 13. The valve 16 will stay wide open while the piston 3 is going down, by reason of the fact that the portion 46 of the cam 35 is concentric with the shaft 37. When the roller 34 reaches the incline 47, the valve 16 will be suddenly closed by the spring 29. During the next upward or compression stroke and the following downward or working stroke, the roller 34 will travel along the concentric portion 48 of the cam 35, whereby both of the valves 13 and 16 will remain closed.

To adjust the roller 34 longitudinally of the arm 31 I have in this instance employed a turn-buckle 49 and the coöperating right and left hand threaded spindles 50 and 51, respectively. It is quite obvious that the point at which the valves 13 and 16 will open, relative to the stroke of the piston 3, will be determined by the position of the roller 34, relative to the operating faces of the cam 35. It is also obvious that the exhaust-valve 13 is operated, or opened, by the spring 36 when the cam face 42 of the cam 35 allows the arm 31 to move downwardly. The strength of the spring 36 will be sufficient to compress the springs 25 and 29, as when the lever-arm 31 moves downwardly the lever-arm 21 will move upwardly, whereby the valve 13 will be opened. As the valve 16 is carried by the valve 13, it will of course be carried upwardly with the valve 13. The movement of the valve 13 will not be enough to cause the heel 50 thereof to leave the socket 51; therefore the duct 11 will never be in communication with the exhaust passage 10.

Fig. 3 illustrates a modified form of valve-operating mechanism which comprises a lever-arm 52, which is connected to the hollow-stem 53 of the exhaust valve 54. The valve 54 is kept against its seat by a spring 55. The valve 54 carries an inlet valve 56, the stem 57 of which passes through the hollow stem 53 of the valve 54, the said stem being provided with a spring seat 58 provided with a roller 59, which is kept in contact with the face of a cam 60 by a spring 61. The cam 60 carries an auxiliary adjustable cam 61′, the said cam 61′ being adapted to operate the lever-arm 52 and valve 54 controlled thereby through the medium of a rod 62. In the above described modified form of valve mechanism, the time of operation of the exhaust-valve can be regulated independently of the time of operation of the inlet valve by shifting the cam 61. In other respects the two forms are alike. For operating the valve 56 the cam 60 is provided with an operating face 63, and for operating the valve 54 the cam 61′ is provided with an operating face 64.

In the modified form shown in Fig. 5, the exhaust-valve 65 carries a hollow stem 65′, to the lower end of which is secured a spring seat 66 provided with rollers 67. The exhaust-valve 65 carries an inlet valve 68, the stem 69 of which passes downwardly through the hollow stem 65′ and terminates in a yoke 70, which carries a roll 71. The auxiliary shaft 72, which is operated as shown from the power shaft, carries two duplicate cams 73 and a single cam 74, which is mounted between the cams 73, as shown in Fig. 6. The cams 73 are adapted to operate the valve 65, while the cam 74 operates the valve 68. To return the valves 65 and 68, after each operation, I provide springs 75 and 76, respectively.

Having now described my invention, what I claim and desire to secure by Letters Patent is:

1. A gas engine provided with a passage for gases, a valve seated in said passage having a central opening and adapted to control the passage of gases through said passage, said gas engine being also provided with a gas duct in communication with the opening in said valve, a second valve carried by the valve first named adapted to control the flow of gas through the opening therein, a lever adapted to operate the valve first named, a second lever adapted to operate the first lever, an operating cam adapted to act directly upon the said second lever, and means whereby the valve, which is carried by the valve first named, can be operated by said cam.

2. A gas engine provided with a passage

for gases, a valve seated in said passage having a central opening and adapted to control the passage of gases through said passage, said gas engine being also provided with a gas duct in communication with the opening in said valve, a second valve carried by the valve first named adapted to control the flow of gas through the opening therein, a lever adapted to operate the valve first named, a second lever adapted to operate the first lever, an operating cam adapted to act directly upon the said second lever, means whereby the valve, which is carried by the valve first named, can be operated by said cam, and adjustable means normally in contact with said cam carried by the said second lever, adapted to regulate the time of operation of said valves.

3. A gas engine provided with a passage for gases, a valve seated in said passage having a central opening and adapted to control the passage of gases through said passage, said gas engine being also provided with a gas duct in communication with the opening in said valve, a second valve carried by the valve first named adapted to control the flow of gas through the opening therein, a lever adapted to operate the valve first named, a second lever adapted to operate the first lever, an operating cam adapted to act directly upon the said second lever, means whereby the valve, which is carried by the valve first named, can be operated by said cam, a slidably adjustable block carried by said second lever, a roller carried by said block adapted to normally contact said cam, and means adapted to adjust said block relative to the operating face of said cam.

4. A gas engine provided with a firing-chamber, an exhaust passage in communication therewith, a valve seated in said passage provided with a central opening, a hollow stem carried by said valve, an inlet duct in communication with said opening, an inlet valve seated in the opening in said exhaust valve, a stem carried by said opening adapted to pass through the hollow stem of said exhaust valve, a roller mounted at the lower end of said tubular stem, a roller mounted at the lower end of the stem of said inlet valve, a cam adapted to operate said exhaust valve, a spring adapted to keep the roller on said hollow stem in contact with said cam, a cam adapted to operate said inlet valve, and a spring adapted to keep the roller on said stem in contact with the cam last named.

Signed at New York city, N. Y., this 13th day of November, 1908.

HERMANN STEINGASSNER.

Witnesses:
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