

No. 713,147.

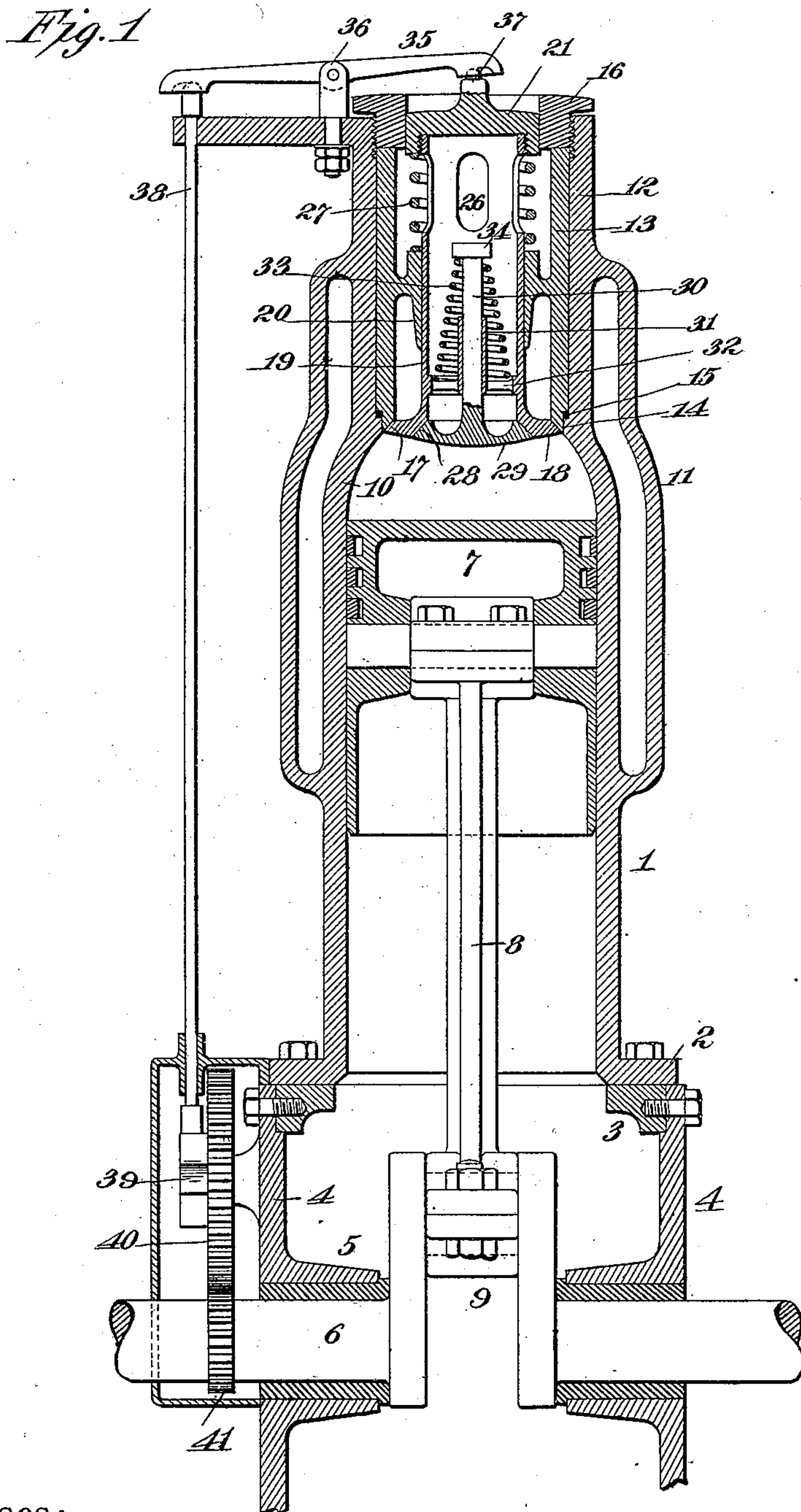
Patented Nov. 11, 1902.

W. M. POWER.  
INTERNAL COMBUSTION ENGINE.

(Application filed Dec. 27, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:

*Geo. F. Coleman*  
*Geo. R. Taylor*

Inventor

*William M. Power*  
by *Ayer Edmunds Ayer*  
Att'ys.

No. 713,147.

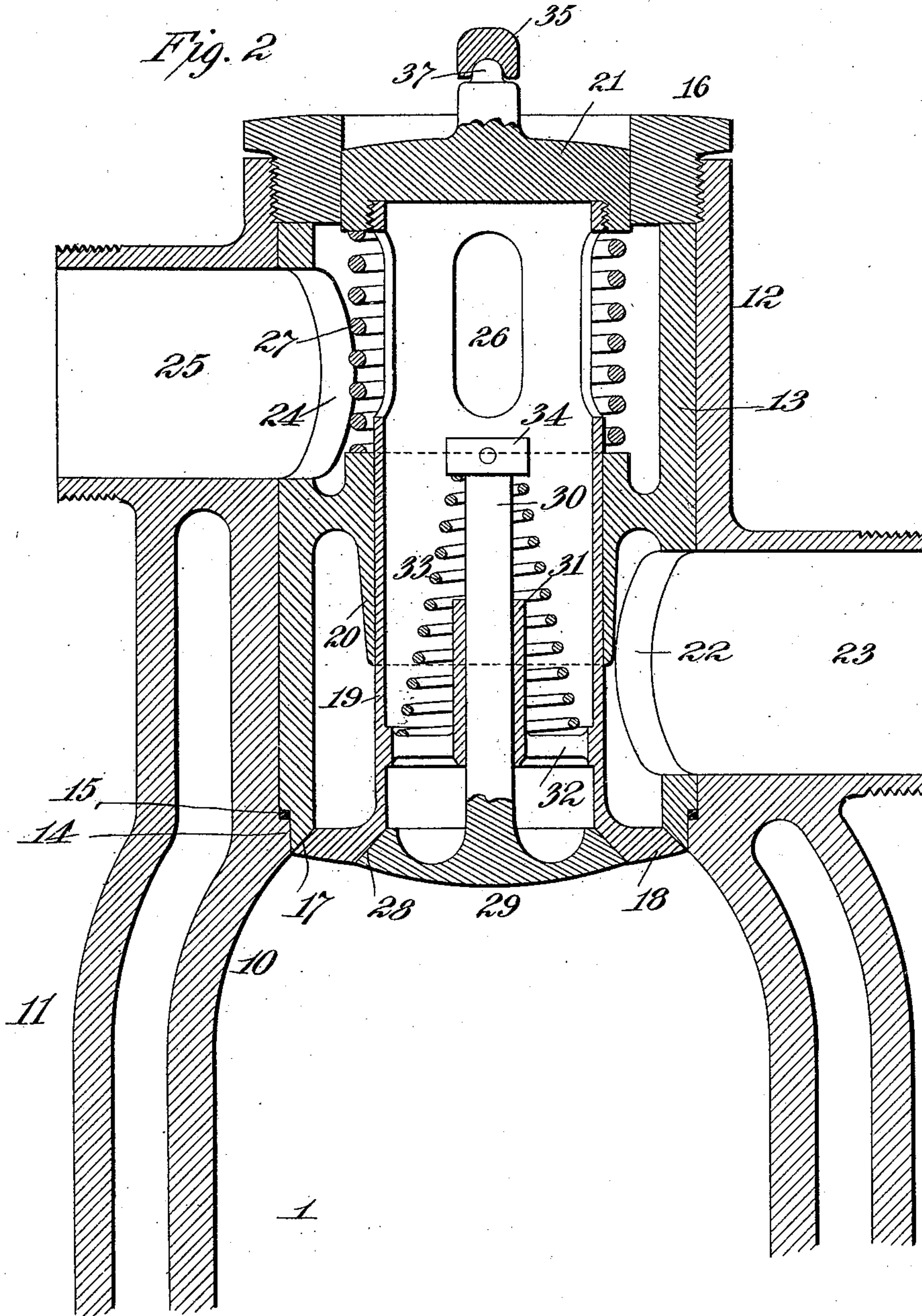
Patented Nov. 11, 1902.

W. M. POWER.  
INTERNAL COMBUSTION ENGINE.

(Application filed Dec. 27, 1900.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses:

*Jas. F. Coleman*  
*Geo. A. Taylor*

Inventor

*William M. Power*  
by *Hyer Edwards & Hyer*  
Att'ys.



# UNITED STATES PATENT OFFICE.

WILLIAM M. POWER, OF MONTCLAIR, NEW JERSEY, ASSIGNOR TO PAN-AMERICAN MOTOR COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

## INTERNAL-COMBUSTION ENGINE.

SPECIFICATION forming part of Letters Patent No. 713,147, dated November 11, 1902.

Application filed December 27, 1900. Serial No. 41,255. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM M. POWER, a citizen of the United States, residing at Montclair, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Internal-Combustion Engines, of which the following is a specification.

My invention relates to various new and useful improvements in internal-combustion engines; and my object is to provide for such engines an improved arrangement of admission and exit valves which shall present many practical advantages.

Broadly stated, my invention consists in the combination, with a suitable engine-cylinder, of a removable valve-casing carried thereby, an exit or exhaust valve mounted in the valve-casing, and an inlet or admission valve mounted in and carried by the exhaust-valve. By reason of this construction the valve-casing can be readily removed and replaced by a new one, whereby both the admission and exhaust valves and their seats also will be readily exchanged. This feature is especially desirable in connection with internal-combustion engines used on automobiles, for the reason that in the event of any trouble with the engine in connection with the valves thereof both valves can be very quickly removed and new ones substituted, thus doing away with the necessity, as is now the case, of first locating the trouble and then remedying it or else of removing both the admission and exhaust valves separately and replacing them with substitutes. With prior devices no provision is made for the removal of the seats of both admission and exhaust valves, and in consequence in the event of difficulty with the valve-seats repairs must be made *in situ*, if at all, while with my improved construction the valves, as well as their seats, are, as explained, readily removable.

My construction also materially simplifies and reduces the cost of engines equipped with the improvements. Furthermore, by arranging the admission-valve so that it is mounted in and carried by the exhaust-valve the mixture in entering the cylinder will keep the ex-

haust-valve relatively cool, so as to prevent warping thereof, permitting at all times the maintenance of a tight fit between the exhaust-valve and its seat.

In order that the invention may be better understood, attention is directed to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a vertical sectional view of a common form of four-cycle single-cylinder internal-combustion engine equipped with my present improvements; and Fig. 2, a section, on an enlarged scale, through the valve-chamber and upper part of the cylinder, taken at right angles to Fig. 1.

In both of the above views corresponding parts are represented by the same numerals of reference.

The cylinder 1 is provided with a flange 2 at its lower end, which is bolted to the crank-casing 3, the latter having removable end disks 4, formed with bearing-boxes 5, for the shaft 6.

7 is the piston, the rod 8 of which connects with the crank 9 of the shaft 6. The upper part of the cylinder 1 is provided with curved walls 10, so that when the piston is at the top of the stroke a chamber will be formed for the compressed mixture. A cylinder of this shape permits of a better exhaustion of the products of combustion than one having angular corners and recesses therein, as will be obvious. Preferably the cylinder is provided with the usual water-jacket 11 for its upper part; but, if desired, it may be cooled in other ways. The cylinder is formed at its outer end with a cylindrical extension 12, around which the water-jacket partially extends, as shown. Mounted in this cylindrical extension is a cylindrical valve-chamber or casing 13, which constitutes, together with the inlet and exhaust valves, the cylinder-head, said valve chamber or casing being seated on a flange 14 and a gasket 15 being interposed between the joint to prevent leakage. The valve-chamber 13 is held in place in any suitable way, but preferably by means of an annular nut 16, threaded into the upper end of the extension 12 and bearing upon the upper



end of the valve-chamber, as shown. The lower end of the valve chamber or casing is tapered to form a seat 17 for the exhaust-valve 18. The exhaust-valve, it will be noted, will be concentrically arranged with respect to the cylinder, and being of large diameter a very rapid exhaust will be afforded thereby without requiring more than a relatively slight opening movement of the valve. The exhaust-valve is provided with a relatively thin tubular body 19, which is guided by a bearing 20, cast with the valve-chamber, and at its upper end it is provided with a cap 21, screwed in place and which bears in the annular nut 16, as will be obvious. The valve-chamber or valve-casing is provided with an opening 22, which registers with an exhaust-pipe 23, as shown. Above the bearing 20 the valve-chamber is provided with an inlet-opening 24, which registers with a pipe 25 for supplying the explosive mixture to the engine. The tubular body of the exhaust-valve is formed with a series of elongated openings 26 therein, through which the explosive mixture will be permitted to enter the interior of the exhaust-valve from the supply-pipe 25. A spring 27, interposed between the bearing 20 and the cap 21, tends to keep the exhaust-valve normally seated. The exhaust-valve is provided with a seat 28 therein, with which coöperates an inlet or admission valve 29 of the usual mushroom type, said admission-valve being obviously mounted within and concentrically with respect to the exhaust or exit valve. The stem 30 of the admission-valve is guided by a bearing 31, carried on arms 32 on the interior of the tubular body 19, and said admission-valve is normally seated by a spring 33, working between the radial arms 32 and a collar 34 at the upper end of the stem 30. Any suitable operating mechanism may be employed for positively actuating the exhaust or exit valve. I preferably employ for the purpose a pivoted lever 35, carried on a swiveled fulcrum 36 and having a recess at one end which fits upon a stud or projection 37, formed on the cap 21, and with a recess or depression at the other end which fits over the valve-rod 38. This valve-rod is actuated in any suitable way—as, for example, from a cam 39, carried upon a gear 40, driven by a pinion 41 at half the speed of the engine-shaft.

The operation will be readily understood. On the suction-stroke of the piston the admission-valve 29 will open and the explosive mixture will be drawn into the cylinder from the admission-pipe 25 through the elongated openings 26 and downwardly through the tubular body 19 of the exhaust-valve. On the compression-stroke both valves will remain closed. On the exhaust-stroke the cam 39 will elevate the valve-rod 38, oscillating the lever 35 and depressing the exhaust-valve 18, so as to open the latter and permit the products of combustion to exhaust through the pipe 23. When it is de-

sired to remove the valves for any purpose, the exhaust-valve 18 is depressed with any suitable operating - tool and the lever 35 swung to one side on the swivel 36. The nut 16 is now removed, so as to free the valve chamber or casing, which can then be removed as a whole, carrying with it both of the valves, after which a new valve chamber or casing and valves can be inserted in place. These operations can be performed in less time than is now required to remove either the exhaust or admission valve of any internal-combustion engine with which I am familiar, besides which no pipe-couplings require to be operated, as with most prior devices. By employing an exhaust-valve of relatively large diameter a very perfect exhaustion of the products of combustion is afforded and all possibility of a back pressure being imposed upon the piston is overcome. Since the exhaust-valve coöperates with a seat arranged in close proximity to the water-jacket and since the explosive mixture is drawn into the cylinder through the exhaust-valve, the latter will be always kept relatively cool and will therefore be prevented from warping, so that at all times it will accurately coöperate with its seat. The valve-casing, with its valves, may be placed, if desired, in a cylinder-head; but I prefer to locate it in the cylinder-casting in the manner described.

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

1. In an internal-combustion engine the combination of a cylinder, a removable valve-casing, an exhaust-valve mounted in the said casing and an admission or inlet valve mounted in and movable with respect to the exhaust-valve the said casing and the said valves constituting the cylinder-head substantially as set forth.

2. In an internal-combustion engine, the combination of a cylinder, a cylindrical removable valve-casing, a seat on the lower end of the said valve-casing, an exhaust-valve coöperating with the said seat and an admission-valve located in and movable with respect to the said exhaust-valve the said casing and the said valves constituting the cylinder-head substantially as set forth.

3. In an internal-combustion engine the combination of a cylinder-casting formed with a contracted portion at its rear end, a cylindrical valve-casing removably mounted in the said contracted portion of the said casting, a valve-seat at the inner end of the said valve-casing, an exhaust-valve mounted in the said valve-casing and coöperating with the said seat and an admission-valve or inlet-valve carried by and movable with respect to the exhaust-valve, the said casing and the said valves forming the cylinder-head substantially as set forth.

4. In an internal-combustion engine the combination of a cylinder, a cylindrical valve-



casing removably mounted in the said cylinder, a valve-seat at the inner end of the said valve-casing, an exhaust-valve mounted in the said valve-casing and cooperating with the said seat, an admission-valve or inlet-valve carried by and movable with respect to the exhaust-valve the said casing and the said valves forming the cylinder-head and an annular nut engaging the said cylinder for retaining the said valve-casing in its position in the said cylinder.

5. In an internal-combustion engine the combination of an engine-cylinder casting formed with a coaxial contracted portion at its rear end of a cylindrical valve-casing carried in said contracted portion, inlet and exhaust openings in said casing registering with corresponding openings formed in said contracted portion, a valve-seat at the inner end of the said valve-casing, an exhaust-valve cooperating with the said seat and having a tubular body, an inlet-valve carried by the exhaust-valve and having its stem mounted in the said tubular body and openings in said tubular body connecting with the inlet-openings to the valve-casing, the said casing and the said valves forming the cylinder-head substantially as set forth.

6. In an internal-combustion engine, the combination with the engine-cylinder formed with a cylindrical extension at its rear end, of a cylindrical valve-chamber carried in said extension, inlet and exhaust openings in said chamber registering with openings formed in said extension, a valve-seat at the inner end of said valve-chamber, an exhaust-valve cooperating with said seat and having a tubular body, an inlet-valve carried by the exhaust-valve and with its stem mounted in said tubular body, openings in said tubular body connecting with the inlet-opening to the valve-chamber, and a removable cap on the outer end of said tubular body, substantially as set forth.

7. In an internal-combustion engine, the combination with an engine-cylinder, of a cylindrical valve-chamber carried by the cylinder near its rear end, an exhaust-valve mounted in said valve-chamber, an inlet-valve carried by and movable with respect to the exhaust-valve and mounted concentrically with respect to the same, an oscillating operating-lever engaging the outer end of the exhaust-valve, a swiveled fulcrum for said oscillating lever, and means for operating said lever, substantially as and for the purposes set forth.

8. In a vapor-engine the combination of a valve-casing, a ring for securing the said casing in the engine, a pair of concentric valves mounted in the said casing, the outer of the said valves having a threaded cap adapted to move in the said ring and forming a bearing

for the said outer valve, a second bearing for the said outer valve carried by the casing, and springs for seating the said valves.

9. In a vapor-engine the combination of a valve-casing, a ring for securing the said casing in the engine, a pair of concentric valves mounted in said casing, the outer of said valves having a threaded cap adapted to move in said ring, a bearing for the said outer valve, a web in said casing for supporting the said bearing and for dividing the said casing into two chambers, and springs for seating the said valves.

10. In a vapor-engine the combination of a valve-casing, a pair of concentric valves, a ring for forming a bearing for said valves, a second bearing for the said valves supported by the said casing, a cap for the outer of the said valves, a spring located between the said cap and the said second bearing for seating the said outer valve, and a second spring connected to the outer valve and the inner valve for seating the said inner valve.

11. The combination with the cylinder of an explosive-engine, of a coaxial extension thereof, an exhaust-valve, an inlet-valve carried by the exhaust-valve, a casing carrying the valves and forming therewith the cylinder-head, and endwise removable from said extension and a means for holding the valve-casing in position.

12. The combination with the cylinder of an explosive-engine of a coaxial extension thereof, an exhaust-valve, an inlet-valve carried by the exhaust-valve, a casing carrying the valves and forming therewith the cylinder-head, and endwise removable from said extension, and a threaded ring engaging the extension and holding the valve-casing in position.

13. In an internal-combustion engine the combination of a cylinder-casting having an inlet-passage and an exhaust-passage, a removable valve-casing located in the said cylinder-casting and having inlet and exhaust passages adapted to register with the corresponding passages of the said cylinder-casting, an exhaust-valve having a hollow stem located in the said valve-casing and having openings in the said stem connecting the interior of the said stem with the inlet-passage of the said casing and the inlet-passage of the said casting, and an inlet-valve for opening and closing one end of the hollow stem, the said valves and the said casing constituting the cylinder-head, substantially as described.

This specification signed and witnessed this 20th day of December, 1900.

WILLIAM M. POWER.

Witnesses:

FRANK L. DYER,  
JNO. R. TAYLOR.