976,180.

W. JOHNSON.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED MAR. 21, 1910.

Patented Nov. 22, 1910.

2 SHEETS—SHEET 1.

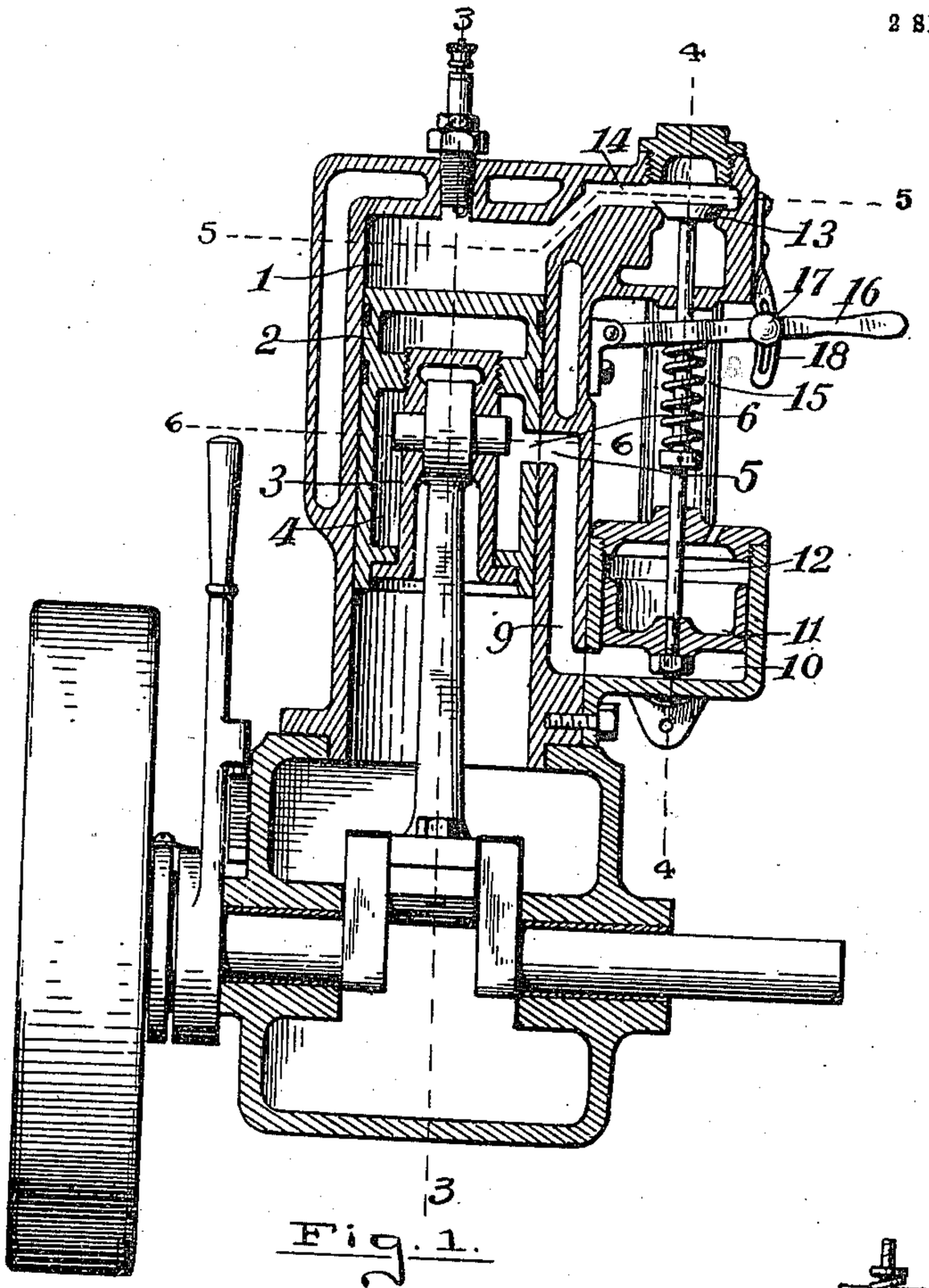

Fig. 1.

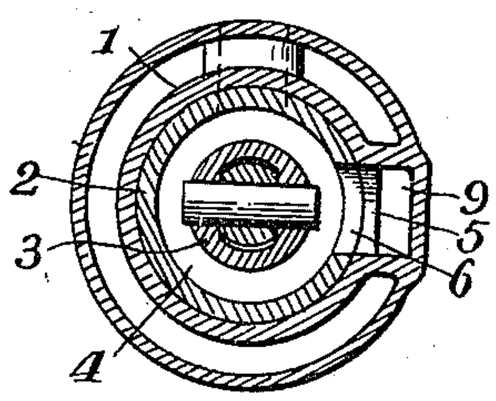

Fig. 6.

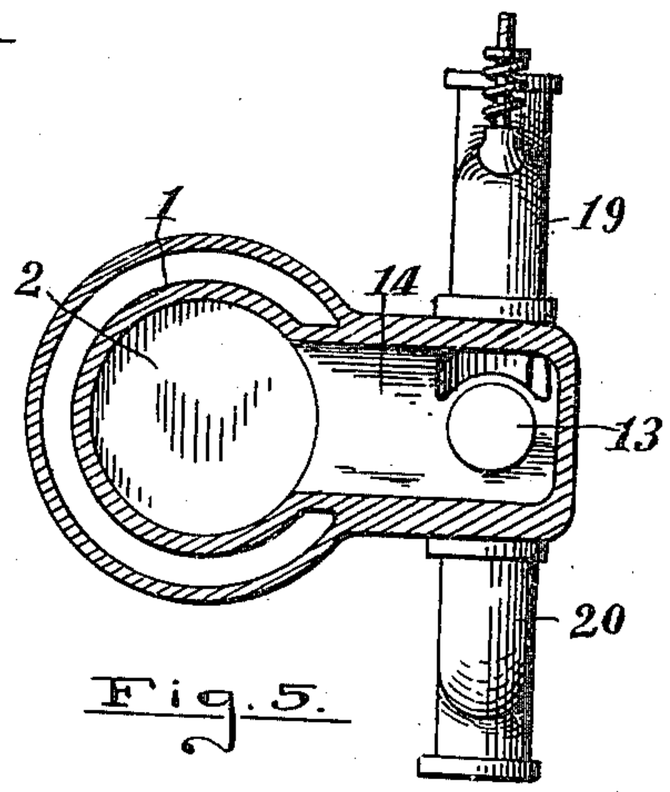

Fig. 5.

Witnesses
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2 SHEETS—SHEET 2.

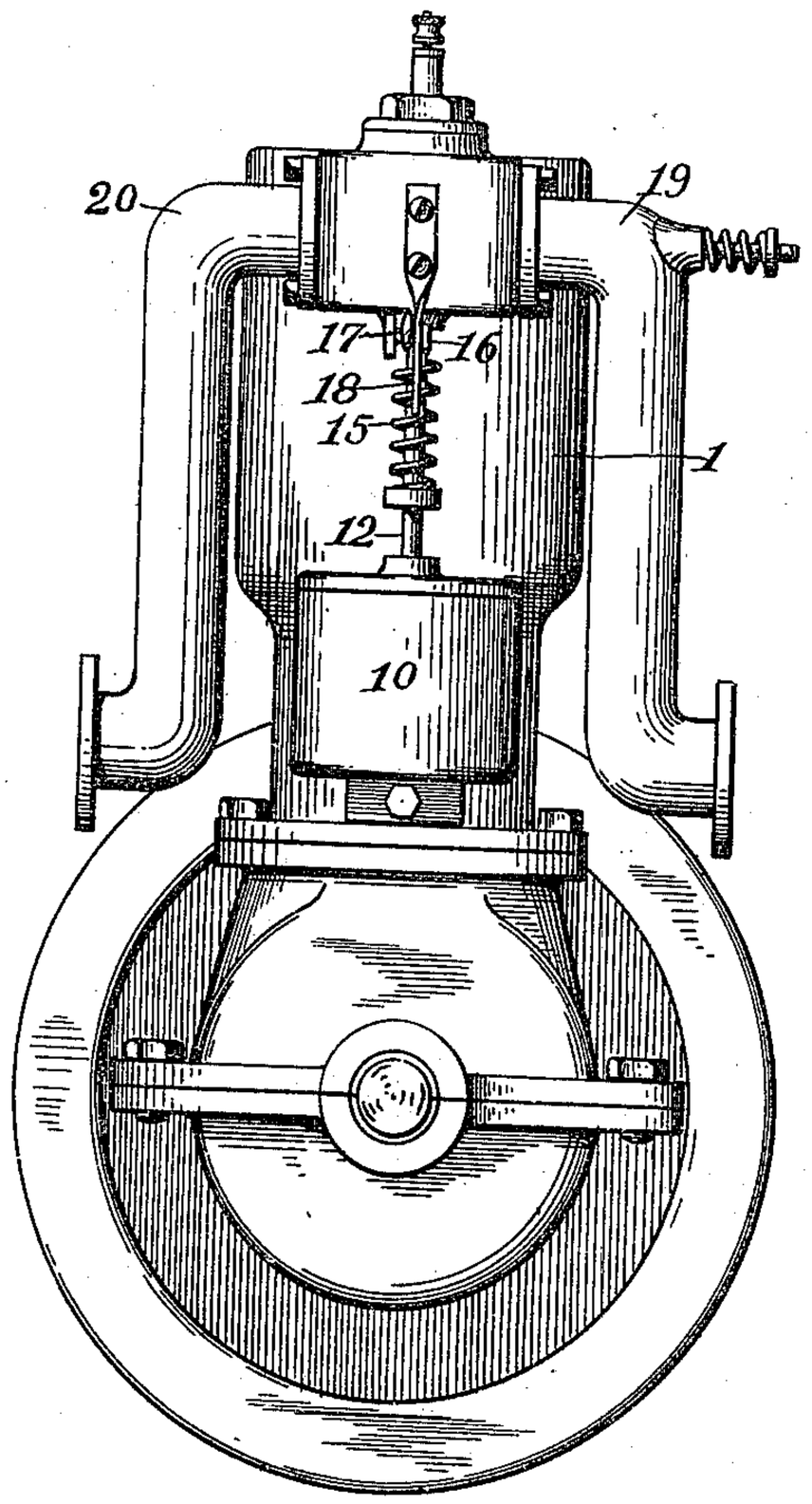

Fig. 2.

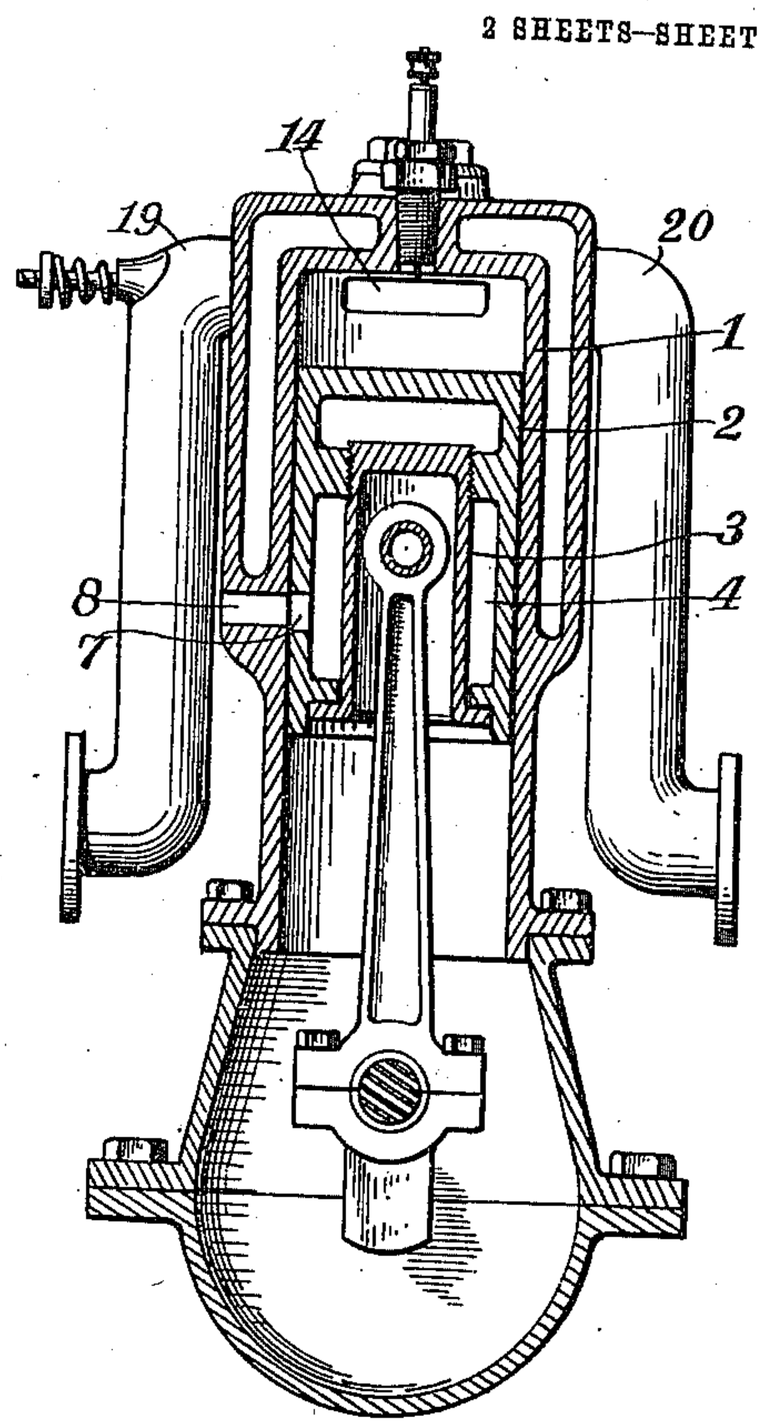

Fig. 3.

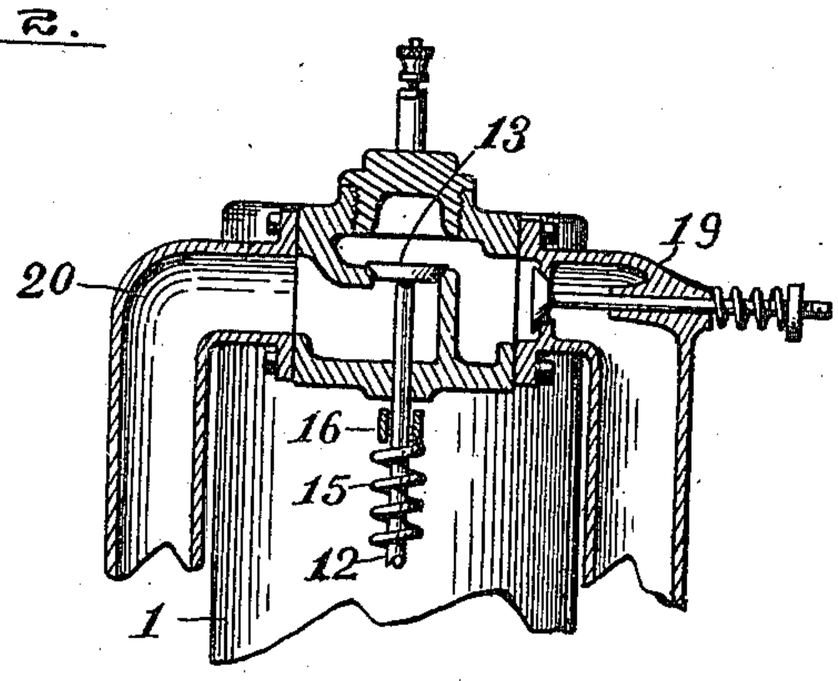

Fig. 4.

Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM JOHNSON, OF MONTAGUE, MICHIGAN, ASSIGNOR OF ONE-HALF TO GEORGE H. NELSON, OF WHITEHALL, MICHIGAN.

INTERNAL-COMBUSTION ENGINE.

976,180. Specification of Letters Patent. Patented Nov. 22, 1910.

Application filed March 21, 1910. Serial No. 550,631.

To all whom it may concern:

Be it known that I, WILLIAM JOHNSON, a citizen of the United States of America, residing at Montague, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Internal-Combustion Engines; 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.

My invention relates to improvements in internal combustion engines and more particularly to that class commonly known as the four cycle type; or in other words, an internal combustion engine, which completes a cycle of operations during four strokes of the piston and in which the valves are opened by fluid pressure only, and its object is to provide an engine which is simple in operation and construction, and to provide the same with various new and useful features, hereinafter more fully described and particularly pointed out in the claims, reference being had to the accompanying drawings, in which:

Figure 1 is a longitudinal vertical section of a device embodying my invention; Fig. 2 a rear elevation of the same; Fig. 3 a transverse vertical section on the line 3—3 of Fig. 1; Fig. 4 a vertical section on the line 4—4 of Fig. 1 showing the intake and exhaust valves; Fig. 5 a horizontal section on the line 5—5 of Fig. 1; and, Fig. 6 the same on the line 6—6 of Fig. 1.

Like numbers refer to like parts in all of the figures.

1 represents the cylinder of the engine, and 2 the piston, which latter is connected to the crank shaft by a connecting rod and reciprocates within the cylinder in the ordinary way. An inner member 3 substantially cylindrical in shape is screwed into a partition near the upper end of the piston and is outwardly flanged at its lower end to engage an inwardly projecting flange near the lower end of the piston, being spaced apart from the walls of the piston to form an annular chamber 4 within the piston. An opening 6 from the chamber 4 is provided in the wall of the piston and is arranged to come opposite a corresponding opening or port 5 in the cylinder 1 when the piston is at the end of its up-stroke. The port 5 communicates by the passage 9 with the lower end of a small cylinder 10. The chamber 4 is also provided with a port 7 which communicates with an opening 8 in the side of the cylinder at the end of the up-stroke of the piston, thus providing an exhaust for the cylinder 10 into the open air or elsewhere as preferred.

A piston 11 in the cylinder 10 is attached to the lower end of a push rod 12 which carries the exhaust valve 13 at its upper end and a spring 15 is provided which holds the valve normally on its seat. To adjust the tension of the spring 15, its upper end is engaged by a lever 16 pivoted at one end and adjustably held in place by a sector 18 and clamping screw 17.

An intake pipe 19 provided with an ordinary spring actuated check valve is placed over the inlet opening which communicates with the cylinder 1 through the passage 14. The exhaust valve 13 also opens into the passage 14 and a pipe 20 is placed over the exhaust opening to carry away the exhaust.

The operation of the engine is as follows: With the piston at the upper end of its stroke, as shown in Fig. 1, and the cylinder containing a compressed charge of gas, the charge is ignited in the usual way, and as the piston reaches the lower end of its stroke, it uncovers the port 5 admitting a portion of the burned charge into the cylinder 10. It will be noticed that the area of the piston head 11 is greater than that of the valve 13, consequently the valve will be lifted from its seat, and as the piston 2 rises and again closes the port 5, the charge will be confined within the cylinder 10 holding the exhaust valve open, and allowing the exhaust charge to escape therethrough during the up-stroke of the piston 2. As the piston reaches the end of its up-stroke, the opening 6 communicates with the port 5, releasing the charge within the cylinder 10 into the chamber 4 and out through the port 7 and passage 8, allowing the valve 13 to drop to its seat where it is held by the spring 15. The next down stroke of the piston will take in a fresh charge of combustible mixture through the intake valve, the up-stroke will compress it, and the operation will be repeated. The engine speed is regulated by adjusting the tension of the spring 15. When the speed increases, the inspiration vacuum increases and the said spring will

yield and dilute the charge by permitting the exhaust valve to open a little and the higher the resistance of the spring, the higher the speed before this diluting will occur. Obviously this spring tension may be adjusted by any well known form of governor if preferred.

What I claim is:

1. An internal combustion engine comprising a main cylinder, an auxiliary cylinder, a piston in the auxiliary cylinder to operate an exhaust valve for the main cylinder, a hollow power piston in the main cylinder having two side ports to exhaust the auxiliary cylinder, a port connecting said cylinders opened by the main piston when at one end of its stroke and communicating with one side port when the said piston is at the other end of its stroke, a port in the main cylinder communicating with the open air and with the other side port in the piston; and an inner cylinder in the power piston to receive a connecting rod and spaced apart from the power piston to form a chamber connecting the side ports.

2. In an engine of the class described, a power cylinder and an auxiliary cylinder, said power cylinder having a side port communicating with the auxiliary cylinder, and another side port, communicating with the open air, a hollow piston in the power cylinder, having side ports and a tubular member within said piston having an open end to receive a connecting rod, and flanged at the lower end, and also spaced apart from the piston to form a chamber in the piston connecting the side ports in the same.

3. In an engine of the class described in combination with a main cylinder and an auxiliary cylinder, the main cylinder having side ports, one port communicating with the auxiliary cylinder and the other port communicating with the open air, a power piston in the main cylinder having side ports, and an annular chamber connecting the side ports, and a cylinder in the piston open at the lower end to receive a connecting rod, and having an outwardly projecting flange at the lower end secured to the piston.

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

WILLIAM JOHNSON.

Witnesses:

I. L. LANFORD,

EMILY LANFORD.