J. SHAW.

INTERNAL COMBUSTION ENGINE.

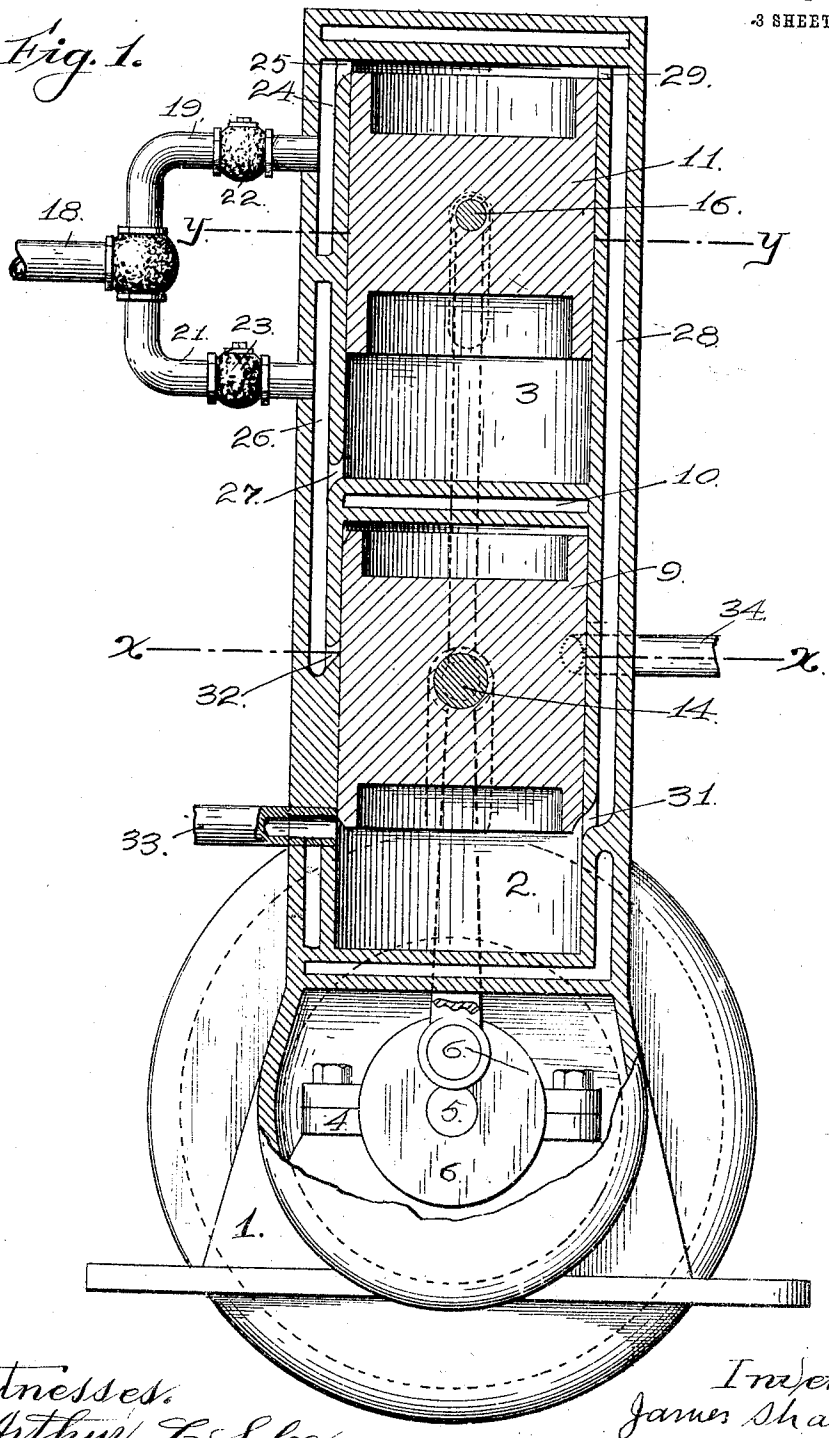
APPLICATION FILED AUG. 30, 1909.

1,003,127.

Patented Sept. 12, 1911.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses.
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A. Dixon

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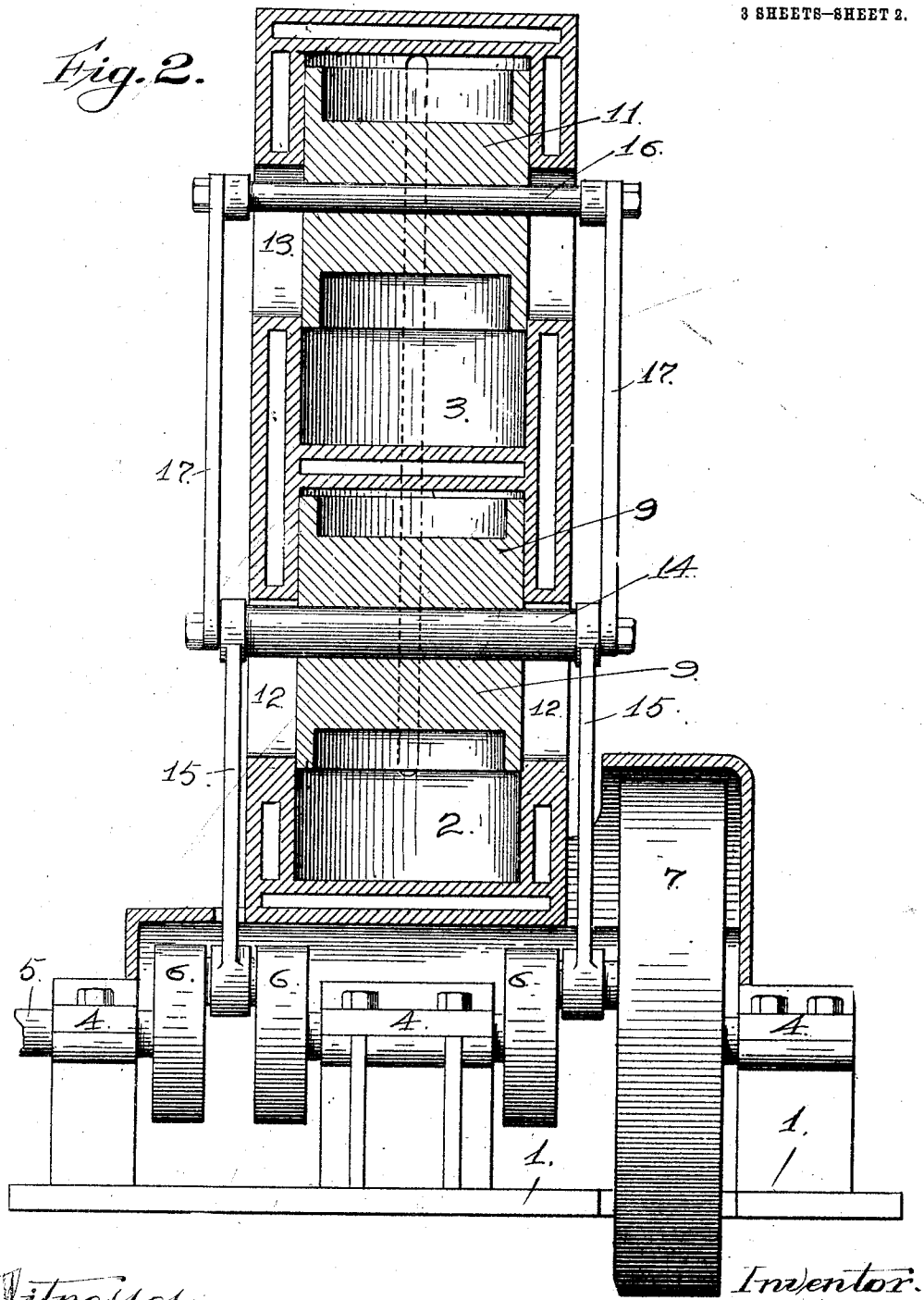
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

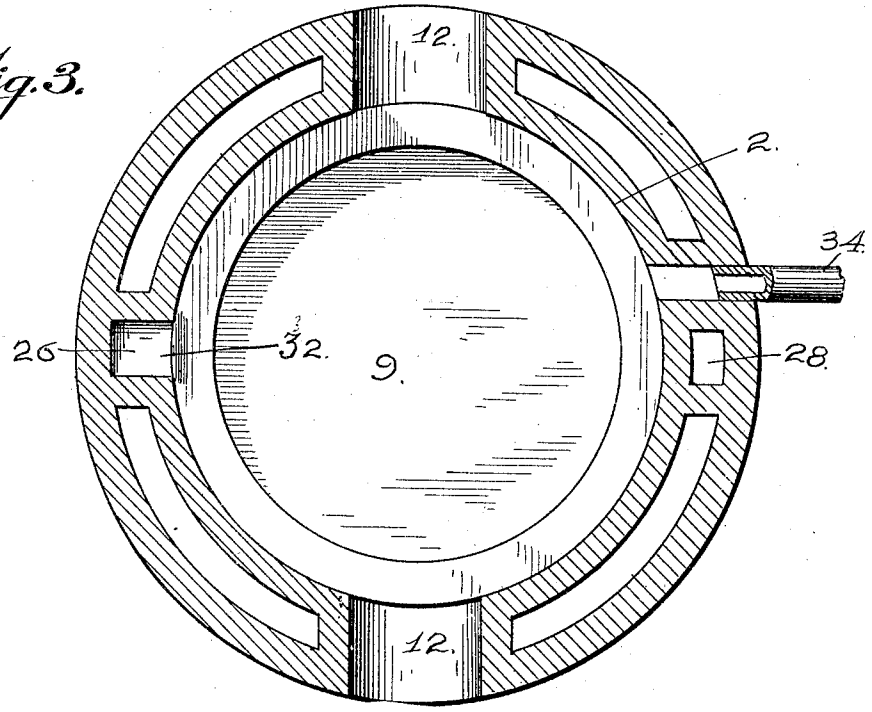
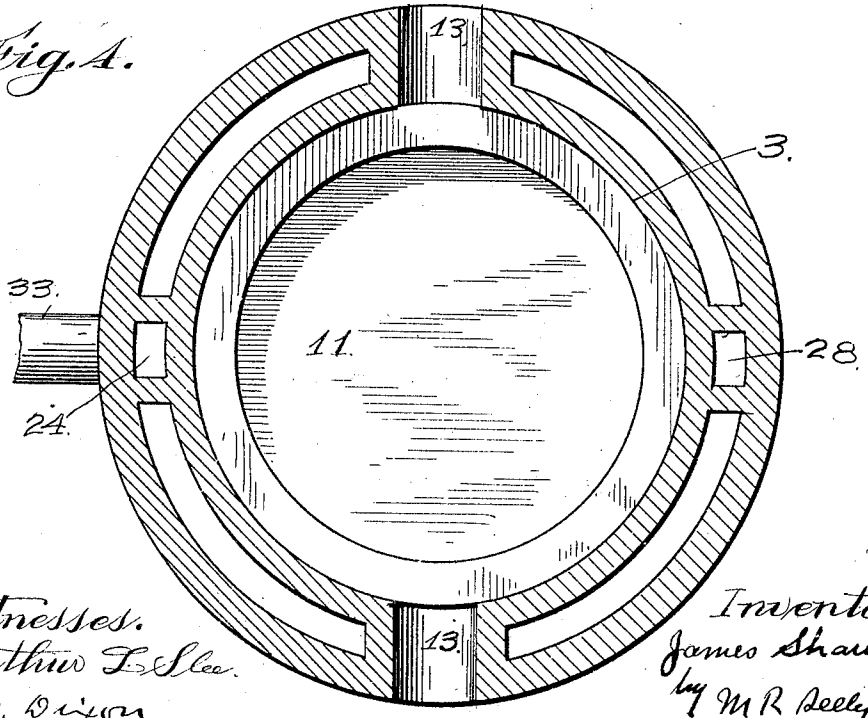


Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMES SHAW, OF ATCHISON, CALIFORNIA.

INTERNAL-COMBUSTION ENGINE.

1,003,127. Specification of Letters Patent. Patented Sept. 12, 1911.

Application filed August 30, 1909. Serial No. 515,276.

To all whom it may concern:

Be it known that I, JAMES SHAW, a citizen of the United States, residing at Atchison, in the county of Contra Costa and State of California, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

My invention relates to improvements in internal combustion engines using gas, or carbureted air, for fuel, and its object is to provide a device of this class whereby two driving impulses are given in a single cylinder for operating the engine with every revolution of the moving parts thereof. I also aim to provide an engine which will give a maximum of power for a minimum weight, and one which will be simple of construction, and inexpensive of manufacture, of operation and of maintenance.

In my invention I provide a compression, or pump, device apart from the engine cylinder, and provide for the delivery of the explosive mixture under pressure to the interior of the cylinder as required.

An embodiment of my invention is illustrated by the accompanying drawings, which form a part of this specification, and in which:

Figure 1 is a sectional side elevation. Fig. 2 is a sectional front elevation. Fig. 3 is a horizontal section on the line *x—x*, Fig. 1, and Fig. 4 is a horizontal section on the line *y—y*, Fig. 1.

Referring by numerals to the accompanying drawings:—1 designates a suitable base, on which are supported the engine cylinder 2, and superimposed on this cylinder 2 is the compression cylinder, or pump, 3. For the convenience of illustration I have shown the walls, or casings, of these cylinders 2 and 3 integral and divided by the partition, or head, 10. Also on the base 1 are bearings 4 supporting the crank shaft 5 with the cranks 6. On the crank shaft 5 I have shown the fly wheel 7.

In the drawings I have shown the cylinders to be water jacketed. I do not confine myself to this form of construction, as it will be apparent that any other means of cooling the cylinders may be employed. However, by showing a water-jacketed cylinder I show a convenient means of construction and a convenient means of illustrating my invention.

Operatable in the engine cylinder 2 is the piston 9, and operatable in the compression cylinder 3 is the piston 11. In the wall, or casing, of the engine cylinder 2, and diametrically opposite each other, are the slots 12. These slots are longitudinal with the cylinder and of lengths to correspond with the stroke of the engine. The cylinder is provided to be of such a length that the piston 9, operatable within it, may be of such dimension longitudinally that the openings of these slots will at all times be covered by the said piston in any position of its stroke. In a like manner the wall, or casing, of the compression cylinder 3 is provided with slots 13 diametrically opposite each other. These slots 13 also are longitudinal with the cylinder and of length to correspond with the stroke of the piston 11. This cylinder 3 is also provided to be of such a length that the piston 11, operatable within it, may be of such dimension longitudinally that the openings of these slots 13 will at all times be covered by the said piston in any position of its stroke.

Secured on the piston 9, and with its ends extending through the slots 12 and operatable therein, is the bar 14. Operatable on this bar and on the cranks 6, of the crank shaft 5, are the piston rods 15. Secured on the piston 11, and with its ends extending through the slots 13, and operatable therein, is the bar 16. Connecting the bar 14 and the bar 16 are the links 17. These links 17 are so provided that they will retain the bars 14 and 16 and the pistons 9 and 11 in relative positions one with the other during all parts of their strokes.

For the inlet of gas, or carbureted air, or other fuel, I provide an inlet pipe 18, with its branches 19 and 21. In the branch 19 is the check valve 22 and in the branch 21 is the check valve 23. The branch 19 is connected with the inlet passage 24 in the wall of the cylinder 3 and the passage 24 has an open port 25 opening into the upper part of the said cylinder 3. The branch 21 is connected with the inlet passage 26, which I have shown in the walls of the cylinders 2 and 3. This passage 26 is provided with an open port 27 opening into the lower part of the compression cylinder 3. These ports 25 and 27 are at the extreme ends of the compression cylinder 3 and are always open. Also in the walls of the cylinders 2 and 3 is

the passage 28. This passage has a port 29, which is always open, in the extreme upper end of the compression cylinder 3, and a port 31 at its opposite end opening into the engine cylinder 2. This port 31 is open only when the piston 9 is at the uppermost part of its stroke, and closed by the said piston in all the other parts of the stroke of the said piston. Opening from the passage 26 is the port 32. This port 32 opens into the engine cylinder 2 and is so adapted that it is only open when the piston 9 is at the lowermost part of its stroke, and closed by the said piston in all the other parts of the stroke of the said piston. I prefer that the edges of this piston 9 be beveled at the points opposite the ports 31 and 32, and that the ports be so constructed that they register and conform with these beveled portions of the piston so that the gas, or carbureted air, or other fuel, as it enters the cylinder will be deflected toward the ends of the cylinder. At points opposite, or nearly opposite, the inlet ports 31 and 32 I provide exhaust ports 33 and 34. The exhaust port 33 is so provided that it is only open when the piston 9 reaches the uppermost part of its stroke, and is closed by the said piston in all the other parts of its stroke. The exhaust port 34 is open when the piston 9 reaches the lowermost part of its stroke, and is closed by the said piston in all the other parts of its stroke.

It will be seen that when in operation, and when the piston 11 is descending, the explosive mixture will be drawn from the pipe 18 through the check valve 22, the inlet passage 24 and the port 25 into the upper part of the compression cylinder. The downward movement of the piston 9 at the same time will close the port 31. Then the piston 11 in its upward movement will compress the explosive mixture that was drawn into the cylinder, and when the piston 9 moves sufficiently to open the port 31 the mixture will be forced into the engine cylinder through the passage 28 and the port 31 and deflected toward the lowermost end of the said cylinder. The inrush of explosive mixture will be such that it will force any burned gases that may be in the cylinder toward and out of the exhaust port 33. The movement of the piston 9, however, will be such, and so rapid, that it will close the exhaust port 33 before any, or much, of the explosive fluid may reach it, or be lost through it.

As the piston 11 moves upwardly compressing the explosive mixture in the upper part of the compression cylinder, explosive fluid is being drawn into the lower part of the compression cylinder from the pipe 18, through the check valve 23, the inlet passage 26 and the port 27. When the piston 11 begins its downward movement the explosive fluid now in the lowermost part of the compression cylinder will be compressed, and when this piston reaches the lowermost part of its stroke the piston 9 will also be at the lowermost part of its stroke and the port 32 will be opened. This will permit the compressed explosive mixture now in the lowermost part of the compression cylinder 3 to pass into the uppermost part of the engine cylinder 2 through the port 27, the passage 26 and the port 32. At the same time the exhaust port 34 will be opened permitting that part of the engine cylinder to be cleared of the burned gases in the same manner as described in the clearing of the gases from the lowermost part of the cylinder. Then the explosive mixture admitted and compressed in the lowermost part of the cylinder is exploded. This explosion will drive the pistons 9 and 11 upward and the piston 9 in its upward movement will compress the explosive mixture in the uppermost part of the cylinder and this mixture will in turn be exploded, driving the piston 9 downwardly. It will be seen that this operation of drawing the explosive fluid into the compression cylinder, and the forcing of this explosive fluid into the engine cylinder on each side of the piston in the engine cylinder, and of compressing and igniting, or exploding, this fluid, will be continuous, and that with a single engine cylinder two driving impulses will be given with every revolution of the crank shaft.

I have not shown any means for igniting, or exploding, the explosive mixture. It is apparent, however, that any suitable device for this purpose well known in the arts may be employed. I have considered it unnecessary to illustrate it as being within the common knowledge of mechanics and designers of this type of engine.

Although I have shown and described what I consider a very desirable form of mechanism for embodying my invention, it is evident that changes and alterations in the form and arrangement of the parts may be made without departing from the spirit of my invention, and I reserve the right to make such changes as will come within the scope of my invention as embodied in the appended claim.

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

An internal combustion engine comprising a casing having a central partition dividing it into an engine cylinder and a pump cylinder, the walls of said casing having ports therein, one port leading from the top of the pump cylinder to near the bottom of the engine cylinder, another of the ports 26 communicating with the bottom of the pump cylinder and with the engine cylinder near the top thereof, and a third port 24 connected with the top of the pump cylinder,

a supply pipe having two branches, one communicating with the port 24 and the other with the port 26, check valves in said branches, an exhaust pipe leading from each end of the engine cylinder, pistons in said cylinders, and a main shaft connected with said pistons.

In testimony whereof I have affixed my signature in the presence of two witnesses, this 9th day of August, 1909.

JAMES SHAW.

Witnesses:
FRANK L. OWEN,
A. DIXON.