T. VEITCH.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED MAY 18, 1909.

975,809.

Patented Nov. 15, 1910.

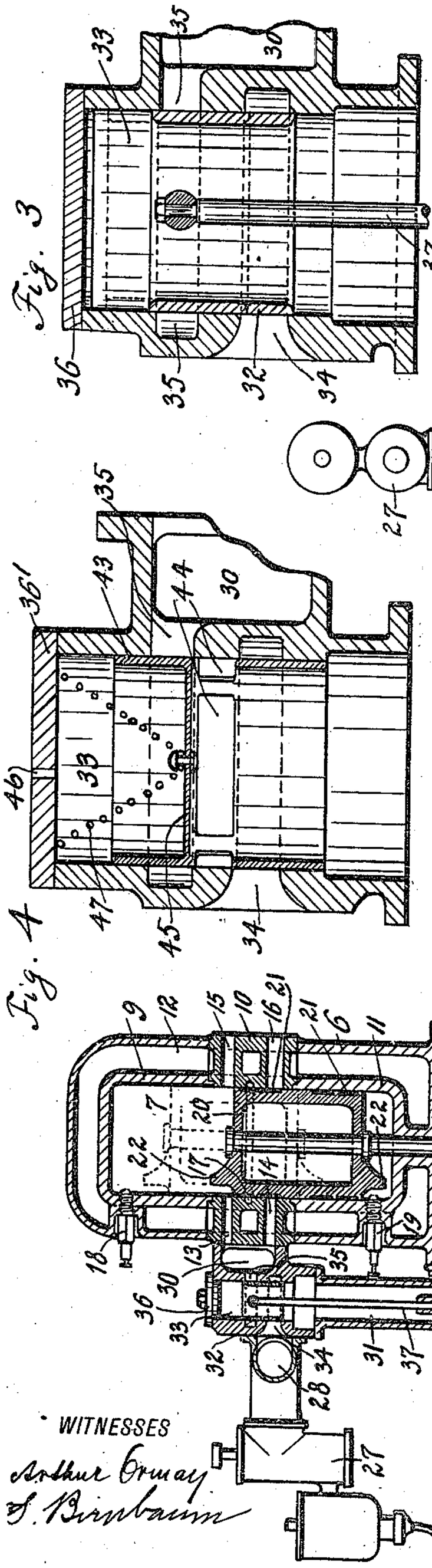

Fig. 3

Fig. 4

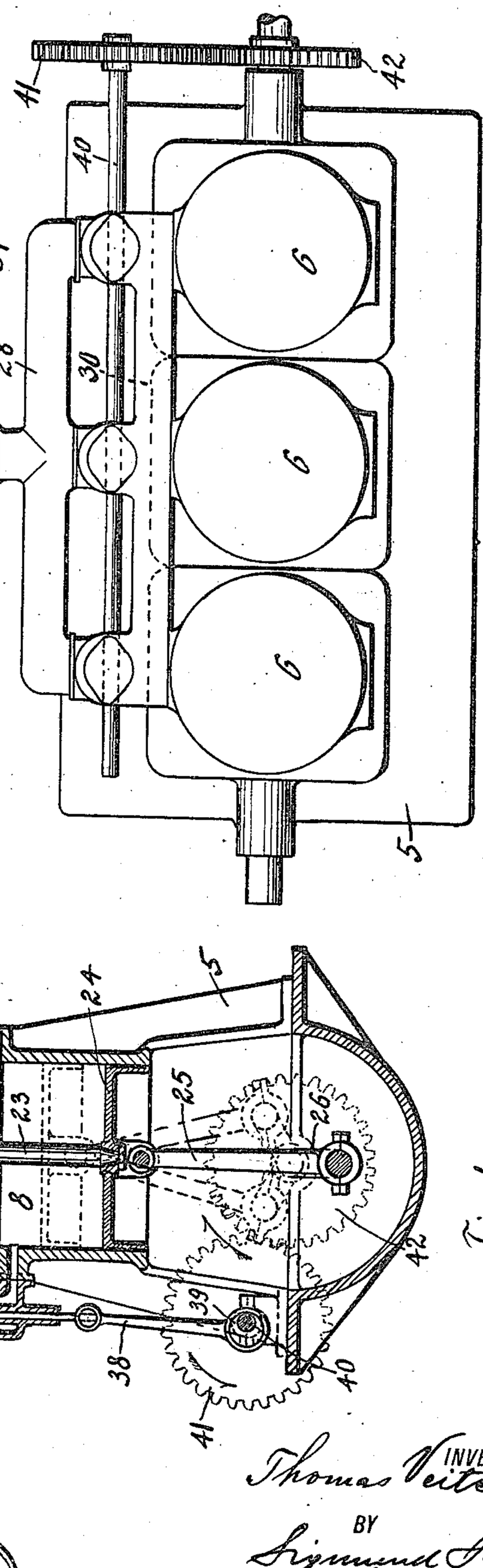

Fig. 2

Fig. 1.

WITNESSES

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INTERNAL-COMBUSTION ENGINE.

975,809. Specification of Letters Patent. **Patented Nov. 15, 1910.**

Application filed May 18, 1909. Serial No. 496,842.

To all whom it may concern:

Be it known that I, THOMAS VEITCH, a citizen of the United States, and resident of Dumont, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

The present invention relates to improvements in internal combustion engines, and more particularly to two cycle double-acting engines, that is to internal combustion engines working on a two-stroke cycle and in which successive burned charges act upon opposite sides of a single piston reciprocating in a single cylinder, whereby the working piston is impelled alternately in each direction.

One of the objects of the present invention is to provide an engine of the character specified in which the working and pump cylinders are located coaxially, and the working and pump pistons whereof form a single rigid structure in such a manner that each double-acting working piston is provided with a single single-acting pump piston.

Another object of the invention is to provide an engine of the character specified, the working cylinders whereof, including their compression spaces, are thoroughly and completely scavenged by the new charge forced into the same.

Still another object of the invention is to provide a single means for each combined working and pump cylinder, which controls the inflow of the charge from the charge forming device or atmosphere to the pump cylinder and at the same time from the pump cylinder into a distributing chamber, common to all of the working cylinders.

Other objects of the invention will be apparent from a reading of the specification and an examination of the drawings, forming part of the present application for Letters Patent.

With these and other objects in view, the invention consists in the combination and arrangement of the several parts thereof, as will be hereinafter more fully described and pointed out in the appended claims.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section of an engine, constructed in accordance with the present invention, in a plane through the center of one of the cylinders, Fig. 2 is a top plan view of the engine, Fig. 3 is a detail of construction of one of the valves, and Fig. 4 is a modification of said valve.

The frame of the engine is shown at 5 and supports the cylinders 6, 6. These cylinders may be termed "combined working and pump cylinders," the working portions 7 of which are of less diameter than the pump portions 8. The working portions 7 are, in the case illustrated in the drawings, composed of a plurality of sections, such as the top section 9, the central section 10 and the bottom section 11. These sections are provided with the usual water-jacket 12, for a well known purpose. Obviously if air cooling is desired, there may be provided instead of the water-jacket the usual ribs in any preferred manner. As the engine is of the double acting type, it is obvious that the working cylinders are closed at both ends. The central section 10 of the working cylinders consists of a ring provided with the inlet ports 13 and 14 and the exhaust ports 15 and 16; ports 13 and 15 serving for the working space above the pistons, while the ports 14 and 16 serve for the working space below the pistons. In the inner wall of the central section 10, and between the inlet- and exhaust-ports, is arranged a circular groove 17, connected in a manner, not shown in the drawings, with an outside supply of lubricating oil. Ignition devices 18 and 19 for the combustible mixture are arranged near to the upper and lower ends of the working cylinders, respectively.

The working pistons of the engine are indicated at 20, 20, closed at both ends, and provided with the usual packing rings 21, 21, near to their upper and lower ends, and with baffle plates 22, 22, upon their tops and bottoms. The piston rods 23, 23 extend through the bottoms of the working cylinders and carry upon their lower ends pump pistons 24, 24, working in the pump cylinders 8. The pump pistons are connected by connecting rods 25, 25, with the cranks 26, 26 of the crankshaft. It will be observed that the pump pistons serve thus at the same time as cross heads for well known purposes.

As for each working cylinder, which in reality corresponds to two cylinders of a single-acting engine, there is provided one

pump cylinder, it is obvious that the volume of combustible mixture, forced by the pump pistons in a manner, hereinafter to be described, into the common distributing chamber, must be substantially twice the volume required in each working cylinder. The area of each pump piston must, therefore, not only be twice the area of each working piston, but substantially larger, so that the burnt gases may be entirely expelled from the working cylinders including also their compression spaces. As the compression space occupies about 30% of the total cylinder volume, an engine, constructed in accordance with the present invention, has a greater power factor of this percentage than either a four-cycle engine or crank compression two-cycle engine of the same dimensions. Of course, when pure air alone is furnished to the working cylinders, and the fuel injected by some means, the proportion between the volumes of the pump cylinders and working cylinders may be even larger than 30%, so that the air in excess of the normal proportion would tend to thoroughly scavenge the working cylinders and by escaping through the exhaust ports carry away a certain amount of heat, and tend to fill these ports.

The charge forming device of the engine is indicated at 27 and is connected to a supply chamber 28, common to all of the cylinders of the engine. The supply chamber communicates through valve controlled passages with a distributing chamber 30, common to all of the working cylinders of the engine. This distributing chamber is piston controlled and may communicate through the inlets 13 and 14, respectively, with the working chambers above and below the pistons. The supply chamber 28 is also connected by means of passages 31, 31 with the pump pistons 8, 8 of the engine.

The communications between the supply chamber and the pump pistons and distributing chamber 30, respectively, are controlled by piston-valves 32, 32. These valves operate in cylindrical chambers 33, 33, provided with circular ports 34, leading from the supply chamber to the passages 31, and with circular ports 35, leading from the passages 31 to the distributing chamber 30. The chambers 33, 33 are closed at their upper ends by covers 36, 36. In alternating the piston valves 32, 32, communications may be opened and closed between the supply chamber and the pump pistons and between the pump pistons and distributing chamber, in a manner hereinafter to be described.

Each piston-valve consists, preferably, of a tubular member open at both ends, and connected by means of valve-rods 37, 37, to pitmen 38, 38, upon the other ends of which operate eccentrics 39, attached to a shaft 40, which is rotated, for instance, by means of gears 41 and 42 from the crankshaft of the engine, and, particularly in the case illustrated in the drawings, at the speed of the crankshaft.

In operation of the engine, when a valve 32 opens a communication between the supply chamber and a passage 31, the combustible charge is introduced into the supply chamber 28, and thence to a pump cylinder. On the upward stroke of a piston, the combustible mixture of the pump cylinder is transferred through the corresponding passage 31 into the distributing chamber 30, and will thus be introduced into a working space. The piston within the combustion chamber compresses then the charge, ignition takes place and the piston is driven forward. The cycle of operation is then repeated. Obviously the parts must be assembled in such a manner that during the downward stroke of a piston, its corresponding piston-valve 32 opens a communication between the supply chamber and its corresponding pump cylinder, while during the upward stroke of the piston, the corresponding valve 32 opens a communication between the pump piston and the distributing chamber.

A modification of the slide-valve is illustrated in Fig. 4 of the drawings, in which a tubular member 43 is shown, having ports 44, 44, and being provided with a partition 45 above said ports. The space between this partition and the cover 36′ of the chamber 33 is in communication through an opening 46 in the cover with the atmosphere. A spring 47, bearing against the cover 36′ and the partition 45 of the valve, tends to hold the said valve in its central position, that is in a position where the communications between the passages 31 and the supply chamber 28 and distributing chamber 30, respectively are closed. This valve is operated automatically by the engine, more particularly during the downward stroke of the corresponding piston of the valve, the suction will operate the valve so that the ports 44 thereof register with the passage 34, whereby a communication is opened between the supply chamber and the pump cylinder, and during the upward stroke of the piston the pressure in the passage 31 lifts the valve against the atmospheric pressure, existing in the chamber 33 above the partition 45, so that the ports 44 of the valve register with the passage 35, whereby a communication is opened between the pump cylinder and the distributing chamber 30. Obviously as soon as the suction or pressure, respectively, ceases, the spring 47 tends to bring the valve into its normal position, whereby all the communications are closed. Attention is called to the fact that the stroke of the pistons in the cylinders is such that the

oil groove 17 is never uncovered by the said pistons, so that the oil does not come into contact with the new charge or the products of combustion of the same.

What I claim is:

1. In a double acting internal combustion engine, the combination with a plurality of working cylinders, of a piston operating in each cylinder and dividing the same into two combustion chambers, a pump cylinder located co-axially with each working cylinder, a single acting piston operating in each pump cylinder and being rigidly connected with its corresponding working piston, and a communicating passage from all of said pump cylinders to all of said combustion chambers.

2. In a double acting internal combustion engine, the combination with a plurality of working cylinders, of a piston operating in each cylinder and dividing the same into two combustion chambers, a pump cylinder located coaxially with each working cylinder, a single acting piston operating in each pump cylinder, a piston rod connecting each pump piston with its corresponding working piston, and a communicating passage from all of said pump cylinders to all of said combustion chambers.

3. In a double acting internal combustion engine, the combination with a plurality of working cylinders, of a piston operating in each cylinder and dividing the same into two combustion chambers, a pump cylinder located coaxially with each working cylinder, a single acting piston operating in each pump cylinder and being rigidly connected with its corresponding working piston, a supply chamber adapted to communicate with all of said pump cylinders, a distributing chamber, a passage for each pump cylinder leading from said distributing chamber to said pump cylinder, means in each passage for controlling the communications between said supply chamber and pump cylinder and said pump cylinder and distributing chamber, and a piston controlled passage leading from each combustion chamber to said distributing chamber.

4. In a double acting internal combustion engine, the combination with a plurality of working cylinders, of a piston operating in each cylinder and dividing the same into two combustion chambers, a pump cylinder located coaxially with each working cylinder, a single acting piston operating in each pump cylinder and being rigidly connected with the corresponding working piston, a supply chamber adapted to communicate with all of said pump cylinders, a distributing chamber, a passage for each pump cylinder leading from said distributing chamber to said pump cylinder, a single valve in each passage for controlling the communications between said supply chamber and pump cylinder and said pump cylinder and distributing chamber, and a piston controlled passage leading from each combustion chamber to said distributing chamber.

5. In a double acting internal combustion engine, the combination with a plurality of working cylinders, of a piston operating in each cylinder and dividing the same into two combustion chambers, a pump cylinder located coaxially with each working cylinder, a single acting piston operating in each pump cylinder and being rigidly connected with the corresponding working piston, a supply chamber adapted to communicate with all of said pump cylinders, a distributing chamber, a passage for each pump cylinder leading from said distributing chamber to said pump cylinder, mechanically operated means in each passage for controlling the communications between said supply chamber and pump cylinder and said pump cylinder and distributing chamber, and a piston controlled passage leading from each combustion chamber to said distributing chamber.

6. In a double acting internal combustion engine, the combination with a plurality of working cylinders, of a piston operating in each cylinder and dividing the same into two combustion chambers, a pump cylinder located coaxially with each working cylinder, a single acting piston operating in each pump cylinder and being rigidly connected with the corresponding working piston, a supply chamber adapted to communicate with all of said pump cylinders, a distributing chamber, a passage for each pump cylinder leading from said distributing chamber to said pump cylinder, a mechanically operated valve in each passage for controlling the communications between said supply chamber and pump cylinder and said pump cylinder and distributing chamber, and a piston controlled passage leading from each combustion chamber to said distributing chamber.

Signed at New York, in the county of New York and State of New York, this 13th day of May, A. D. 1909.

THOMAS VEITCH.

Witnesses:
SIGMUND HERZOG,
S. BIRNBAUM.