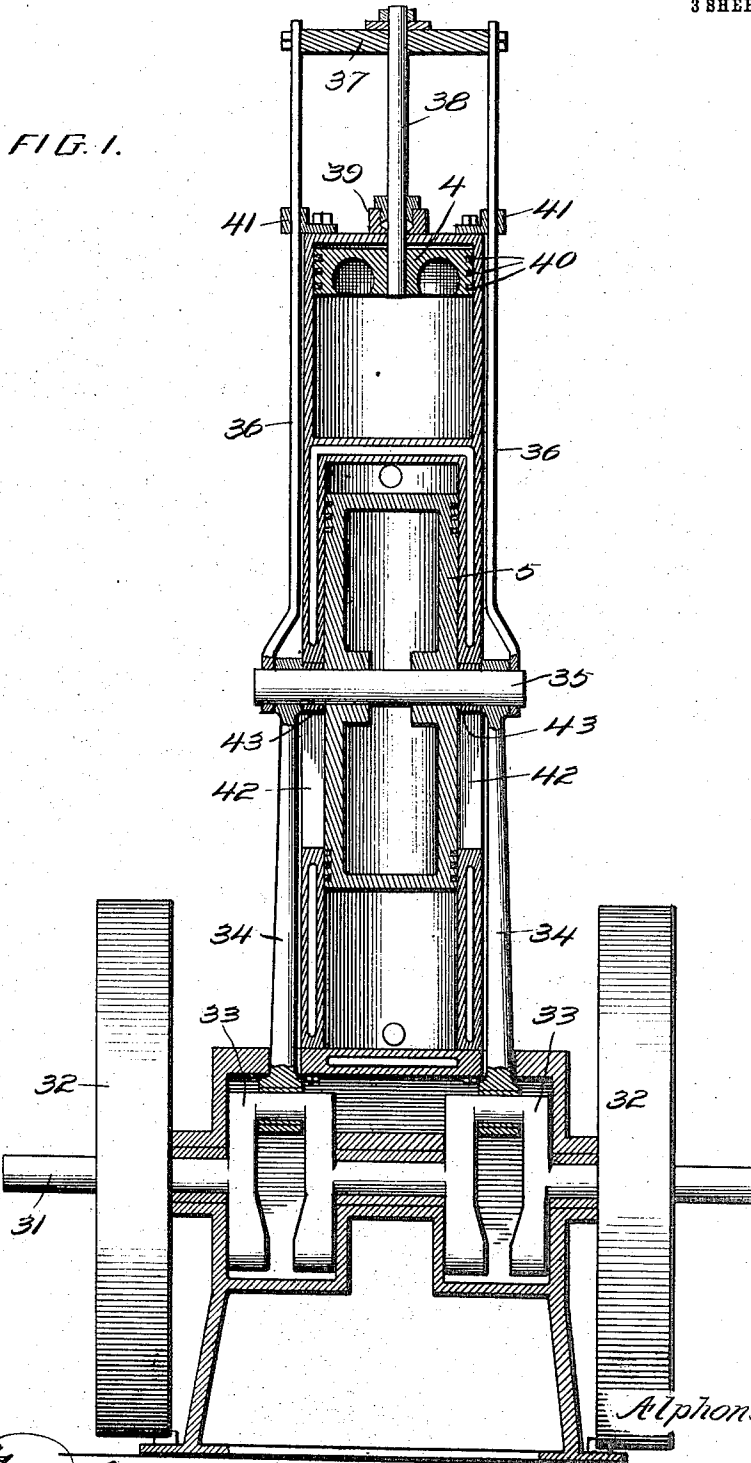


A. BUTSCH.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED OCT. 1, 1909.

966,309.

Patented Aug. 2, 1910.

3 SHEETS—SHEET 1.



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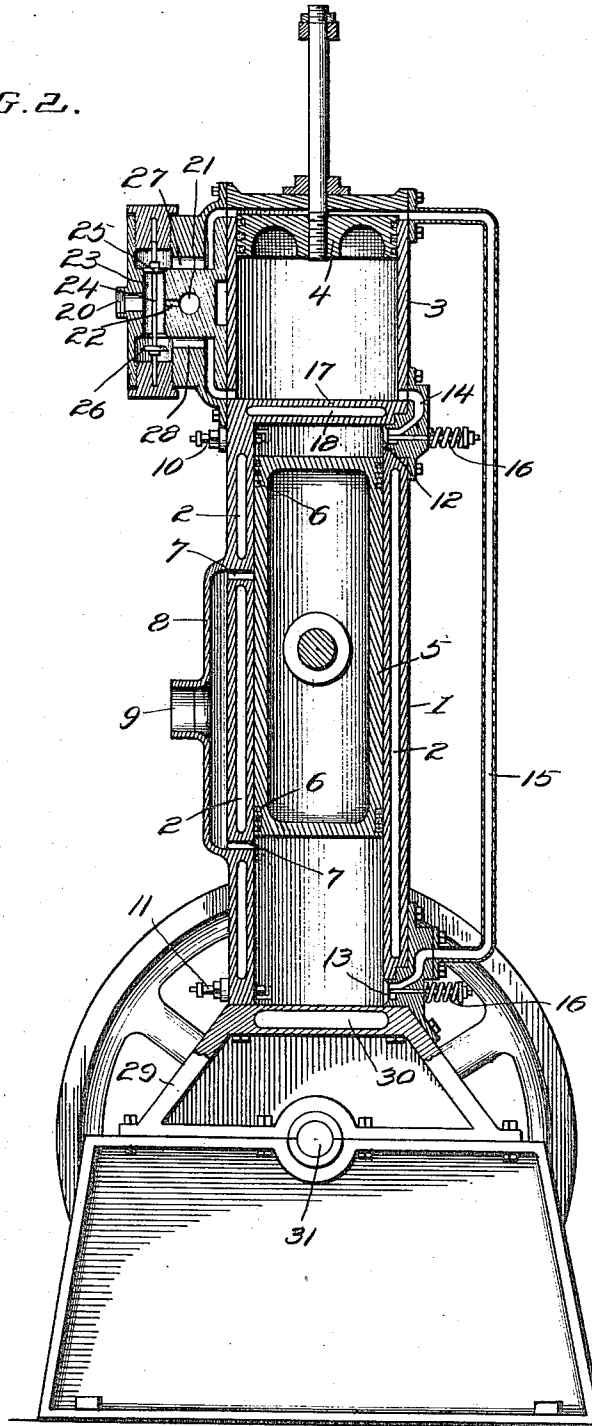
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3 SHEETS—SHEET 2.

FIG. 2.



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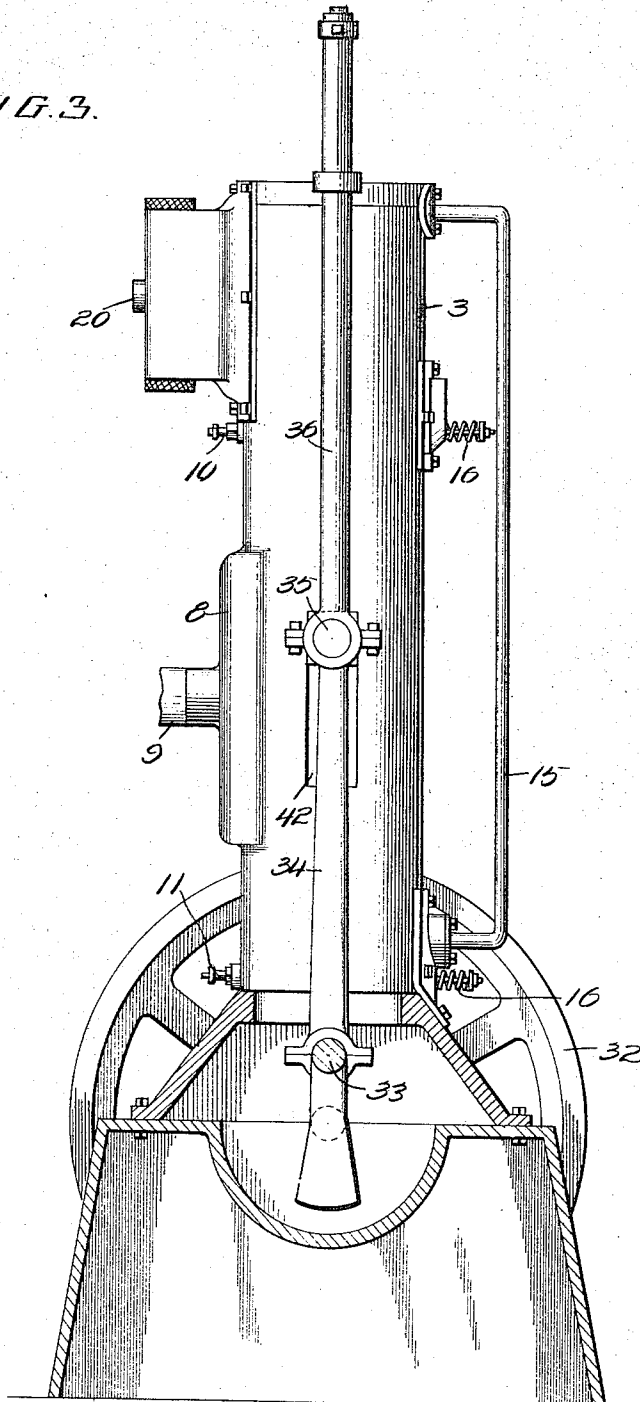
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3 SHEETS—SHEET 3.

FIG. 3.



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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

966,309.

Specification of Letters Patent.

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Application filed October 1, 1909. Serial No. 520,473.

To all whom it may concern:

Be it known that I, ALPHONSE BUTSCH, a subject of the King of Great Britain, residing at St. Lucia, British West Indies, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines, the object of the present invention being to provide what is known as a double acting engine or in other words an engine in which the explosive force of the charge acts alternately on opposite ends of the piston whereby two active strokes are provided for in each complete cycle of operation of the engine thereby giving greater power and by dispensing with the fly wheel or reducing the size thereof, materially decreasing the total weight of the engine.

A further object is to provide a construction which will insure a scavenging of the cylinder thereby producing greater efficiency due to the purer and denser charges of mixture. In the engine hereinafter particularly described the majority of the moving parts of the engine are arranged externally where they are accessible and may be easily oiled and inspected from time to time. There is also a complete absence of cams, cam rods, lifting rods and other mechanical appliances used in four-cycle engines thereby greatly simplifying the construction and making the engine durable and reliable. The construction also avoids irregular wear on the piston and cylinder walls; furthermore there is an absence of trouble by preventing leakage and also an absence of base explosions. The engine is also adapted to be run in either direction which particularly adapts the engine for marine purposes, the engine being reversed by simply adjusting or reversing the timer which controls the ignition.

With the above and other objects in view the invention consists in the novel construction, combination and arrangement of parts herein fully described, illustrated and claimed.

In the accompanying drawings:—Figure 1 is a longitudinal section through a vertical internal combustion engine embodying the present invention. Fig. 2 is a like section taken at right angles to Fig. 1. Fig. 3 is a side elevation of the engine from the same point of view as Fig. 2.

1 designates the engine cylinder which is water-jacked as shown at 2 and which has

cast integrally therewith, by preference, a charging or pump chamber 3 in which works a reciprocatory charging or pump piston 4.

5 designates the main piston which is double ended; that is to say the piston 5 is closed at both ends and is provided adjacent to each end with piston rings 6 of any suitable number.

The cylinder 1 is provided with exhaust ports 7 so located as to be unmasked by the piston 5 just before it reaches the limit of its movement in either direction. These exhaust ports 7 communicate with a single manifold 8 provided with an exhaust orifice 9. Adjacent to its opposite ends, the cylinder is equipped with spark plugs 10 and 11 and opposite said spark plugs are arranged intake valves 12 and 13, the valve 12 controlling a passage 14 communicating with the adjacent end of the charging chamber 3 while the intake valve 13 controls the discharge end of a pipe 15 which leads to the upper end of the charging chamber 3 as best illustrated in Fig. 2. The intake valves 12 and 13 are shown as held seated by means of springs 16 which embrace the outwardly projecting stems of said valves as clearly shown in Fig. 2.

The charging chamber 3 is divided from the main body of the cylinder by means of an intervening wall or cylinder head 17 which is water-jacked as shown at 18. At one side of the charging chamber 3 there is arranged a vaporizer comprising an air inlet orifice 20, a gasolene inlet orifice 21 having a port 22 arranged directly opposite the air inlet orifice 20 and a vaporizing and mixing chamber 23 in which the opposed currents of air and gasolene meet in opposition to each other thus insuring the atomizing or vaporization of the gasolene. The vaporizer or mixing chamber 23 is controlled by a double valve embodying a stem 24 having fast thereon two valves 25 and 26 arranged at a greater distance apart than the valve seats formed at opposite ends of said vaporizing or mixing chamber 23. These valves act as check valves during each cycle of operation of the engine and control the passages 27 and 28 which lead into the charging or pump chamber 3 at opposite ends thereof as clearly shown in Fig. 2.

The cylinder is mounted upon a suitable crank case or base 29 which is preferably water-jacked as shown at 30.

31 designates a crank shaft on which one

or more fly wheels 32 are mounted, said shaft embodying parallel cranks 33 to which are attached connecting rods 34 arranged at opposite sides of the cylinder and connected at their opposite ends to a wrist pin 35 extending centrally through the main piston 5 and projecting on opposite sides of said piston. The connecting rods 36 extend from the pin 35 to a cross head 37 fast on the outwardly projecting stem 38 of the charging or pump piston 4 above referred to.

39 designates a stuffing box through which the stem 38 operates. The pump piston 4 is also provided with the usual piston rings 40.

41 designates guides through which the rods 36 slide.

By reference to Fig 1 it will be seen that the main cylinder is provided at diametrically opposite points with slots or guideways 42 extending lengthwise thereof but not far enough to uncover the piston rings of the main cylinder. The wrist pin 35 passes through bearing boxes 43 mounted to slide lengthwise of the slots 42 and these bearing boxes sustain the lateral thrust on the piston 5 ordinarily produced by the angularity of the connecting rods 34 as the lower ends thereof follow the sweep of the cranks 33 of the crank shaft, thereby adding materially to the life and durability of the engine.

The operation of the engine may be described as follows: Starting with the main piston 5 in the position shown in Fig. 2, a charge of gas has just been exploded in the lower end of the cylinder and the lower exhaust port 7 has been unmasked in the upward movement of the piston so as to allow the burnt gases to pass into the manifold 8 and outward therefrom. Just at this moment the intake valve 13 opens and allows a fresh charge of mixture forced through the pipe 15 by the action of the pump piston 4 to enter the lower end of the cylinder and force out the burnt gases and at the same time charge the cylinder with fresh gas. The piston then returns, compressing said charge of gas in the lower end of the cylinder whereupon it is fired by the plug 11. As the piston descends it uncovers the upper exhaust port 7 and the valve 12 is opened thereby admitting gas under pressure from the charging chamber 3 into the upper end of the cylinder. Then in the return or upward movement of the piston the valve 12 closes and the gas is compressed in the upper end of the cylinder and subsequently fired by the plug 10. The piston 4 moves simultaneously with the piston 5 and in moving downward it sucks mixture through the passage 27 and in so doing lifts

the valve member 25 of the double valve described. At the same time, the lower valve 26 is closed by pressure against the same and the charge in the chamber 3 is forced through the passage 14 into the upper end of the main cylinder 1. In the upward or return movement of the piston 4, said piston sucks the mixture into the chamber 3 through the passage 28 and past the valve 26 while said piston also acts to close the valve 25 by forcing the gas through the passage 27, the gas being also forced through the pipe 15 into the lower end of the main cylinder 1 for the purpose above set forth. Thus two active strokes are produced in each complete cycle of operation of the engine.

I claim:—

1. A double acting internal combustion engine embodying a main cylinder, a charging cylinder formed integrally therewith, a double ended main piston working in the main cylinder, a wrist pin carried by said piston and projecting at opposite ends laterally beyond the piston and working in slots extending lengthwise of the main cylinder, a charging piston working in the charging cylinder, connections on the outside of the cylinder for causing the simultaneous reciprocation of said pistons, a crank shaft, and connecting rods interposed between the crank shaft and said wrist pin and arranged exteriorly of the cylinder, substantially as described.

2. A double acting internal combustion engine embodying a main cylinder, a double ended piston working therein, a charging cylinder formed integrally with the main cylinder and divided from the latter by an intervening wall, a charging piston working in the charging cylinder, means for causing a simultaneous reciprocation of both pistons, a vaporizing valve casing having passages connecting with opposite ends of the charging cylinder, a mixing chamber in said valve casing having gasolene and air inlet ports arranged in opposition to each other, and a double valve embodying a stem and valve members fast thereon and located at a distance apart greater than the valve seats which they occupy, the said double valve being operated by the suction and pressure effected by the reciprocatory movements of the charging piston.

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

ALPHONSE BUTSCH.

Witnesses:

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