G. F. SWAIN.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED JAN. 28, 1909.

1,000,128.

Patented Aug. 8, 1911.

2 SHEETS—SHEET 1.

Fig. 1

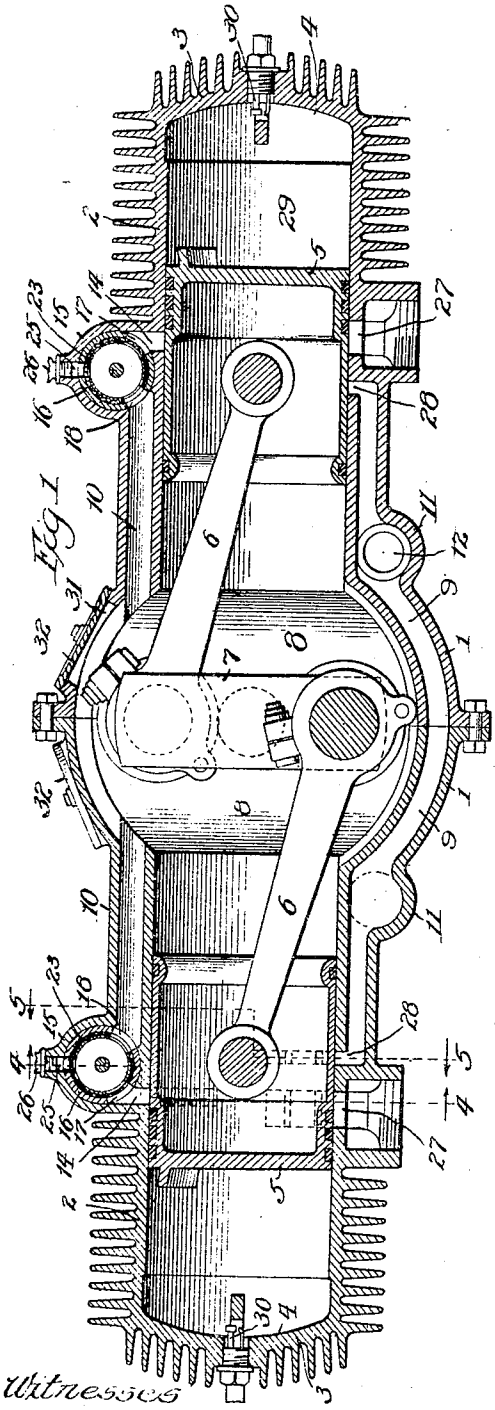
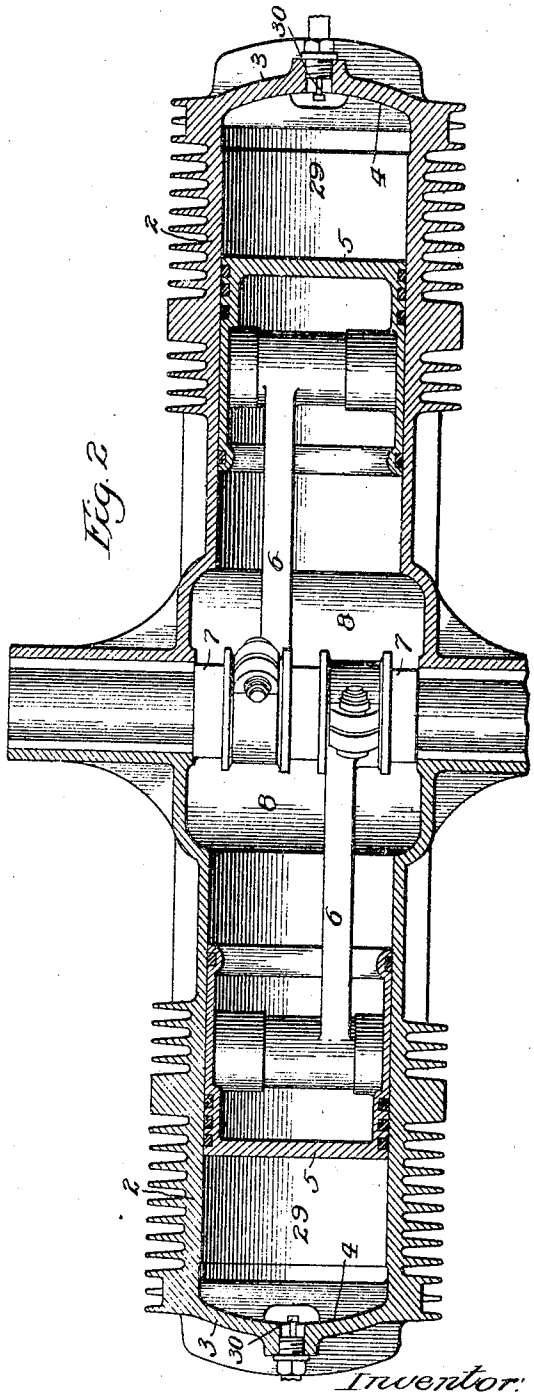


Fig. 2



Witnesses

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2 SHEETS—SHEET 2.

Fig. 3.

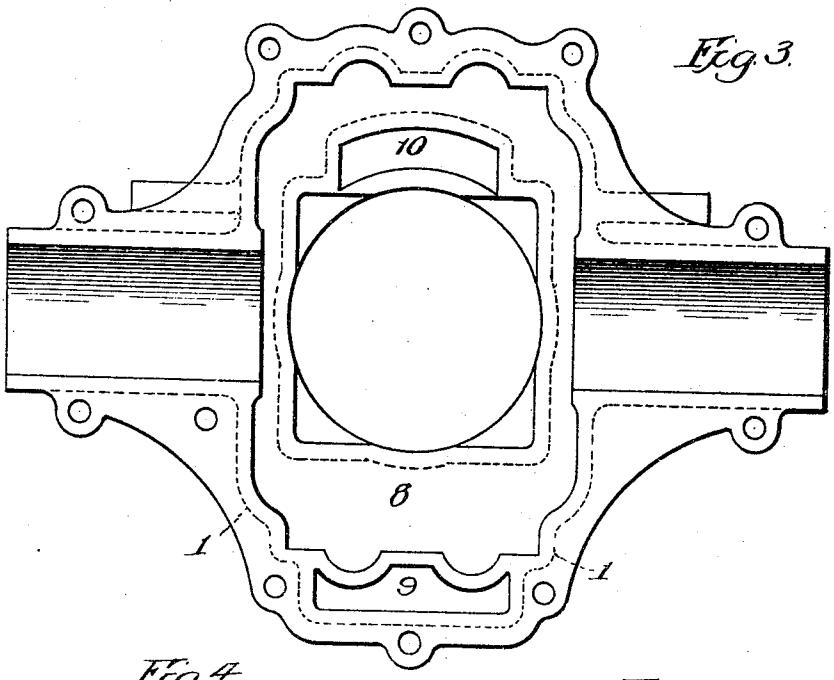


Fig. 4

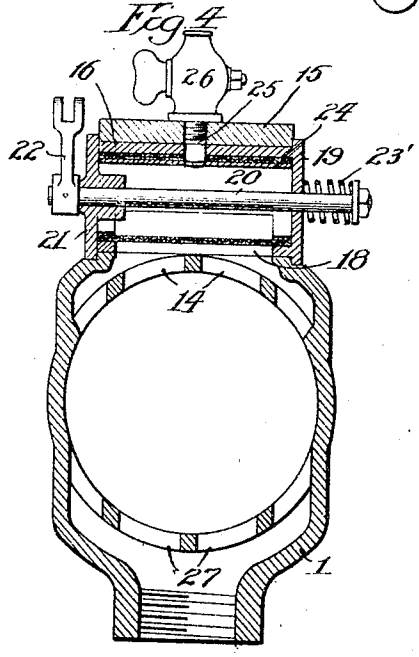
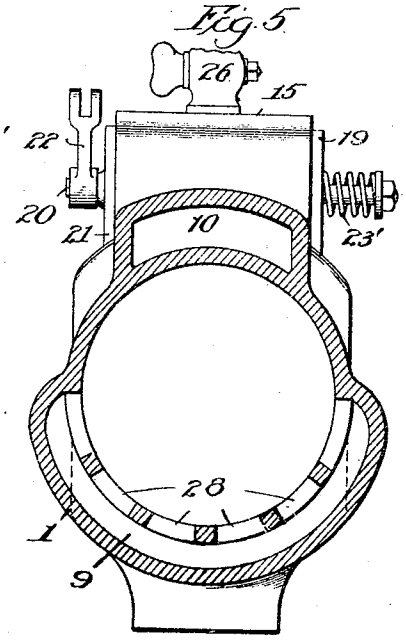


Fig. 5.



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UNITED STATES PATENT OFFICE.

GEORGE F. SWAIN, OF CHICAGO, ILLINOIS.

INTERNAL-COMBUSTION ENGINE.

1,000,128. Specification of Letters Patent. Patented Aug. 8, 1911.

Application filed January 28, 1909. Serial No. 474,836.

To all whom it may concern:

Be it known that I, GEORGE F. SWAIN, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Internal-Combustion Engines, of which the following is a full, clear, concise, and exact description.

This invention relates to an internal combustion engine, and its object is to provide an engine of this character, of a simple and inexpensive nature, and of a compact, strong and durable construction, which can be quickly assembled, and in which the various ports are cast in the engine casing.

The invention consists of an internal combustion engine in which the cylinder is cast integral with the crank casing base, the casting having formed therein the requisite passages for admitting gas to the compression chamber and from thence to the engine cylinder.

The invention further consists in certain novel features of construction, combination and arrangement of the several parts of the engine, whereby certain important advantages are attained, and the device is rendered simpler, and cheaper, and adapted to being quickly and easily assembled, as will hereinafter be more fully set forth.

The several features of my invention may be more clearly understood by reference to the accompanying drawings, in which—

Figure 1 is a sectional view taken axially through the cylinder, piston and crank casing of the engine; Fig. 2 is a similar section, taken at right angles to Fig. 1; Fig. 3 is a plan view of the crank casing; Fig. 4 is a transverse section on the line 4—4 of Fig. 1; and Fig. 5 is a transverse section on the line 5—5 of Fig. 1.

Similar reference characters are used to designate similar parts wherever shown.

My invention is preferably embodied, as shown in the drawings, in a double, opposed engine, the two halves of which are similar and interchangeable. Each half is in the form of an integral casting, consisting of a base 1, comprising one half of the crank casing, and a cylinder 2 having a cylinder head 3 which is preferably concave on its inner side. The piston 5 plays in the bore of the cylinder 2, said piston being connected in the usual manner by a connecting rod 6 with a crank 7 turning in the compression chamber 8.

Heretofore it has been customary to cast the cylinder and the crank casing in separate parts, and subsequently to bolt these parts together. It has also been customary to machine such parts and then bolt thereto the several ports necessary for introducting gas to the compression chamber, and from thence to the engine cylinder. Therefore, to produce a double, opposed engine, it has heretofore been customary to bolt together four distinct castings, with three meeting surfaces, and then to secure to the outer walls thereof parts provided with the required passages for the gas. In the case of my engine, however, only two castings are required, which are identical in structure, and are assembled merely by bolting together the flanges about their abutting bases, said castings having produced in their own walls the requisite passages for the gas. As shown most clearly in Figs. 1 and 3, each casting is provided in one side of its wall with a passage 9, which extends from the lower edge of the base through the wall to the compression chamber 8. When the two parts of the casting are bolted together, the passages 9 of the two halves form a continuous feed-supply passage connecting approximately the middle portion of the interior of the cylinders 2. Each casting is provided with a boss 11 through which the passage 9 extends. By boring an opening, as at 12, in one or the other of the bosses 11, as may be desired, an inlet is provided for the admission of gas to the fuel supply passage 9. The wall of each casting is also provided with a passage 10 which extends from the interior of the base of the casting down the wall of the cylindrical portion thereof. The passages 10 connect with the interior of the crank casing, and form passages for conducting the gas from the compression cham-

ber 8 to the inlet port 14, from which latter port the gas upon the return stroke of the piston 5 is admitted to the cylinder back of the same.

Integral with the casing is a cylindrical, hollow boss 15, open at each end (see Figs. 1, 4 and 5). Located upon the interior of this boss is a rotatable cylindrical valve 16 having longitudinal slots 17 and 18, respectively, which normally communicate with the inlet port 14 and the passage 10 respectively. The cylindrical valve 16 fits tightly in the bore of the boss 15, and has a closed bottom 19 which is bored axially to receive the pin 20. The open end of the cylinder 16 is closed by a cover 21 through which the pin 20 also extends, the outer end of said pin being secured to a crank 22. A spring 23′ at the opposite end of the pin 20 serves to hold the cover 21 securely in place, so as to close the opening in the end of the cylinder 16. Therefore, to control the admission of gas to the engine, it is only necessary to operate the crank 22. Each half of the casing is provided with these valves 16, and the cranks 22 which control their position may obviously be connected, if desired, so as to be moved simultaneously.

In order to prevent back ignition from the combustion chamber of the engine through the port 14, a cylindrical wire gauze or similar screen may be inclosed upon the interior of the valve 16 to cover said port. Said gauze is preferably cut away at the port 18 in order not to obstruct the flow of gas through such opening. If desired, the gauze 23 may lie between the walls of the cylinder 16 and the outer surface of a cylinder 24 fitting within the cylinder 16 and serving to hold the gauze in place. The cylindrical boss 15 is preferably pierced at 25, and the opening closed by a stop cock 26.

Diametrically opposite to the inlet port 14 is the exhaust port 27. Both the port 14 and the port 27 are controlled in the usual manner by the piston 5. The openings 28 at the end of the passages 9 communicating with the compression chamber 8 back of the forward positions of the pistons 2, are open in the forward position of said pistons to admit gas into the compression chamber. The gas from this compression chamber passes through the passage 10, valve 16, port 14, into the ignition chamber 29, where it is ignited from the spark plug 30. At the end of the backward movement of the piston 5 the exhaust gases pass out through the exhaust port 27, while the charge within the chamber 29 is renewed through the port 14.

In order to provide access to the crank shaft 7, the casting is provided with an opening 31 which is closed by a removable cover 32. The opening 31 is placed at one side of the axial center of the casting, and hence when two of such castings are assembled, as shown in Fig. 1, with their bases opposed to each other, and their corresponding passages 9 and 10, respectively, in alinement, an opening is provided on each side of the axial center of the engine, thus giving access to the connections to the crank shaft of each of the connecting rods 6.

It will thus be apparent that I provide a casting in which the several ports are located within the casting itself, and that hence the usual machining of the casting and the bolting thereto of additional parts providing for such ports is rendered unnecessary. To prepare the casting for its intended purpose, it is merely necessary to drill in the casting a few required openings and to bolt two of the castings together at their bases.

I claim:

1. In an internal combustion engine, the combination with two castings providing oppositely arranged engine cylinders having an interposed crank-chamber, of oppositely arranged pistons reciprocating in said cylinders, the walls of each of said castings being provided with a longitudinal passage leading from the crank-chamber and, at the end of the passage, with an inlet port to the cylinder adapted to be opened and closed by the piston, the walls of said castings being further provided with passages therein adapted, when the castings are assembled, to form a continuous fuel-supply passage communicating at its opposite ends with the crank-chamber through openings arranged to be controlled by said pistons, each of said cylinders being further provided with an outlet port adapted to be opened and closed by the corresponding piston.

2. An internal combustion engine comprising two similar hollow castings having closed heads and open bases, the two bases being secured together in opposed relation to provide a combined compression chamber and crank casing, each casting consisting of an elongated body portion having a cylindrical bore and a hollow enlarged base integral with said body portion, said cylindrical bore being provided on opposite sides with an inlet and an outlet port, respectively, the walls of said castings being further provided each with a passage therein extending from an intermediate point of said cylindrical bore to the end of the castings and there communicating with each other, and an additional passage extending from the interior of the base to said inlet port, whereby, when two of said castings are secured together with their corresponding passages in alinement, a continuous passage for admission of gas to the compression chamber extends from one cylinder to the other through the walls of said castings; crank mechanism mounted in said crank casing;

and double opposed pistons operatively connected to said crank mechanism and working in said cylindrical bores, said pistons controlling the admission of gas to the compression chamber and also controlling said inlet and outlet ports to the gas ignition chamber.

In witness whereof, I hereunto subscribe my name this 21st day of January, A. D., 1909.

GEORGE F. SWAIN.

Witnesses:

GEORGE E. FOLK,

ALFRED H. MOORE.