C. W. FOSTER.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED FEB. 23, 1910.

972,841. **Patented Oct. 18, 1910.**

2 SHEETS—SHEET 1.

Fig. 2.

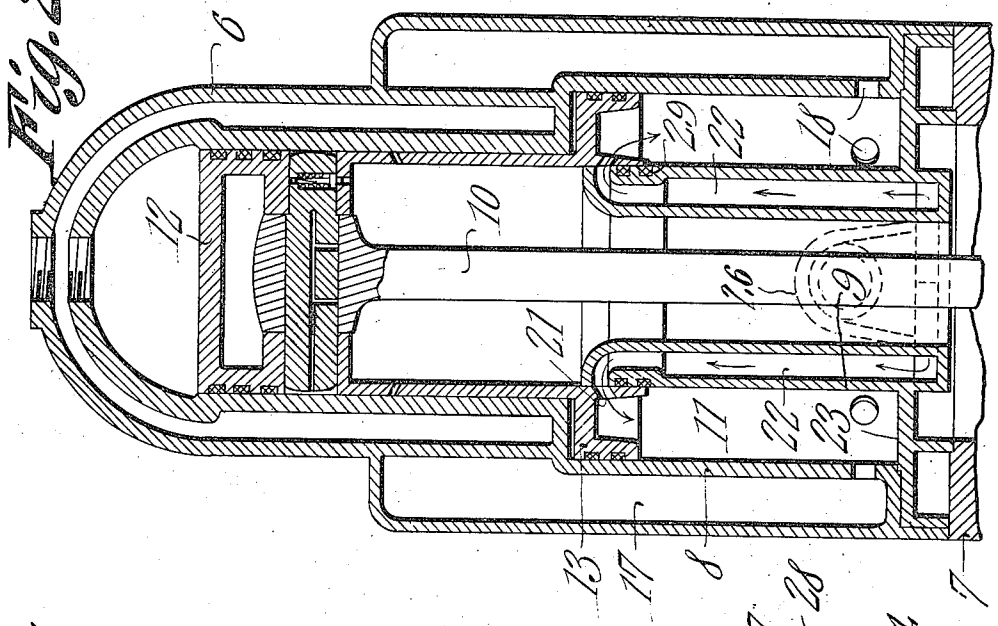
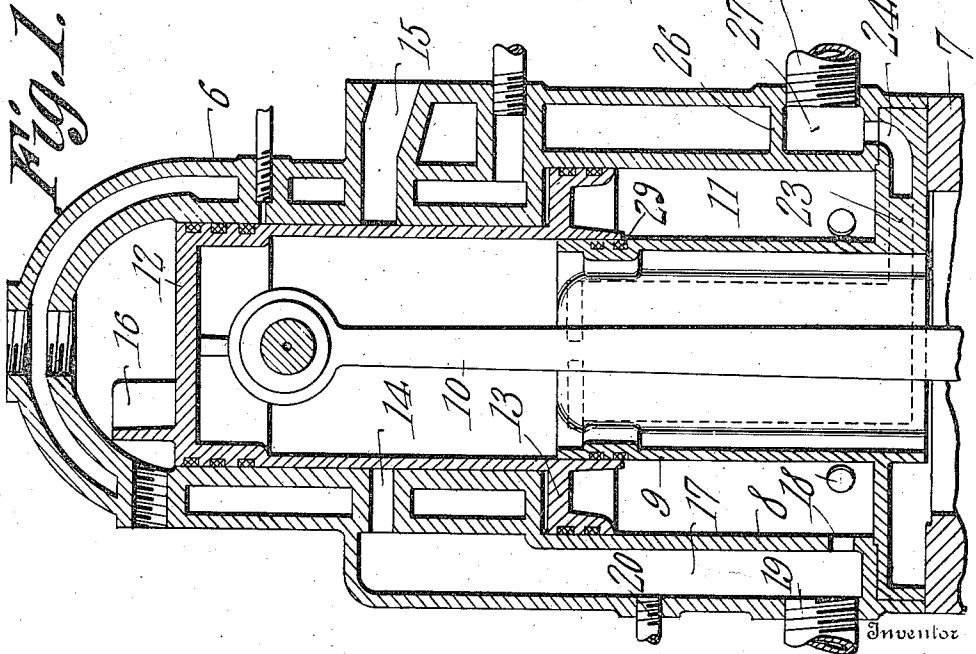


Fig. 1.



Witnesses

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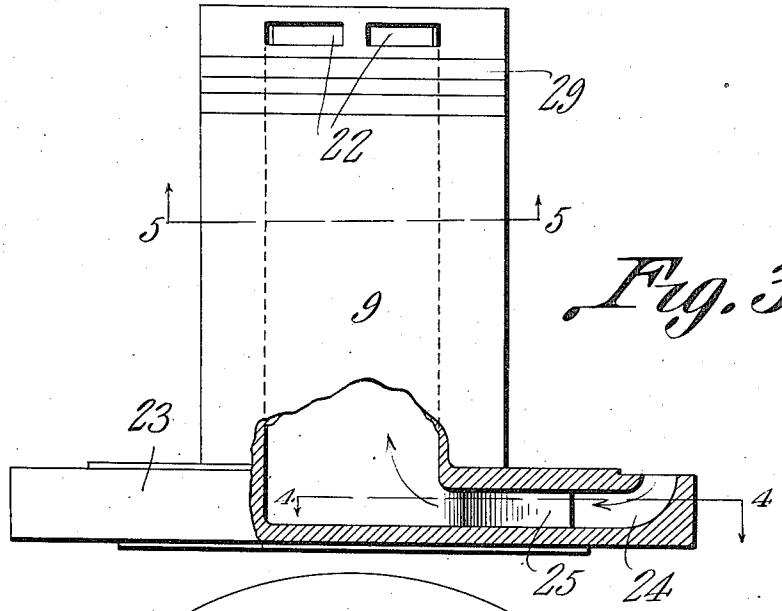

Fig. 3.

Fig. 4.

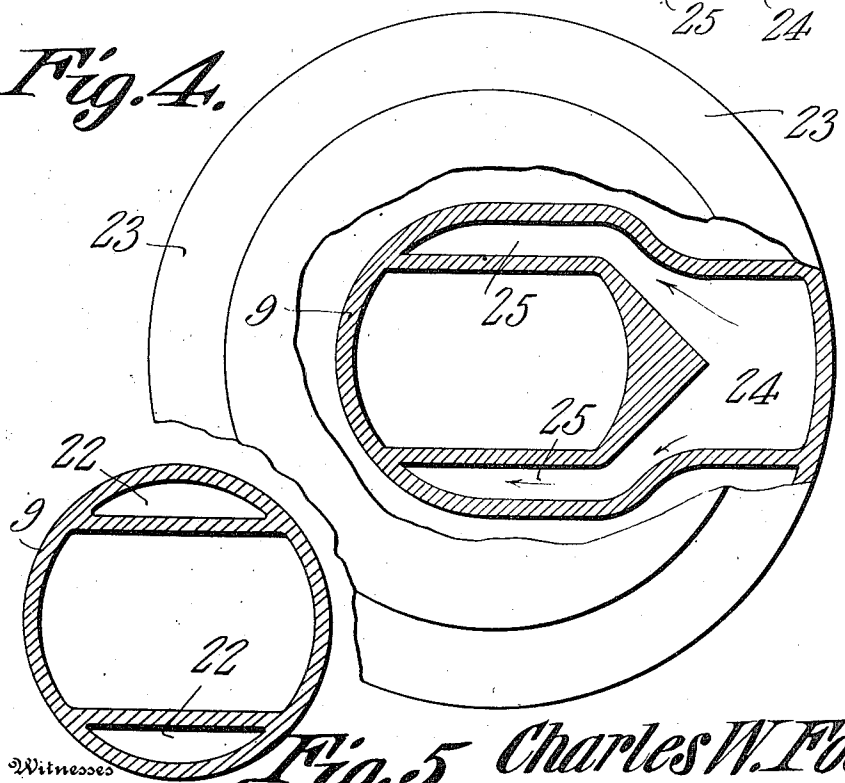

Fig. 5.

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UNITED STATES PATENT OFFICE.

CHARLES W. FOSTER, OF NEW HAVEN, CONNECTICUT.

INTERNAL-COMBUSTION ENGINE.

972,841. Specification of Letters Patent. Patented Oct. 18, 1910.

Application filed February 23, 1910. Serial No. 545,495.

To all whom it may concern:

Be it known that I, CHARLES W. FOSTER, a citizen of the United States, residing at New Haven, in the county of New Haven and State of Connecticut, have invented a new and useful Internal-Combustion Engine, of which the following is a specification.

This invention relates to two-cycle internal combustion engines of that type in which the cylinder and the piston are so constructed and arranged that the latter operates as a working piston as well as the piston of a pump for supplying a fresh charge to the engine.

It is the object of the invention to provide an improved cylinder structure forming a pump or compression chamber, together with a novel arrangement of ports for admitting the charge thereinto, whereby an increased speed and power is obtained.

With these objects in view, the invention consists in a combination and arrangement of parts to be hereinafter described and claimed, reference being had to the accompanying drawings, in which—

Figures 1 and 2 are central vertical sectional views of the engine taken at right angles with respect to each other. Fig. 3 is an elevation, partly broken away, of the cylinder hereinafter referred to. Fig. 4 is a horizontal section on the line 4—4 of Fig. 3. Fig. 5 is a horizontal section on the line 5—5 of Fig. 3.

Referring to the drawings, 6 denotes the cylinder of the engine, the same being mounted on a crank case 7 of which a fragment only is shown, said crank case, as usual, also serving as the engine base. The cylinder is formed at its lower end with an enlargement 8 into which extends a cylinder 9 open at both ends so that the piston rod 10 may pass therethrough. The cylinder 6 is arranged concentrically within the enlargement 8, and spaced from the wall thereof, so as to form an annular compression or pump chamber 11. The upper portion of the cylinder 6 constitutes the working cylinder of the engine.

A piston 12 operates in the working cylinder, and this piston is lengthened so as to extend into the compression chamber 11, the cylinder 9 fitting snugly in the bore of the piston extension, and the lower end of the latter terminating in a head 13 working in the compression chamber 11, and thus forming the pump piston.

In the wall of the working cylinder are inlet and exhaust ports 14 and 15 respectively, which are located in the same horizontal plane, so as to be uncovered simultaneously by the working piston 12 at the end of its outward stroke, as is usual in two-cycle engines. The top of the piston has the usual deflector 16 which comes into position in front of the inlet port when the latter is uncovered.

The compression chamber 11 communicates with a receiver comprising a chamber 17 the walls of which are formed integral with the cylinder 6, and extending entirely or partly around the same. In the wall of the receiver are ports 18 which open into the lower end of the compression chamber 11, on one side of the piston head 13. The compression chamber, on the other side of the piston head, is closed. The inlet port 14 of the working cylinder leads from the upper end of the receiver into said cylinder. The combustible mixture is supplied to the receiver by a pipe 19 entering the same, said pipe leading to a suitable charge forming device (not shown). To the receiver is also connected a lubricant supply pipe 20 which delivers the lubricant thereinto, to be carried with the charge into the working cylinder.

In the extension of the piston 12, below the piston head 13, are ports 21 which open at one end into the compression chamber 11. The other ends of the ports 21, when the piston 12 is at the end of its inward stroke, register with the ends of passages 22 formed in the walls of the cylinder 9, on diametrically opposite sides thereof, and opening through the outer surface of the cylinder. The lower end of the cylinder 9 is formed with an enlargement or base portion 23 which extends across the lower end of the compression chamber 11, and closes said end. In the enlargement 23 is a passage 24 having two branches 25 leading respectively to the passages 22. In the receiver 17, at the lower end thereof, is a partition 26 which forms a chamber 27 closed to the receiver. This chamber is entered by a pipe 28 leading to a charge forming device. The chamber 27 also opens into the passage 24.

In operation, the piston head 13 travels upwardly in the compression chamber 11 on the up stroke of the working piston 12,

whereupon a charge is drawn into the receiver 17 through the pipe 19, and said charge passes through the ports 18 into the compression chamber 11, below the piston head 13. When the piston makes its working stroke, the piston head 13 travels downwardly in the compression chamber, and compresses the charge therein, and the same is forced into the working cylinder through the port 14 when the latter is uncovered by the working piston at the end of its down stroke. At the end of the upward stroke of the piston, the ports 21 register with the outlet ends of the passages 22, and an additional supply of air and gas is let into the compression chamber 11 below the piston head 13. It will be noted that the ports 21 are inclined downwardly, so that this additional charge will be deflected in the same direction.

By the construction and arrangement of parts as described herein, an auxiliary or third port is secured, and the admission of air or gas is mechanically and positively controlled.

The pipes 19 and 28 leading to the charge forming devices will be provided with suitable valves so that either one or both of said pipes may be employed for supplying air and gas to the compression chamber 11. The pipe 19 produces what is termed a two-port system, and the pipe 28 a three-port system. The engine may be operated under either one, or both of these systems.

The outer surface of the cylinder 9 is provided with packing rings 29.

What is claimed is:

1. In a two-cycle internal combustion engine, a working cylinder having an enlargement, a cylinder extending into the enlargement to form an annular compression chamber between the same and said enlargement, said cylinder having passages opening through its side and connected to a charge forming device, a piston in the working cylinder, said piston having an extension fitting on the second mentioned cylinder, with ports in the extension registering with the ends of the aforesaid passages when the piston is at the end of its inward stroke, a head on the piston extension working in the compression chamber, and a receiver opening into said compression chamber, said receiver having a fuel inlet, and an outlet into the working cylinder.

2. In a two-cycle internal combustion engine, a working cylinder having an enlargement, a cylinder extending into the enlargement to form an annular compression chamber between the same and said enlargement, said cylinder being shaped at its lower end to close the corresponding end of the compression chamber, and said cylinder having passages opening through its side, and connected to a charge forming device, a piston in the working cylinder, said piston having an extension fitting on the second mentioned cylinder, and said extension having ports opening into the compression chamber, and registering with the ends of the aforesaid passages at the end of the inward stroke of the piston, a head on the piston extension working in the compression chamber, and a receiver opening into the compression chamber, said receiver having a fuel inlet, and an outlet into the working cylinder.

3. In a two-cycle internal combustion engine, a working cylinder having an enlargement, a cylinder extending into the enlargement to form an annular compression chamber between the same and said enlargement, said cylinder having a base portion extending across the lower end of the compression chamber, and forming a closure for said end, and the wall of said cylinder containing diametrically opposite passages opening through its side, and the base portion of the cylinder having a branched passage connected to a charge forming device, the branches of said passage leading respectively to the first mentioned passages, a piston in the working cylinder, said piston having an extension fitting on the second mentioned cylinder, and said extension having ports opening into the compression chamber, said ports registering with the ends of the aforesaid passages in the cylinder, at the end of the inward stroke of the piston, a head on the piston extension working in the compression chamber, and a receiver opening into the compression chamber, said receiver having a fuel inlet, and an outlet into the working cylinder.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

CHARLES W. FOSTER.

Witnesses:

HEATON H. WRIGHT,

JOHN F. FABIAN.