

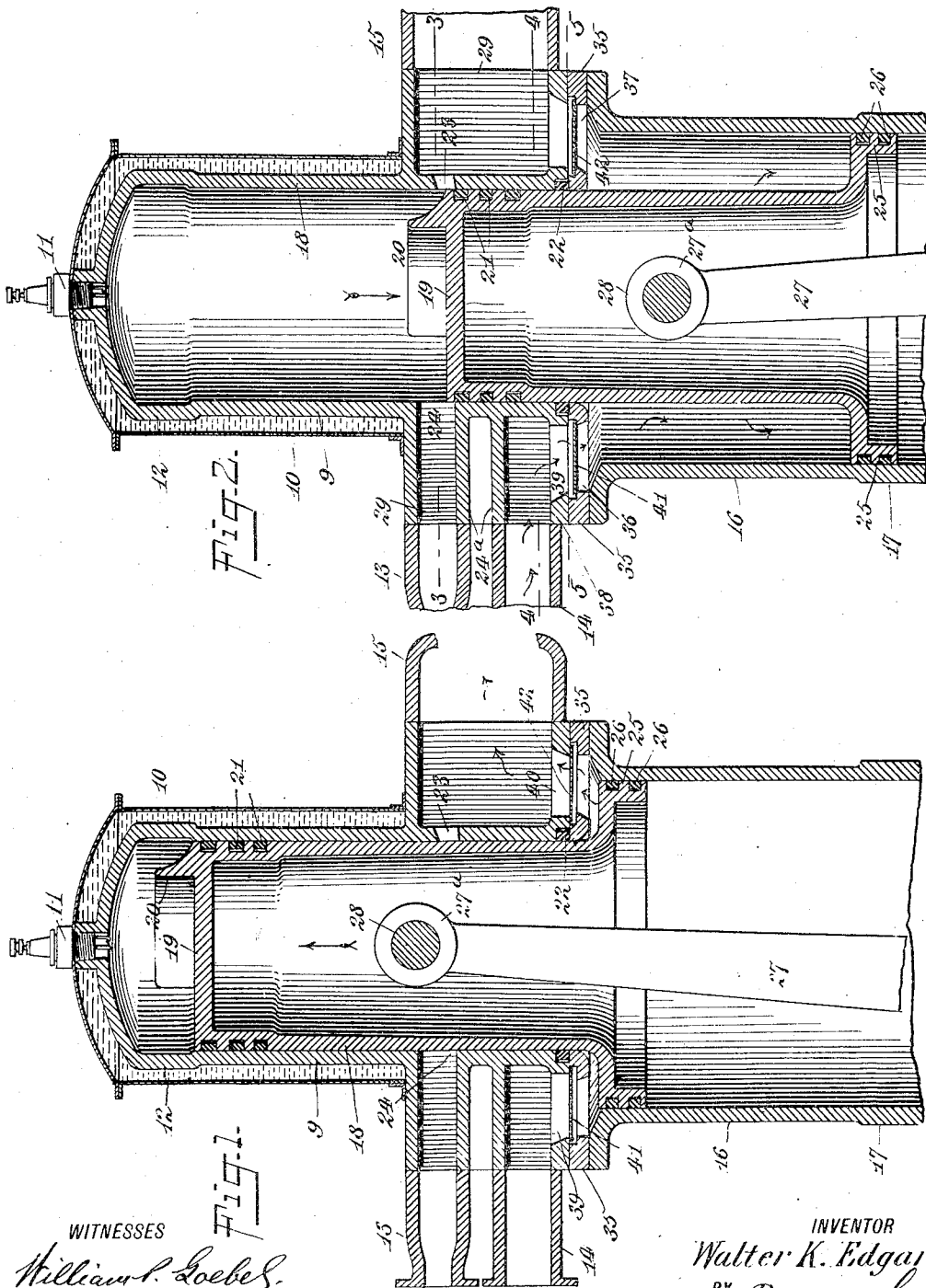
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APPLICATION FILED MAR. 20, 1919.

1,356,757.

Patented Oct. 26, 1920.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

Fig. 3.

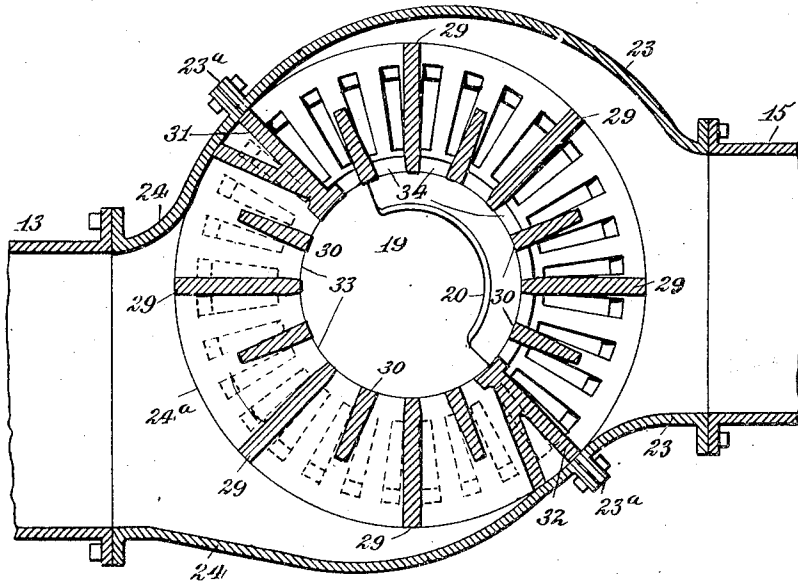
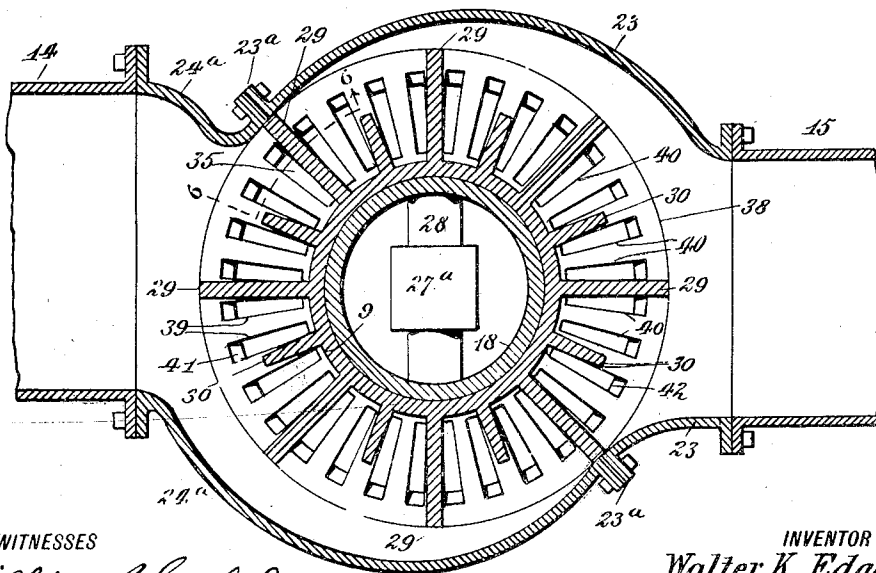


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

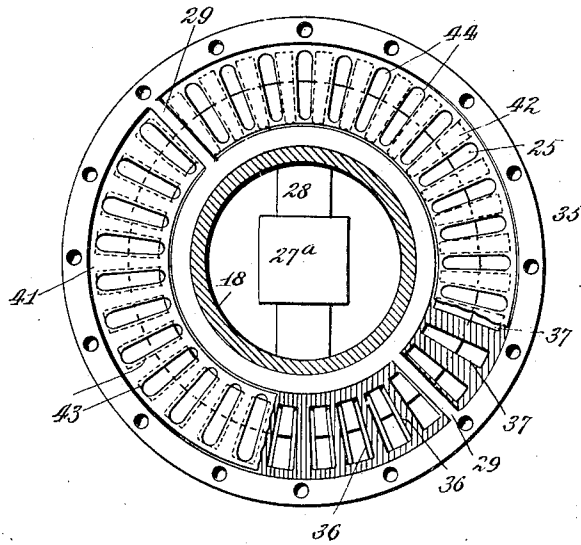


Fig. 8.

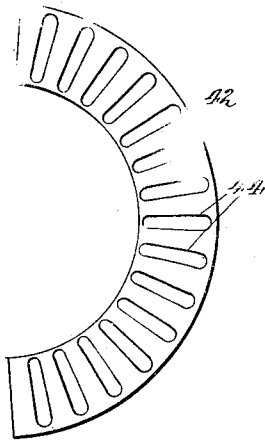


Fig. 6.

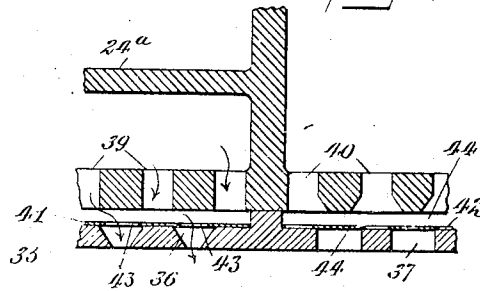
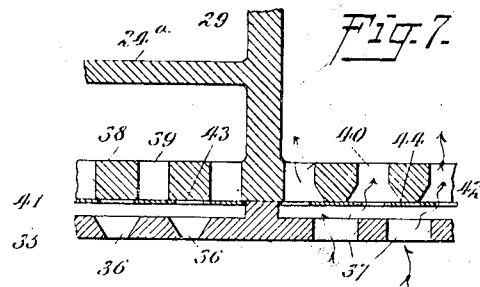


Fig. 7.



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1,356,757.

Specification of Letters Patent.

Patented Oct. 26, 1920.

Application filed March 20, 1919. Serial No. 283,840.

To all whom it may concern:

Be it known that I, WALTER K. EDGAR, a citizen of the United States, and a resident of St. Joseph, in the county of Buchanan and State of Missouri, have invented a new and Improved Engine, of which the following is a full, clear, and exact description.

My invention relates to engines, and more particularly to two-cycle internal combustion engines of a kind adapted for use in aviation, and of various other kinds in which simplicity of construction, efficiency in action and compactness in building are desirable factors.

The purpose of my invention is to simplify the mechanism of the two-cycle engine and to provide for compression of the explosive mixture at the same stroke of the piston which is incidental to the exhaust.

More particularly stated, I seek to render the engine capable, at a single stroke of the piston, of accomplishing efficiently, and with a minimum of mechanism, a number of distinct operations which have heretofore been accomplished only by use of more elaborate mechanism, coupled with increased weight and higher cost.

Reference is made to the accompanying drawings forming a part of this specification, and in which like reference characters indicate corresponding parts throughout all the figures.

Figure 1 is a substantially central vertical section through a typical form of my improved engine, the piston being near the upper limit of its travel;

Fig. 2 is a section similar to Fig. 1, but with the piston approaching the lower limit of its travel;

Fig. 3 is a section on the line 3—3 of Fig. 2, looking toward the bottom of said figure;

Fig. 4 is a section on the line 4—4 of Fig. 2, looking toward the bottom of said figure;

Fig. 5 is a section on the line 5—5 of Fig. 2, looking toward the bottom of said figure;

Fig. 6 is a section on the line 6—6 of Fig. 4, looking in the direction indicated by the arrows and showing the valve mechanism as it would appear with various movable parts occupying the positions indicated in Fig. 2;

Fig. 7 is a section similar to Fig. 6 but showing the valve mechanism as it would appear with various movable parts occupying the positions indicated for them in Fig. 1; and

Fig. 8 is a plan view of one of the valve members.

The engine cylinder is shown at 9, and is provided with sheet metal water jackets, one being shown at 10, and with a spark plug 11. The engine cylinder is also provided with an explosion chamber 12. These parts are of the usual or any desired construction.

The exhaust pipe is shown at 13, and an intake pipe at 14, this intake pipe being adapted for connection with the carbureter so as to receive the explosive mixture therefrom.

Below the engine cylinder 9 and coaxial therewith is a cylinder 16 having greater diameter than the engine cylinder and used for compressing the explosive mixture prior to its entry into the working cylinder as hereinafter described. The compression cylinder 16 may be formed as a part of the crank casing 17.

Slidably mounted within the engine cylinder 9 is a trunk piston 18, provided with a piston head 19 and with a deflector 20, the shape of this deflector being such as to give it a tendency to direct upwardly the explosive mixture as it enters the cylinder. The trunk piston 18 is provided with packing rings 21. Engaging the trunk piston is a scraper ring 22 of the usual or any desired construction. A pair of casings 23, 24, of a form which may be understood by reference to Figs. 3 and 4, are secured together by joints 23^a and are used for guiding the explosive mixture and the gases of combustion. The trunk piston 18 is provided with a portion 25 of greater diameter than the portion fitting within the working cylinder 9. This portion of greater diameter carries packing rings 26, and fits into the compression cylinder 16. A pitman 27 is provided with a bearing 27^a, through which extends a cross pin 28, this cross pin being carried by the trunk piston 18.

The lower portion of the cylinder 9 is cut away, as shown in Fig. 3, and formed into a number of separate ribs 29, 30, 31, 32, spaced apart and disposed radially, as may be understood from Fig. 3. Between these ribs are openings 33, constituting exhaust ports. Similar openings 34 constitute ports which lead into the compression reservoir. The ports 33 and 34 are separated by the radially-disposed ribs 31 and 32, as shown in Fig. 3, these ribs constituting a dividing

line between the ports of different character, as may be readily understood from Fig. 3.

A ring 35 which rests upon the upper end of the compression cylinder 16, serves as a support for the valve mechanism, as hereinafter described. This ring is provided with two sets of ports 36, 37, each set arranged approximately in the form of a semi-circle, as may be understood from Fig. 5. The ports 36 are for the purpose of admitting the explosive mixture from the carburetor into the compression chamber 16. The ports 37 are for the purpose of permitting the egress of the explosive mixture from the compression cylinder 16 out into the reservoir 15. Thus the ports 36 are active when the piston is moving downwardly, and the ports 37 are active when the piston is moving upwardly.

Above the ring 35 is a ring 38 which is provided with two sets of ports 39 and 40, more or less analogous to the ports 36, 37 just described. That is to say, the ports 39 lead in from the carburetor and the ports 40 lead out toward the reservoir.

The action of the ports may be readily understood by an inspection of Figs. 3 and 4, the ribs 31 and 32 constituting a dividing line, as above mentioned. All ports to the left of this dividing line are incidental to control of communication between the carburetor and the compression chamber 16, while the ports to the right of the dividing line are incidental to control of communication between the compression cylinder 16 and the reservoir 15.

The ring 35 supports a pair of valve members 41, 42, each having approximately the form of a semi-ring, as may be understood from Fig. 8. In order to accommodate these valve members, the ring 35 is cut away slightly, as may be understood from Fig. 2, so that the said members 41, 42 are housed within it and have slight vertical play within the supporting ring. These valve members are movable independently of each other, as may be understood from Figs. 6 and 7. When the valve member 41 is in its lowermost position, as indicated in Fig. 6, the explosive mixture can flow freely through the ports 39, 36, and also through the valve member, which is for this purpose provided with openings 43. The valve member 42 is similarly provided with openings 44, and when in its lowermost position, as indicated in Fig. 6, closes the ports 37. When raised to its uppermost position, however, as indicated in Fig. 7, the ports 37, 40 are in open communication with each other through the openings 44 of the valve member 42. The valve members 41, 42 are each stamped from thin sheet metal, preferably about thirty gage in thickness.

The operation of my device is as follows:

Suppose that the piston as a whole is near the upper limit of its travel, as indicated in Fig. 2. A charge of explosive mixture is now under compression in the explosion chamber 12. A moment later, the compression being completed, the charge is exploded and the piston thereof driven downward. As soon as the piston head 19 uncovers the upper portion of the exhaust port, the burnt gases make their escape outwardly through the exhaust pipe 13. This, of course, instantly reduces the gas pressure within the cylinder to approximate pressure of the atmosphere. The piston descending a shade farther in the same direction, the port 23 is opened, as indicated in Fig. 2. This allows a charge of explosive mixture from the reservoir 15 to pass in through the port 23, strike the deflector 20, and expand to fill the working cylinder 9. In doing this, it helps to scavenge the cylinder of the burnt gases in a manner well understood in two-cycle engines.

The down stroke of the piston, as just described, is accompanied, however, by additional action by the portion 25 of increased diameter. This portion acts somewhat after the manner of a separate piston. As this portion moves downwardly within the compression cylinder 16, a partial vacuum is thereby produced in this compression cylinder, the result being that explosive mixture from the carburetor is inducted into the compression cylinder, as indicated by arrows in Fig. 2. The valve member 41, because of the slightly increased air pressure upon its upper face, moves downwardly and now occupies the position indicated at the lower left-hand portion of Fig. 6. The valve continues to occupy this position until the piston reaches the bottom limit of its stroke.

The piston now moves upwardly so that the explosive charge contained within the working cylinder 9 is compressed and rendered ready for explosion. The upward movement of the piston, by limiting the space above the enlarged portion 25, compresses the portion of the explosive mixture contained within the compression chamber 16. This causes both of the valve members 41 and 42 to rise, as indicated in Fig. 7. The result is that the ports 39 are closed, whereas the ports 40 and 37 are left open, so that the explosive mixture contained within the compression chamber 16 now passes upwardly through the openings 44, and thus goes freely into the reservoir 15.

The next succeeding down stroke of the piston duplicates the various operations described so that the action is repeated. Each down stroke, which is the power stroke, causes the induction of explosive mixture into the compressor, and each up stroke transfers the portion of explosive mixture

thus compressed into the reservoir 15. Each down stroke of the piston also opens the exhaust and allows the burnt gases to make their escape; and this done, a charge of explosive mixture from the compressor passes through the port 23 and fills the working cylinder, as above described.

I do not limit myself to the precise construction shown, as variations may be made therein without departing from the spirit of my invention. Neither do I limit myself to the use of my device as an aviation engine, as is it well adapted for stationary work or any other branch of the art requiring a two-cycle engine.

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

1. A device of the character described comprising a working cylinder, a compression cylinder, a piston provided with a portion fitting into said working cylinder and another portion fitting into said compression cylinder, a single valve controlling admission of an explosive mixture from a carbureter into said compression cylinder, a single valve for controlling the flow of explosive mixture from said compression cylinder, a reservoir for receiving the explosive mixture from the compression cylinder, and a port uncovered by movement of the piston for admitting a charge of said explosive mixture from said reservoir into said working cylinder.

2. In an engine of the character described, the combination of a working cylinder, a compression cylinder, a piston having a portion fitting into said working cylinder and a different portion fitting into said compression cylinder, a valve ring located intermediate said working cylinder and said compression cylinder, said valve ring being provided with a pair of compartments, each of considerable length, a single valve disposed within each compartment and extending practically the entire length thereof so as to control a considerable number of ports, and mechanism coacting with said compression cylinder for receiving therefrom a compressed charge of explosive mixture and for transferring the same into said working cylinder.

3. A device of the character described comprising a working cylinder, a compression cylinder coaxial therewith, a number of ribs extending from said compression cylinder to said working cylinder for the purpose of supporting said working cylinder coaxially with respect to said compression cylinder, a valve ring disposed intermediate said working cylinder and said compression cylinder and provided with a plurality of ports, a pair of valve members, each having the approximate form of a

semi-ring and fitted movably relative to said valve ring; and mechanism coacting with said valve ring for controlling the flow of explosive mixture through one of said valve members into said compression cylinder and for controlling the flow of the compressed explosive mixture from said compression cylinder into said working cylinder.

4. In a two-cycle engine, the combination of a working cylinder, a compression cylinder, a piston provided with a portion fitting within said working cylinder and with another portion fitting within said compression cylinder, a valve ring mounted upon said compression cylinder and provided with a pair of compartments, each compartment having a semi-annular form, and further provided with ports opening into said compartments, a pair of valve members, each having the approximate form of a semi-ring, each valve member being disposed in one of said compartments, and mechanism coacting with one of said valve members for controlling the flow of explosive mixture from a carbureter into said compression cylinder.

5. In a two-cycle engine, the combination of a working cylinder, a compression cylinder, a piston provided with a portion fitting within said working cylinder and with another portion fitting within said compression cylinder, a series of ribs extending from said working cylinder to said compression cylinder, said ribs being spaced apart, a ring carried by said compression cylinder and being provided with openings or ports, valve members disposed between said ribs and said ring, an inlet pipe having communication with said compression chamber and controlled by one of said valves, and a reservoir having communication with said compression chamber and controlled by another of said valves.

6. In a two-cycle engine, the combination of a working cylinder, a compression cylinder, a piston provided with a portion fitting within said working cylinder and with another portion fitting within said compression cylinder, a series of ribs extending from said working cylinder to said compression cylinder, said ribs being spaced apart, a ring carried by said compression cylinder and being provided with openings or ports, valve members disposed between said ribs and said ring, an inlet pipe having communication with said compression chamber and controlled by one of said valves, a reservoir having communication with said compression chamber and controlled by another of said valves, and a port between said reservoir and the interior of the working cylinder arranged to be uncovered by the movement of the piston.

WALTER KIRK EDGAR.