A. F. RIEDL.

TWO-CYCLE ENGINE.

APPLICATION FILED JAN. 20, 1913.

1,091,963.

Patented Mar. 31, 1914.

3 SHEETS—SHEET 1.

Fig. 5

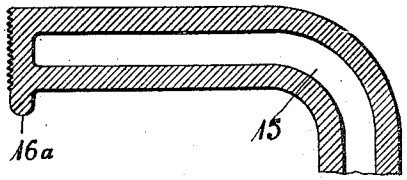
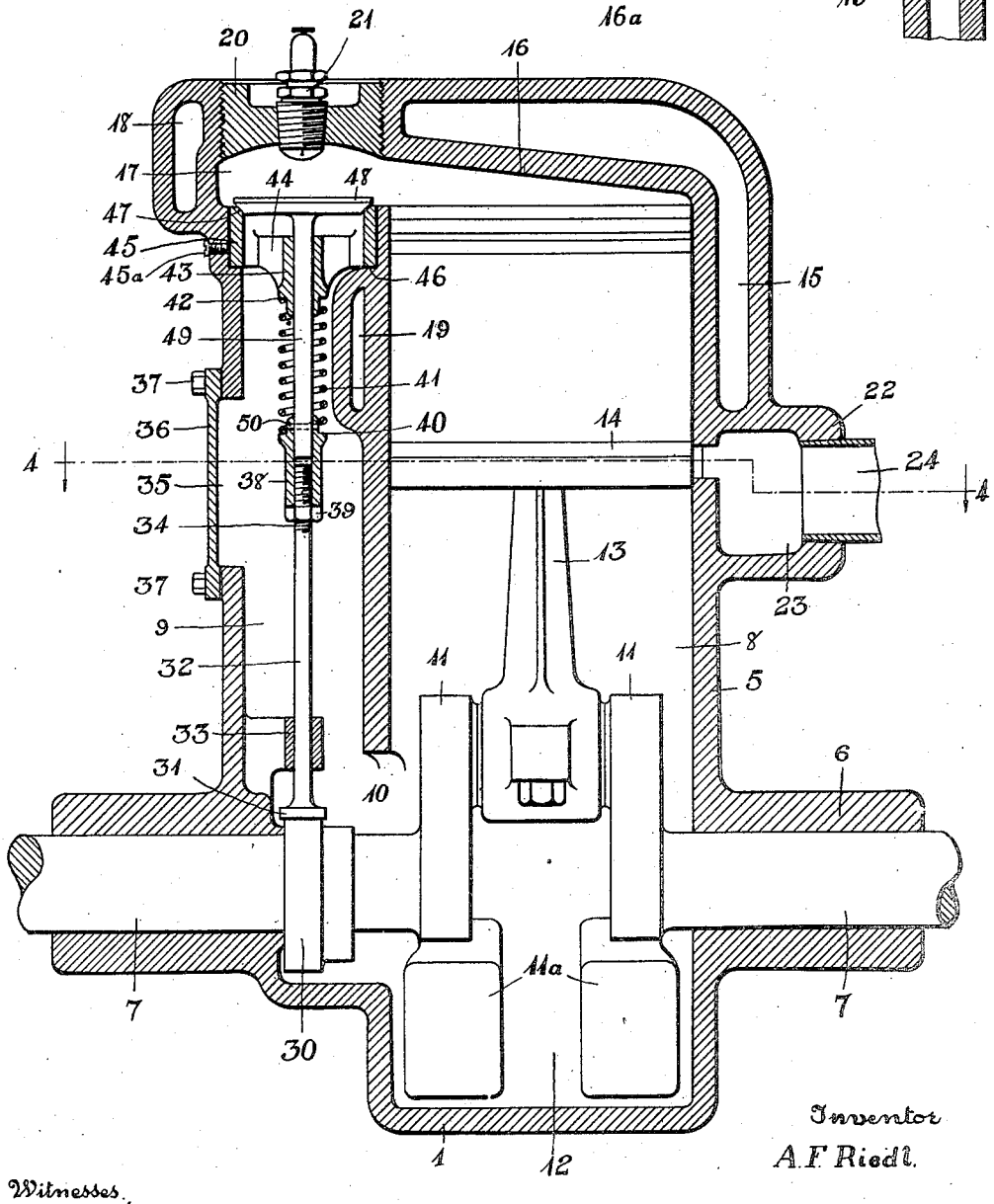


Fig. 1



Witnesses.

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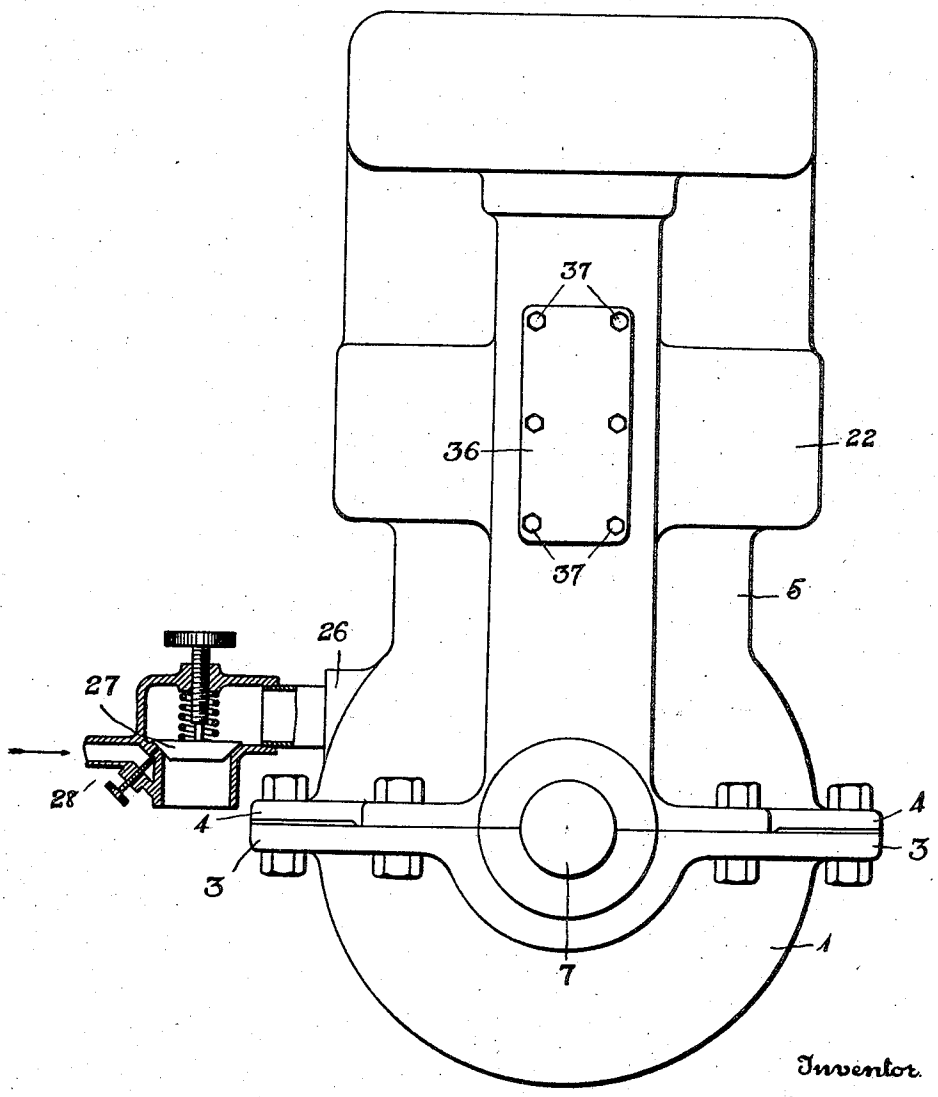
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3 SHEETS—SHEET 2.

Fig. 2



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3 SHEETS—SHEET 3.

Fig. 4

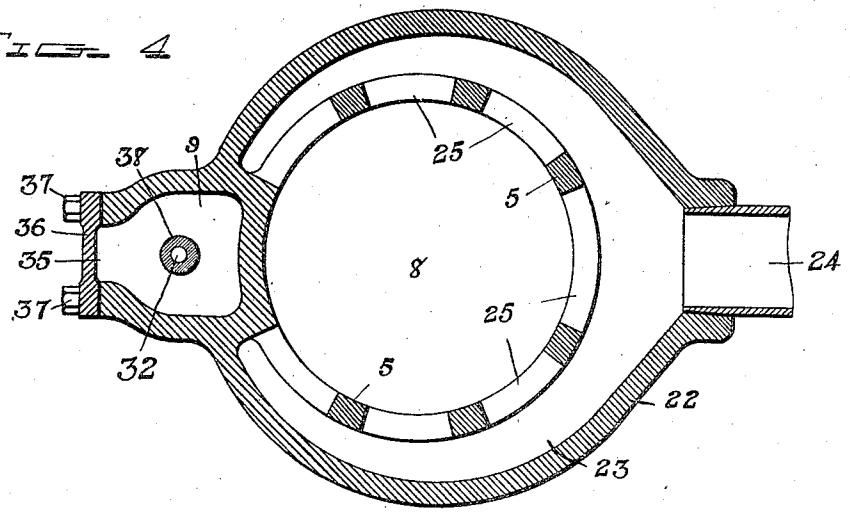
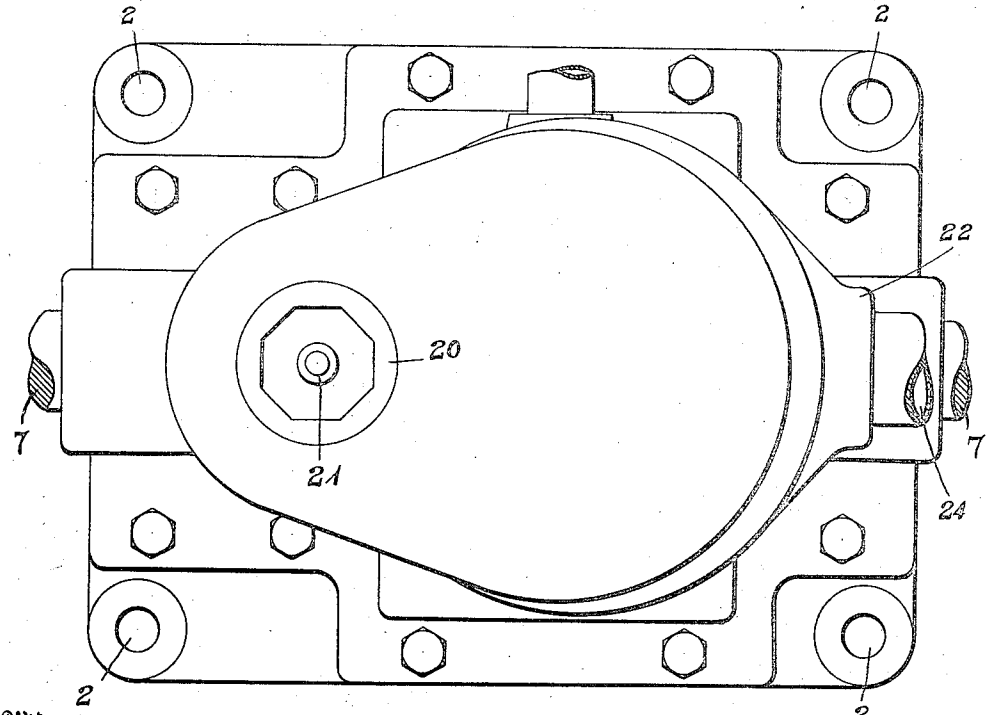


Fig. 3



Witnesses.

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UNITED STATES PATENT OFFICE.

ALBERT FRED RIEDL, OF BUFFALO, NEW YORK.

TWO-CYCLE ENGINE.

1,091,963. Specification of Letters Patent. Patented Mar. 31, 1914.

Application filed January 20, 1913. Serial No. 743,153.

To all whom it may concern:

Be it known that I, ALBERT FRED RIEDL, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Two-Cycle Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to internal combustion engines, and more especially to those operating on the two-cycle principle; and the object of the same is, chiefly, to simplify the parts of a gasolene engine of this type to the end that the power may be increased and the gasolene consumption decreased.

Further objects will appear in the following specification which sets forth the preferred construction of this engine, as illustrated in the drawings wherein—

Figure 1 is a central vertical sectional view through one cylinder of this engine, taken along the center of the crank shaft. Fig. 2 is an end elevation thereof, taken from the left of Fig. 1. Fig. 3 is a plan view, and Fig. 4 is a horizontal section on the line 4—4 of Fig. 1 with the piston and crank shaft omitted. Fig. 5 is a cross section through the upper end of the cylinder, showing a slight modification in its internal shape.

In the drawings the crank case 1 has suitable devices 2 by means of which the cylinder shown is supported from the framework of the machine, and also has flanges 3 bolted to similar flanges 4 at the bottom of the shell 5, half-bearings 6 being formed in said flanges and adapted to register when these parts are assembled so as to receive the crank shaft 7 as well known in this art. The shell is cast with an upright piston chamber 8, and alongside the same an upright valve chamber 9 which communicates at its lower end through a passage 10 with the space occupied by the crank 11 and usually known as the pumping chamber 12, and said crank is connected by a rod 13 with the piston 14 which reciprocates vertically within the chamber 8 in the usual manner. The upper portion of the cylinder, or piston chamber 8, is water-jacketed as at 15 on its sides and over its head, and internally the top of this chamber by preference slopes downward as at 16 from the spark chamber 17 to the remote side of the piston chamber 8 for a purpose to appear below. The jacket 15 is also by preference carried around the spark chamber as at 18, and even down within the wall or partition between the chambers 8 and 9 as at 19, though I do not wish to be limited with respect to the jacket. The upper end of the spark chamber 17 is closed by a plug 20 which by preference screws into an opening larger than the valve yet to be described and so that said valve may be removed when desired, and through this plug extends the spark plug 21 which is connected to an ignition system as usual. Cast around the wall of the main cylinder or shell 5 is a hollow rib 22 containing an exhaust chamber 23 which is in communication with an outlet 24 that may lead to a muffler not necessary to illustrate, and the piston chamber 8 comunicates with the exhaust chamber 23 by means of exhaust openings 25 through the wall of the shell 5 within the rib 22 as best seen in Fig. 4. It is to be understood that the throw of the crank 11 is sufficient to carry the piston 14 downward far enough to expose the exhaust openings 25 at each revolution of the main shaft 7 in a manner well understood in explosive engines of this type. The intake may be suitably disposed, but I have illustrated it as opening through the side of the shell at the point 26 in Fig. 2; and 27 is an outwardly closing spring-actuated check valve which opens to admit a charge from the carbureter as indicated at 28.

Resting on a cam 30 secured on the main shaft 7 is a head 31 at the lower end of a push rod 32 which extends upward through a guide 33 formed within or carried by the shell 5 of the cylinder-casting, and the upper end of this rod is threaded as at 34 opposite an opening 35 in the wall of the valve chamber 9, which opening is closed by a plate 36 held removably in place by tap bolts 37. Engaging said threads is a nut 38, held locked thereon by a jam nut 39, said nut 38 being elongated vertically and having an exterior shoulder 40 on which rests a coiled expansive spring 41. The upper end of this spring stands beneath a shoulder 42 formed around a tubular boss 43 which extends from the center of a spider 44 forming part of a casting whose ring-shaped wall or shell 45 rests upon a shoulder 46 within the valve chamber 9 and is internally beveled at its upper end as at 47 so as to pro-

duce a valve seat. Resting upon the latter is the beveled edge of the head 48 of the inlet valve, whose stem 49 passes downward through the bore of said boss 43, throughout the length of said spring 41, and into the upper end of said nut 38, wherein it is by preference secured removably in any suitable manner as by the pin 50 shown in Fig. 1. With this construction it follows that the expansion of the spring 41 tends to move downward the nut and the parts attached thereto, so that the head 31 is kept in contact with the cam 30, and tends also to move upward the boss 43 and spider 44 whose ring rests upon the shoulder 46 and is held in place by being closely fitted into the upper end of the valve chamber 9. However, when removed therefrom it can be lifted out through the opening disclosed by removing the plug 20, as also can the valve when its stem is detached from the nut 38 by withdrawing the pin 50. By removing the plate 36 the opening 35 is exposed so that the operator may pass his hand into the same and gain access to the parts of the valve mechanism for the purpose of adjustment, repair, or replacement. Should it become necessary to replace the push rod 32 that can be done when the engine is taken down and the crank shaft 7 and its cam 30 removed from beneath the head 31, after which the entire push rod can be drawn downward through the guide 33. However, this will rarely occur, as the adjustment permitted by the nut 38 and jamb nut 39 will take up for wear, and even a broken spring could be replaced through the opening disclosed by the plug 20.

The operation of a two-cycle engine thus constructed may be briefly described as follows: With the parts standing as shown in Fig. 1 and the charge compressed, when the spark occurs said charge is exploded and the piston descends until it uncovers the exhaust ports so that the smoke and burnt gases pass readily through the openings 25 into the chamber 23 and out the outlet 24. The descent of the piston will to a slight extent compress the charge within the chamber 12, which charge is pumped through the opening 10 upward into the valve chamber 9, as the check valve 27 closes to prevent this charge being driven back toward the carbureter. At a proper moment the cam 30 raises the push rod and valve, its head 48 is lifted off the seat 47, and the charge under slight compression is driven upward into the chamber 17 and admitted at the extreme top of the piston chamber 8 whose beveled upper end 16 causes the inflowing charge to be thrown downward onto the top of the outflowing gases, rather than to be mingled therewith, with the result that the gases are forcibly expelled through the openings 25. Just at a proper moment the high point of the cam 30 passes from beneath the head 31 and the spring 41 quickly closes the valve 48; then the piston begins its ascent to compress the charge within the upper end of the piston chamber 8 and simultaneously to draw a new charge inward through the intake 26—the first upward movement of the piston closing the exhaust openings 25. When the piston again reaches the position shown in Fig. 1, the operation is repeated.

A two-cycle engine as thus constructed possesses the following points of advantage: The admission of the mixture into the extreme upper end of the piston chamber, especially when said upper end is beveled outward as shown at 16, is of advantage in a two cycle motor because the mixture is used to expel the gases and yet it does not commingle therewith to any injurious extent. The interposition of the waste gases between this mixture and the head of the piston causes them to act as a cushion and serves to retain the mixture constantly at the top. With the parts properly timed, the pumping action in the chamber 12 and the high point of the cam 30 will admit the fresh mixture at a time when the pressure of the inlet and exhaust are the same. I consider it of advantage also to have the mixture travel constantly in one direction, and the passages for its travel are large and uninterrupted. The positive opening of the inlet valve by a cam mounted directly on the crank shaft prevents the possibility that the engine can be set out of time and avoids the necessity for a cam shaft and the gears connecting it with the main shaft. Better combustion results where the mixture is not diluted with the exhaust gases, and the charge is wholly fired when the spark plug is located at a point where there is the least possibility of pollution of the charge. The larger the area of the piston and therefore the bore of the cylinder, the greater will be the number and size of the exhaust openings 25 and therefore the less time required to thoroughly exhaust the gases; although there is but a single row of openings 25, they are uncovered at a time when the connecting rod is passing horizontally across the lowest point assumed by the crank and when the piston of course has ceased its downward movement and has not quite yet commenced its upward movement. The general structure results in the provision of large passages for the travel of the gas, the fewest number of turns, and the elimination of small by-passes; added to which is the fact that the mixture and the gases are both caused to travel the shortest possible distance, so that resistance to their flow is minimized and an increased efficiency of the engine is obtained. It is hardly necessary to add that a two-cycle engine is always sim-

pler than one involving a greater number of parts, and the structural features of the engine above described possess extreme simplicity without sacrificing accessibility.

Fig. 5 illustrates how a deflection or baffle 16ª may be used in place of the sloping head 16 of the cylinder, and this baffle will deflect the gases with much the same result. At the bottom of Fig. 1 I have shown counterbalance weights 11ª at the inner ends of the crank arms 11, for an obvious purpose, and also a set screw 45ª for holding the collar 45 on the shoulder 46. These details and others will, however, occur to the builder, and may be adopted without departing from the principle of my invention.

What is claimed as new is:

1. In an internal combustion engine, the cylinder shell having upright piston and valve chambers communicating near their lower ends, the wall of the piston chamber being provided with an exhaust and an intake; combined with the piston, crank shaft, connecting rod, a cam on said shaft, a guide at the lower end of said valve chamber and a valve seat at its upper end, a push rod slidably mounted through said guide and resting on said cam, a valve whose head rests on said seat and whose stem depends therefrom, a long nut screwed on the upper end of the push rod, a spider within the upper end of said valve chamber having a central boss, the valve stem passing through said boss and into said nut, a pin through the stem and nut, and an expansive spring coiled around the stem between said nut and spider.

2. In an internal combustion engine, the cylinder shell having upright piston and valve chambers communicating near their lower ends, the wall of the piston chamber being provided with an exhaust and an intake; combined with the piston, crank shaft, connecting rod, a cam on said shaft, a guide at the lower end of said valve chamber and a valve seat at its upper end, the wall of the shell between these elements having a side opening, a plate removably closing said opening, a push rod slidably mounted through said guide and resting on said cam, a valve whose head rests on said seat and whose stem depends therefrom, a long nut screwed on the upper end of the push rod and having a shoulder, a spider within the upper end of said valve chamber having a central boss with a downwardly facing shoulder, the valve stem passing through said boss and into said nut, means for detachably connecting it with said nut, and an expansive spring coiled around the stem between said shoulders.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ALBERT FRED RIEDL.

Witnesses:
C. A. GEORGES,
FREDERICK L. GOETZ.