L. C. VANDERLIP.
GAS ENGINE.
APPLICATION FILED MAY 21, 1908.

957,017.

Patented May 3, 1910.

3 SHEETS—SHEET 1.

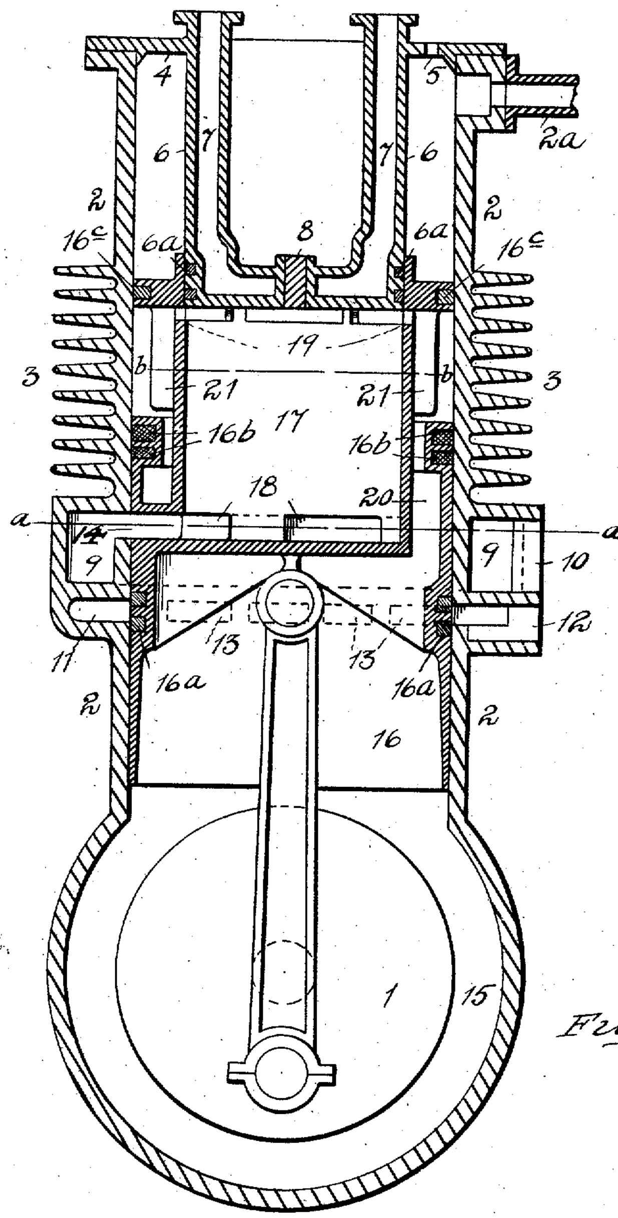


Fig. 1.

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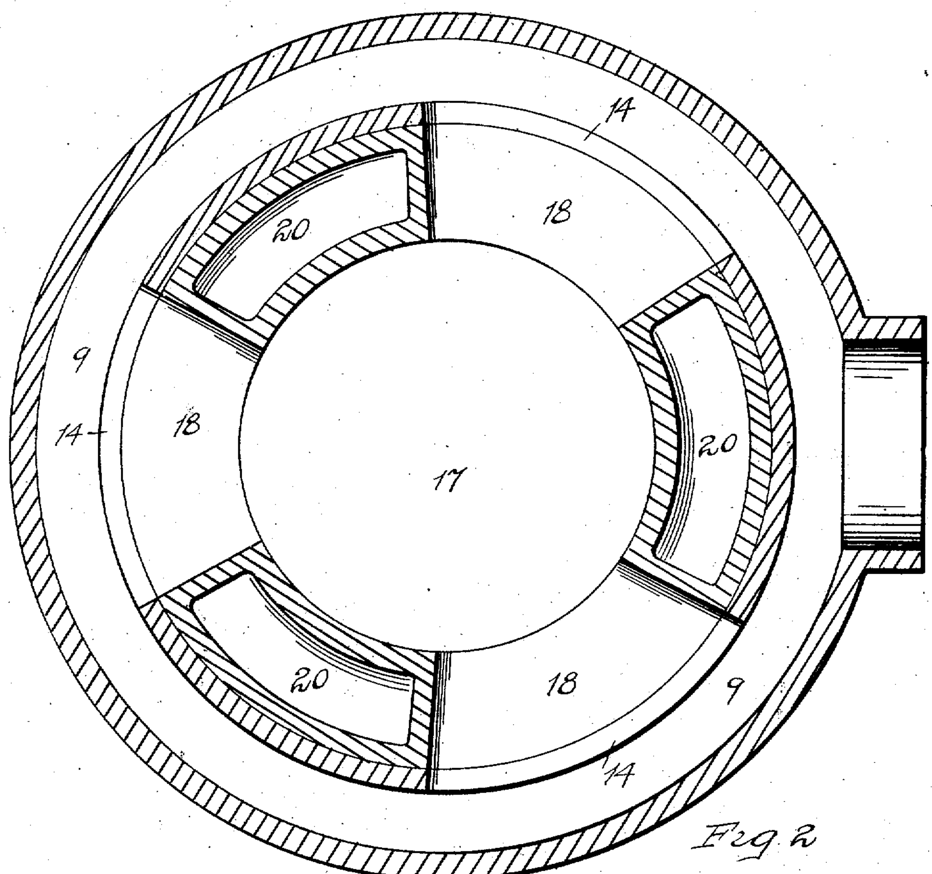


Fig. 2

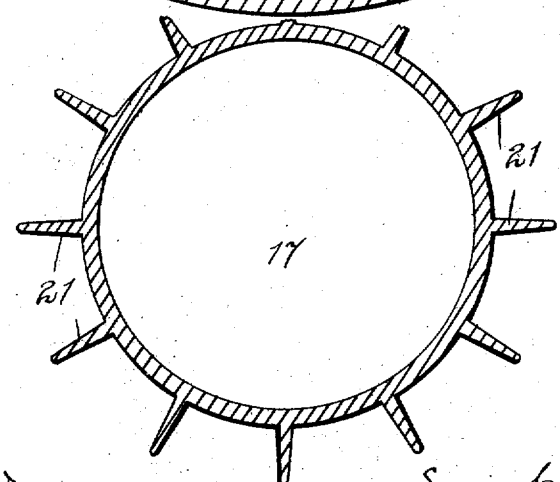


Fig. 3

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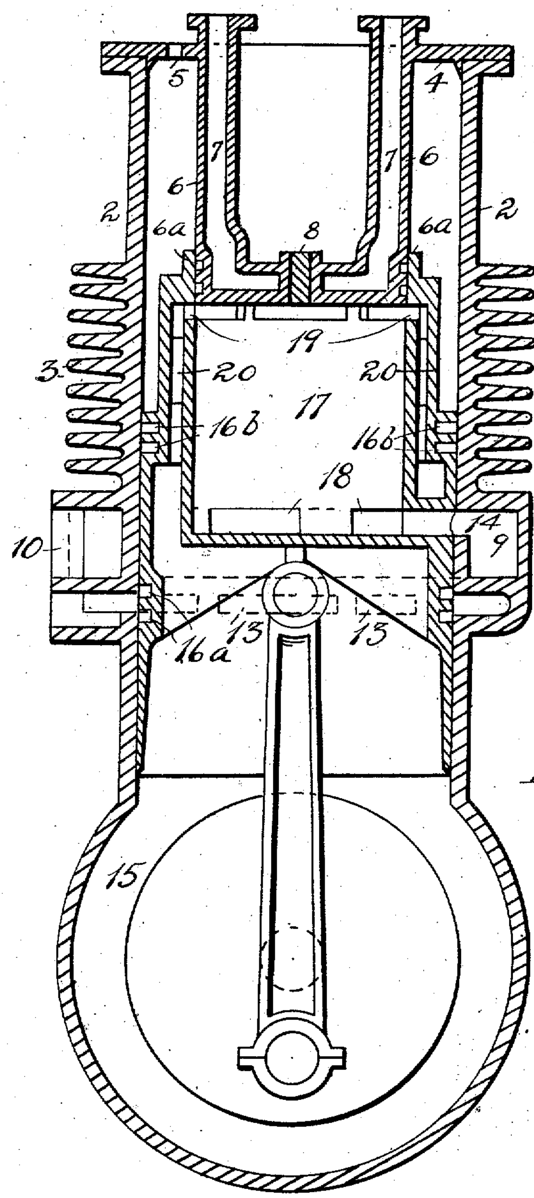


Fig. 4.

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# UNITED STATES PATENT OFFICE.

LOUIS C. VANDERLIP, OF ELKHART, INDIANA.

GAS-ENGINE.

957,017. Specification of Letters Patent. Patented May 3, 1910.

Application filed May 21, 1908. Serial No. 434,905.

*To all whom it may concern:*

Be it known that I, LOUIS C. VANDERLIP, a citizen of the United States, residing at Elkhart, county of Elkhart, State of Indiana, have invented a certain new and useful Improvement in Gas-Engines, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to gas engines, and especially to that kind of engine which works upon the two cycle principle, or mode of operation.

In the accompanying drawings:—Figure 1, is a vertical central section. Fig. 2, is a section on the line *a*—*a*, Fig. 1, drawn to a larger scale. Fig. 3, is a detail section upon the line *b*—*b*, Fig. 1, drawn to a larger scale. Fig. 4 is a view similar to Fig. 1, showing a modification.

15 is the crank case.

2 is a cylinder upon the crank case 15.

3 indicates cooling ribs upon the cylinder 2.

4 is a cover or end upon the cylinder 2.

$2^a$ represents an aperture through the wall of the cylinder 2 at the upper end thereof. The aperture $2^a$ may communicate with a source of supply of explosive mixture.

5 indicates an aperture which may be formed through the cover 4.

6 is a cylindrical projection concentric with the cylinder 2, and extending inwardly from the cover 4.

7, 7, represent a water jacket in the cylindrical projection 6.

At 8, an aperture is formed, in which may be secured the sparking plug.

9, 9, indicate an annular chamber formed around the cylinder 2 toward the lower end thereof.

10 is an opening from the annular chamber 9.

11 is an annular chamber formed around the cylinder 2 just below the annular chamber 9, and 12 is an inlet passage to the annular chamber 11. There is a wall common to said two annular chambers.

13, 13, indicate ports, or passages, formed through the wall of the cylinder 2, and communicating with the annular chamber 11.

14, Figs. 1 and 2, indicate apertures formed through the wall of the cylinder 2, and communicating with the annular chamber 9.

16 is a piston adapted to reciprocate in the usual way in the cylinder 2. The piston 16 may be provided with piston rings $16^a$, $16^b$, $16^c$, at the positions indicated.

17 is a cylinder formed upon or integral with the piston 16. The lower end of the cylinder 17 is closed, and the upper end extends around the cylindrical projection 6, said projection is provided with packing rings $6^a$ around its lower end, which fit close and form a tight joint with the walls of the cylinder 17.

18, Figs. 1 and 2, are ports formed through the walls of the cylinder 17, and adapted to register with the apertures or ports 14 when the piston 16 is at the lower end of its stroke.

19 are ports formed through the wall of the cylinder 17 toward the upper end thereof, and so located that they shall come just below the lower end of the projection 6 when the piston 16 is at the lower end of its travel. It will be noticed that the space between the projection 6 and the cylinder 2 is filled by a portion of the piston 16, and an aperture 5 may be formed at the upper end of the cylinder 2 to permit the air to pass in and out, and thus prevent a vacuum being formed at the upper end of the cylinder 2, or compression taking place there.

The operation of the above described device is as follows:—The charge is ignited at the upper end of the stroke of the piston within the cylinder 17, and presses the piston 16 downward to constitute the working stroke. During the downward motion of the piston 16 a charge is somewhat compressed in the crank chamber 15. At or near the lower end of the working stroke the ports 18 commence to register with the ports 14, and the products of combustion escape through said ports into the annular chamber 9, and pass out the exhaust passage 10. Soon after the ports 18 commence to register with the ports 14, the ports 19 come below the cylindrical projection 6, and the explosive mixture compressed in the crank chamber 15 passes through passages 20, and through the ports 19, displacing the products of combustion, and filling the cylinder 17 with an explosive mixture. Upon the return of the piston 16 this charge is compressed, and the cycle is again repeated. At the upper end of the stroke of the piston 16, its lower edge uncovers the ports 13, and the outer air or air and gas or vapor, as the case may be, rushes in through the passage 12, and the ports 13 to supply the partial vacuum in the crank-case 15 occasioned by the rising of the piston 16, as well understood in the art as applied to the so-called three port two cycle engines. At the same time the rings $16^c$ and adjacent parts of the piston pass over the aperture $2^a$, admitting air or air and gas or vapor, as the case may be, through the passage 20 into the crank-case, and obstructing the passage of air from the port 5. It will be understood that either the ports 13 or aperture $2^a$ may be used alone, in which case only an explosive mixture would be admitted, or both may be used together and explosive mixture taken in through both, or both may be used together, air only being taken through one, in which case the relative time of opening would be properly arranged to secure the proper proportions of fuel and air in the mixture, as will be well understood by those conversant with the art. Upon the wall of the cylinder 17, and projecting outward therefrom, I form ribs 21, which impart heat from said cylinder to the gases passing by them, and assist to keep the piston 17 cool. The heat is also dissipated from said cylinder by radiation to the adjacent walls of the cylinder 2, and is dissipated from the latter by the ribs or pins 3. The projection 6 contacts with and cools the inner wall of the cylinder 17. The fresh mixture is admitted at one end of the cylinder 17, and the exhaust is discharged from the other end of said cylinder, and both the inlet and exhaust ports extend for the greater part of a complete circle, so that they may be made comparatively narrow, and yet will have ample capacity for a fast running engine. In the same way the ports 13 may extend substantially all around the cylinder 2, permitting the fresh charge to fill the vacuum in the crank case 15 completely during the very brief interval that they are open. The pressure in the cylinder 17 is reduced to atmospheric, or below, by the time the inlet ports open, so that the liability of explosions in the crank case is avoided. The gases admitted through passage $2^a$ strike directly and immediately against the cylinder 17, and help to cool the same. Both the ports $2^a$ and 13 may be used, or either may be used, without the other. Where only the ports 13 are used the passages 20 may be entirely within the piston 16, inasmuch as it will not be necessary to bring these passages to the surface at the top of the piston, in order to communicate with the port or aperture $2^a$. In Fig. 4 the modified form of the cylinder 17 is shown, in which the passages 20 communicate with the ports 19 and do not open to the periphery of said cylinder.

What I claim is:—

1. In a gas engine, the combination of a cylinder having a compression chamber therein, a second cylinder adapted to reciprocate in the first named cylinder and to compress the charge in said compression chamber, a projection from the first named cylinder fitting within the other of said cylinders closing one end of the same, the other end being otherwise closed, a port in the second cylinder permanently communicating with said compression chamber and adapted to be uncovered by said projection at one end of the movement of the last named cylinder to permit the charge to flow therethrough from said compression chamber and to be covered by said projection during the remainder of the stroke of said cylinder, for the purpose described, and an exhaust port in the second cylinder adapted to register with an exhaust outlet at the time the port is uncovered by said projection.

2. In a gas engine, the combination of a cylinder having a compression chamber, a second cylinder adapted to reciprocate in the first named cylinder and to compress gas in said compression chamber, and provided with an internal combustion chamber formed therein, said second cylinder being provided with cooling ribs extending from its outer wall and within the first named cylinder, a space being left between said cylinders closed by a partition on said second cylinder at one end and open at the other end to said compression chamber, an intake port 19 in said second cylinder opening into the combustion chamber and to the space between the cylinders, means for controlling said port, said port being so located as to admit gas to the combustion chamber from said compression chamber through said space.

3. In a gas engine, the combination of a cylinder, a piston adapted to reciprocate in said cylinder and provided with an internal combustion chamber, a port through the wall of said piston communicating with said combustion chamber, and means for controlling the same, a compression chamber in said cylinder upon one side of said piston, a passageway in the wall of said piston surrounding said combustion chamber and communicating with said compression chamber and, toward the end of the stroke during which compression takes place in the compression chamber, with said combustion chamber, an opening at the periphery of said piston communicating with said passageway, said cylinder being provided with an induction aperture, said aperture and said opening from said passageway being so located that they shall register with each other toward the end of the stroke in which a charge is to be drawn into the compression chamber to permit the charge to enter said compression chamber.

4. In a gas engine, the combination of a cylinder having a crank case, a piston adapted to compress a charge in said crank case, said piston having a combustion chamber formed therein, a projection from said cylinder fitting into said chamber and closing one end thereof, the other end being otherwise closed, a port in the wall of said chamber adapted to pass beyond said projection toward the end of the stroke during which said piston compresses a charge in said compression chamber, to permit a charge to pass into said combustion chamber, said piston being provided with a passageway communicating with said port and with said compression chamber.

5. In a gas engine, the combination of a cylinder having a crank case, a piston adapted to compress a charge in said crank case, said piston having a combustion chamber formed therein, a projection from said cylinder fitting into said chamber and closing one end of said chamber, the other end being otherwise closed, a port in the wall of said chamber adapted to pass beyond said projection toward the end of the stroke of said piston during which it compresses a charge in said compression chamber, said piston being provided with a passage communicating with said port and with said compression chamber, said passage opening at the outer side of said piston toward the end remote from said crank case, said cylinder being provided with a port adapted to register with the side opening of said passage toward the end of the stroke following the working stroke of the piston.

6. In a gas engine, the combination of a cylinder having a compression chamber therein, a second cylinder adapted to reciprocate in the first named cylinder and to compress a charge in said compression chamber, a projection from the first named cylinder fitting within the other of said cylinders, a port in the wall of the inner cylinder, permanently communicating with said compression chamber and adapted to pass beyond said projection at one end of the movement of said cylinder to permit the charge to flow therethrough from said compression chamber and to be covered by said projection during the remainder of the stroke of said cylinder, a second port in said inner cylinder toward the opposite end thereof to that in which is the first named port, said last named port being adapted to be covered by the wall of the outer cylinder and to be uncovered thereby toward the end of the working stroke, for the purpose described.

In testimony whereof, I sign this specification in the presence of two witnesses.

LOUIS C. VANDERLIP.

Witnesses:
MYRTLE L. MUDGE,
F. W. RAHN.