J. A. GILES.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED MAR. 19, 1909.

990,974.

Patented May 2, 1911.

2 SHEETS—SHEET 1.

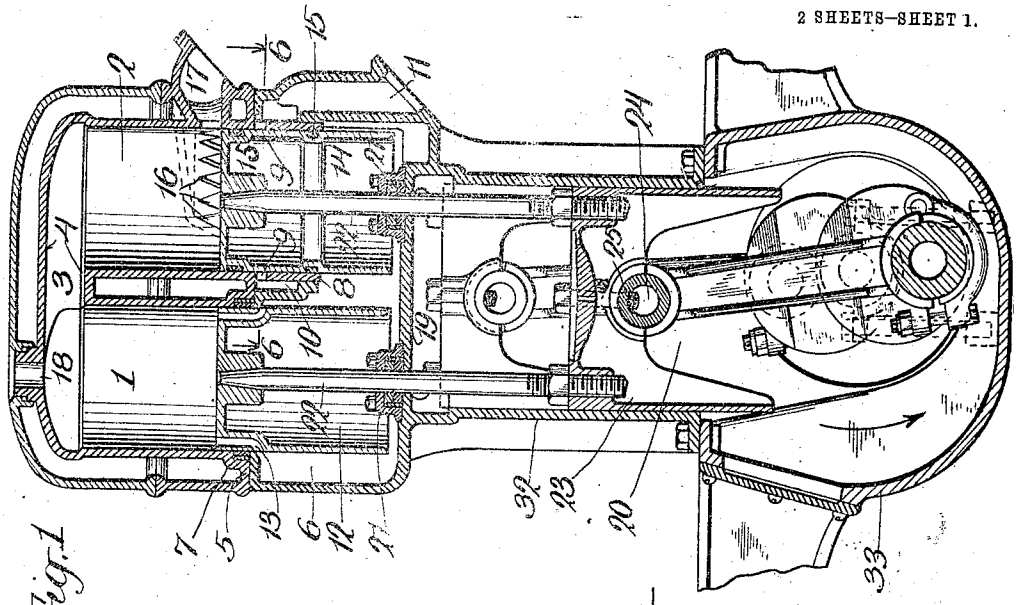

Fig. 1

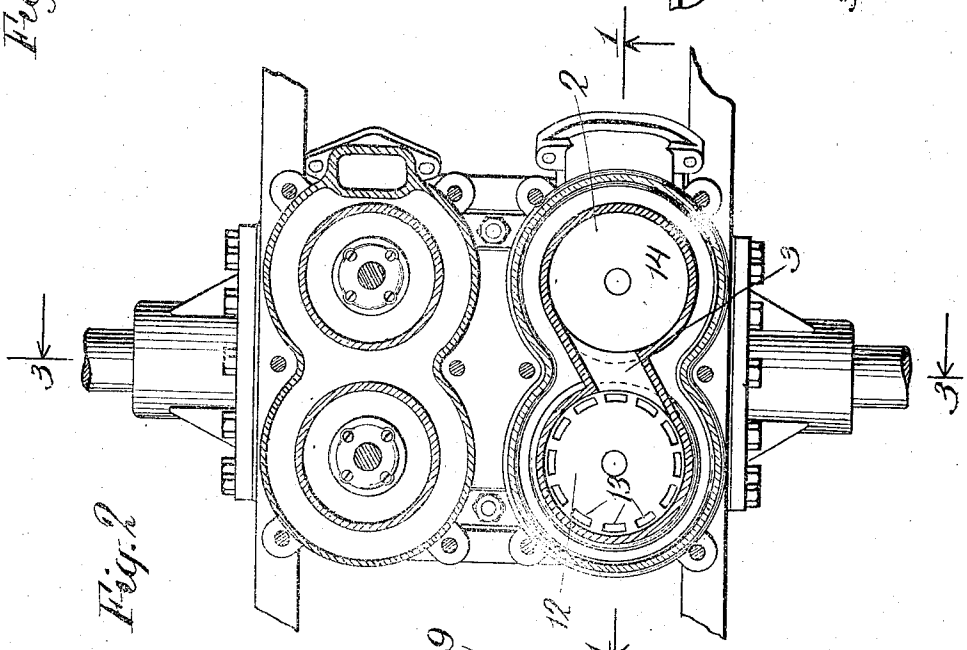

Fig. 2

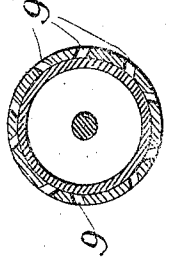

Fig. 6.

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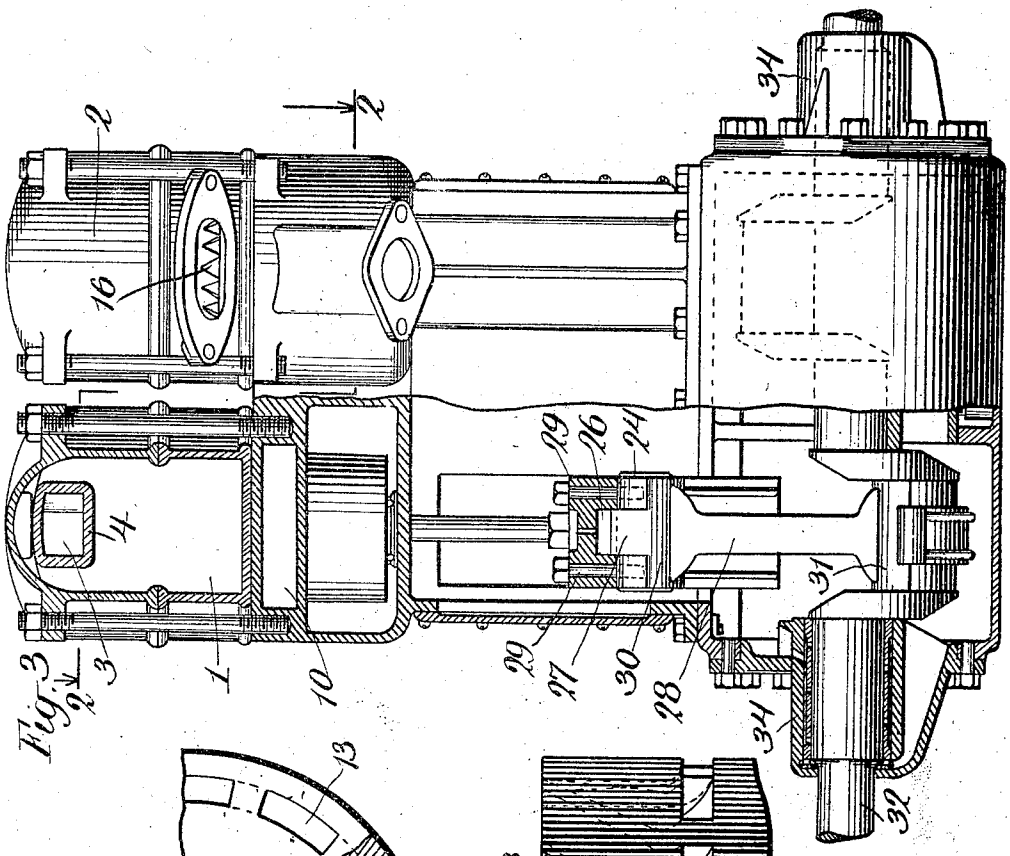

Fig. 3.

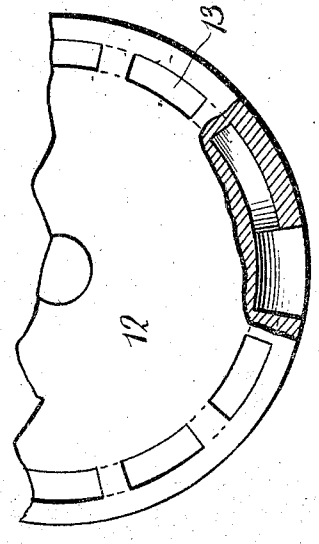

Fig. 4.

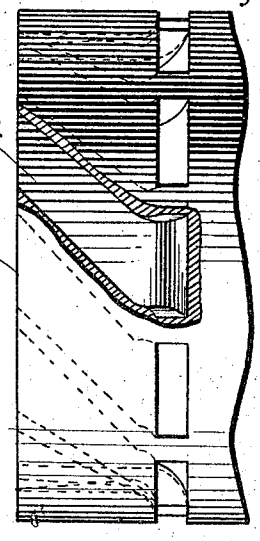

Fig. 5.

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INTERNAL-COMBUSTION ENGINE.

990,974. Specification of Letters Patent. Patented May 2, 1911.

Application filed March 19, 1909. Serial No. 484,404.

To all whom it may concern:

Be it known that I, JULIAN A. GILES, a citizen of the United States of America, and resident of Derby, county of New Haven, and State of Connecticut, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

My invention relates to internal combustion or gas engines and particularly to the class of two-cycle engines.

The object of my improvement is to provide an engine of this class which shall be simple and effective in its construction and operation, which shall be especially convenient for manufacture and one in which the admission of mixture to the compression chamber and to the cylinders and the exhaust of burned gases is controlled by the movement of the pistons covering and uncovering ports suitably arranged.

My invention consists in the novel constructions and arrangements of parts hereinafter more fully pointed out and described.

In the drawings accompanying and forming a part of this specification, Figure 1 represents a section on line 1—1 of Fig. 2, Fig. 2 a section on line 2—2 of Fig. 3, Fig. 3 a partial section on line 3—3 of Fig. 2, and Figs. 4 and 5 respectively a partial plan and side view of the upper end of the piston operating in the cylinder in which the combustible charge is admitted, and Fig. 6 represents a section on line 6—6 of Fig. 1 through the ports in the lower end of cylinder 2.

The reference characters are used in the same sense throughout the drawings and the specification.

The preferred form of my invention herein illustrated and described, is designed especially for power driven vehicles and similar uses and it comprises two complete engines united in a single frame work, each of which comprises two cylinders, two pistons and two piston rods connected to a single crosshead, connecting rod and crank. The two cylinders are designated by numerals 1 and 2, respectively, the former being the cylinder in which the explosive charge or combustible mixture is admitted, while the cylinder 2 is the one from which the burned gases are exhausted. These cylinders are connected at their upper ends by a continuously open passage 3. The cylinders 1 and 2 are formed of an integral casting, being joined at their upper or explosion end by the walls 4 of the connecting passage 3, and at their lower ends by a web 5 which web is finished to form a seat to engage a corresponding seat on the top of the compression chamber 6. The cylinder 1 terminates at this seat and has formed in its end a recess 7 for the reception of packing rings, as clearly shown in Fig. 1. The cylinder 2 has an end 8 which projects some distance below the lower face or seat of the web 5 and has a series of ports 9 formed therein, which ports when uncovered by the upward movement of the piston afford communication between the interior of the cylinder below the piston and the annular chamber 10 formed in a recessed portion of the compression chamber 6 and surrounding the projecting end 8 of the cylinder 2. The annular chamber 10 communicates with the passage 11 which is adapted to connect with a source of mixture supply, in any convenient manner. The piston 12 operates in cylinder 1 and is provided with ports 13 which are adapted when the piston is in its lowest position to afford communication between the compression chamber 6 and the cylinder 1. These ports are arranged, as clearly shown in Figs. 4 and 5, so as to give the mixture a spiral direction as it enters the cylinder, thereby causing the heavier or unevaporated particles of the mixture to rapidly fly outward and make contact with the hot walls of the cylinder to cause their more rapid and complete evaporation. The piston 14 operates in cylinder 2. This piston is provided with two sets of packing rings 15 but has no ports in it. When this piston is in its highest position its lower edge uncovers the ports 9, thereby admitting mixture from the chamber 10 to the compression chamber 6, and when it is in its lowest position, or at the end of its working stroke, it uncovers the exhaust ports 16 in

cylinder 2. These exhaust ports lead to the exhaust passage 17. The exhaust ports 16 are of triangular form, each triangular opening having its apex uncovered first by the descending piston. The object of this construction is to materially lessen the report due to the sudden release of the gases.

The upper end of cylinder 1 is provided with an opening 18 for the reception of an igniting device of any approved construction.

The compression chamber 6 is provided at its lower end with a transverse web 19 which forms a partition between the compression chamber and the crosshead and crank case 20. Stuffing boxes 21 are secured to the partition 19 to prevent leakage around the piston rods 22 which are secured to the pistons at their upper ends and to the crosshead 23 at their lower ends.

In order to provide for the increased pressure on the crosshead pin 24, which results from having two pistons connected to a single crosshead, and to keep within the limited space available in engines of this class, I provide a special construction of crosshead and connecting rod which enables me to utilize the surface of the pin on the side on which the thrust is exerted for its entire length. A semi-cylindrical recess 25 is formed in the crosshead to fit the curvature of the crosshead pin 24, and a recess 26 of greater depth than the semi-cylindrical recess 25 is formed in the crosshead at right angles to the axes of the pin, to receive the connecting rod strap 27 which is here shown as being formed integrally with the connecting rod 28. The pin 24 is secured to the crosshead by means of the bolts 29. The upper end of the connecting rod 28 has recessed extensions 30 which extend out on either side of the strap 27 to the ends of the pin. By means of this construction the entire lower surface of the pin is available for bearing surface. The lower end of the connecting rod engages the crank 31 on the crank shaft 32 in any approved manner. The crosshead works in vertical guides formed in the hollow column 32, which is preferably cast integrally with the compression chamber 6 and is joined at its lower end to the crank frame 33 in which are the crank shaft bearings 34. It is thus seen that the crosshead and connecting rod work in a closed case which is separated from the compression chamber by the transverse partition or web 19, by means of which construction the lubricating oil contained in the crank case is prevented from mingling with the mixture and at the same time the volume of the compression chamber is limited to a more economical proportion, permitting a higher compression therein.

Having thus described my invention what I claim is:

1. In an internal combustion engine the combination with a compression chamber and a pair of cylinders having their explosion ends connected by a passage and their opposite ends opening into said compression chamber, of a crank case, a crank in said crank case, a partition separating said crank case from said compression chamber, pistons in said cylinders having rods connected thereto which pass through said partition, exhaust ports in one of said cylinders adapted to be uncovered by the piston in said cylinder at the end of the outward or working stroke, admission ports for the mixture in the same cylinder adapted to be uncovered by said piston at the end of its inward stroke to admit mixture to said compression chamber, and ports in the piston in the other cylinder adapted to be uncovered when the piston therein is near the end of its outward stroke to convey mixture from said compression chamber to said other cylinder.

2. In an internal combustion engine the combination with a compression chamber and a pair of cylinders having their explosion ends connected by a passage and their opposite ends opening into said compression chamber, of a crank case, a crank in said crank case, a partition separating said crank case from said compression chamber, pistons in said cylinders having rods connected thereto which pass through said partition, exhaust ports in one of said cylinders adapted to be uncovered by the piston in said cylinder at the end of its outward or working stroke, admission ports for the mixture in the same cylinder adapted to be uncovered by said piston at the end of its inward stroke to admit mixture to said compression chamber, and ports in the piston in the other cylinder adapted to be opened when the piston is near the end of its outward stroke, said ports being arranged to cause the mixture to enter said cylinder in a spiral direction.

3. In an internal combustion engine the combination with a crank, a crank-shaft, a connecting-rod and a cross-head, operatively connected together, of a pair of pistons, a pair of piston-rods connecting respectively said pistons with said cross-head, a pair of cylinders in which said pistons operate respectively, having their explosion ends in open communication, a compression chamber into which said cylinders open separated from the cross-head by a partition between the cross-head and the pistons, a chamber adapted to be connected with a supply of combustible mixture and communicating with said compression chamber through ports or openings in the wall of one of said cylinders adapted to be uncovered by the piston operating therein, and ports in the piston operating in the other cylinder to

control the admission of mixture from said compression chamber to said other cylinder.

4. In an internal combustion engine the combination with a compression chamber and a seat formed integrally therewith, of a pair of parallel cylinders having their explosion ends connected by an open passage, a transverse web connecting said cylinders near their opposite ends said web forming a seat adapted to register with the seat of said compression chamber, one of said cylinders terminating at and the other projecting beyond the plane of said seat into said compression chamber.

5. In an internal combustion engine a compression chamber in combination with a pair of parallel cylinders having their explosion ends connected by an open passage, a transverse web forming a seat connecting said cylinders, a seat formed upon said compression chamber adapted to register with the seat connecting said cylinders, one of said cylinders terminating at and the other projecting beyond the plane of said seat into said compression chamber and having an exhaust passage formed on it between said transverse web and the explosion end of the cylinder, said exhaust passage communicating with the cylinder through openings in the cylinder wall.

6. In an internal combustion engine a compression chamber having a seat formed integrally therewith, in combination with a pair of parallel cylinders having their explosion ends connected by an open passage, a transverse web connected to said cylinders near their opposite ends and forming a seat adapted to register with the seat on said compression chamber, one of said cylinders terminating at and the other projecting beyond the plane of said seat and having an exhaust passage formed on it between said seat and the explosion end of the cylinder communicating with the cylinder through openings of increasing width in the cylinder wall.

7. In an internal combustion engine a compression chamber having a seat formed integrally therewith, in combination with a pair of parallel cylinders having their explosion ends connected by an open passage, a transverse web connecting said cylinders near their opposite ends forming a seat adapted to engage said seat of said compression chamber, one of said cylinders terminating at and the other projecting beyond the plane of said seat and having an exhaust passage formed on it between said seat and the explosion end of said cylinder, and a mixture passage formed about the projecting end of said cylinder communicating with the interior thereof through openings in the cylinder wall.

8. In an internal combustion engine the combination with a pair of parallel cylinders having their explosion ends joined by an open passage and connected by a transverse web forming a seat, one of said cylinders terminating at said seat and having a recess formed therein for the reception of packing rings, and the other projecting beyond said seat, and having exhaust ports between said seat and its explosion end and inlet ports on the other side of said seat, of a compression chamber having a seat secured to the seat on said cylinders and provided with a recess adapted to receive the projecting end of said cylinder to form a mixture passage around said projecting end.

9. In an internal combustion engine, a compression chamber in combination with a pair of parallel cylinders having their explosion ends connected by an open passage and connected at a distance from their explosion ends by a transverse web forming the upper wall of said compression chamber, a transverse web or partition forming the lower wall of said compression chamber, a vertical web forming the side walls, of said compression chamber and having a seat adapted to register with and be secured to a seat in said upper wall, an exhaust passage formed on one of said cylinders between said upper wall and the explosion end of the cylinder, said exhaust passage being connected with said cylinder through openings in the cylinder wall.

10. In an internal combustion engine the combination with a compression chamber and a pair of cylinders having their explosive ends connected by a passage and their opposite ends opening into said compression chamber, of a frame, a crank in said frame, a partition connecting said frame with said compression chamber, pistons in said cylinders having rods connected thereto which pass through said partition, exhaust ports in one of said cylinders adapted to be uncovered by the piston in said cylinder at the end of the outward or working stroke, controlled ports to admit mixture to said compression chamber and ports in the piston in the other cylinder adapted to be uncovered when the piston therein is near the end of its outward stroke to convey mixture from said compression chamber to said other cylinder.

11. In an internal combustion engine the combination with a compression chamber and a pair of cylinders having their explosion ends connected by a passage and their opposite ends opening into said compression chamber, of a frame, a crank in said frame, a partition separating said frame from said compression chamber, pistons in said cylinders having rods connected thereto which pass through said partition, exhaust ports in one of said cylinders adapted to be uncovered by the piston in said cylinder at the end of its outward or working stroke, controlled

ports to admit mixture to said compression chamber, and ports in the piston in the other cylinder adapted to be opened when the piston is near the end of its outward stroke, said ports being arranged to cause the mixture to enter said cylinder in a spiral direction.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

JULIAN A. GILES.

Witnesses:
FRANK M. CLARK,
S. H. LESSER.