R. A. REYNOLDS.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED MAR. 15, 1909.

1,007,491.

Patented Oct. 31, 1911.

2 SHEETS—SHEET 1.

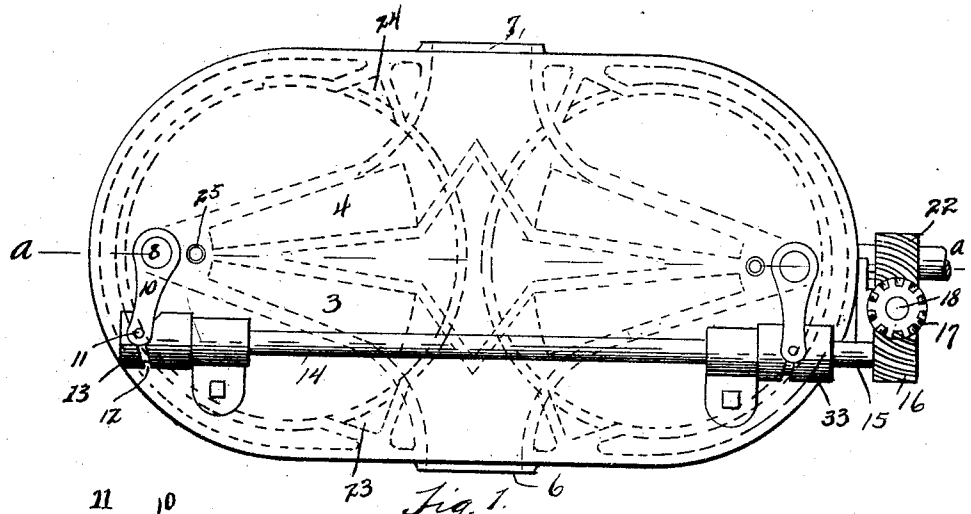

Fig. 1.

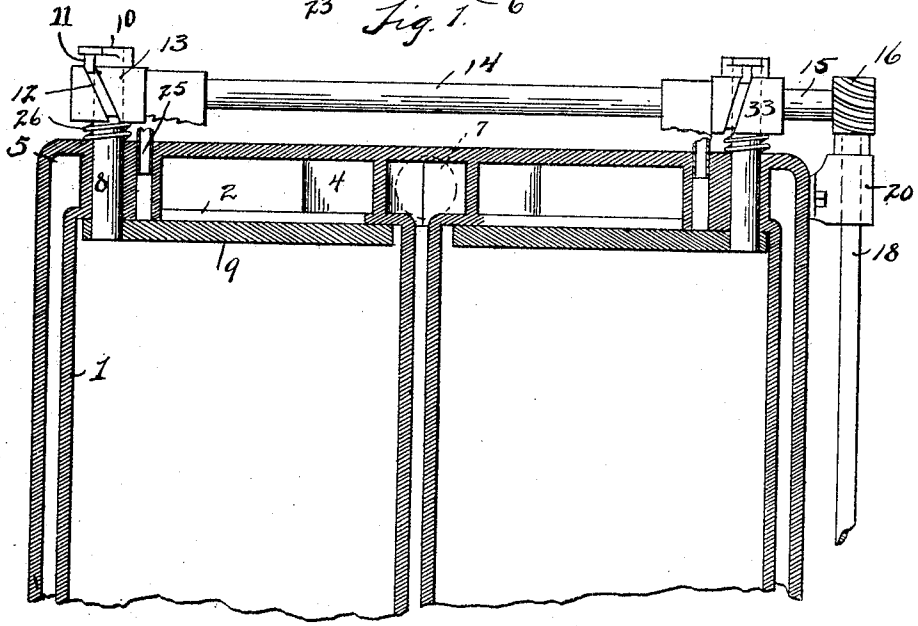

Fig. 2.

Inventor

Robert A Reynolds

Witnesses

Chas E. Wisner

Edward F. Gardner.

By Parker & Burton

Attorneys

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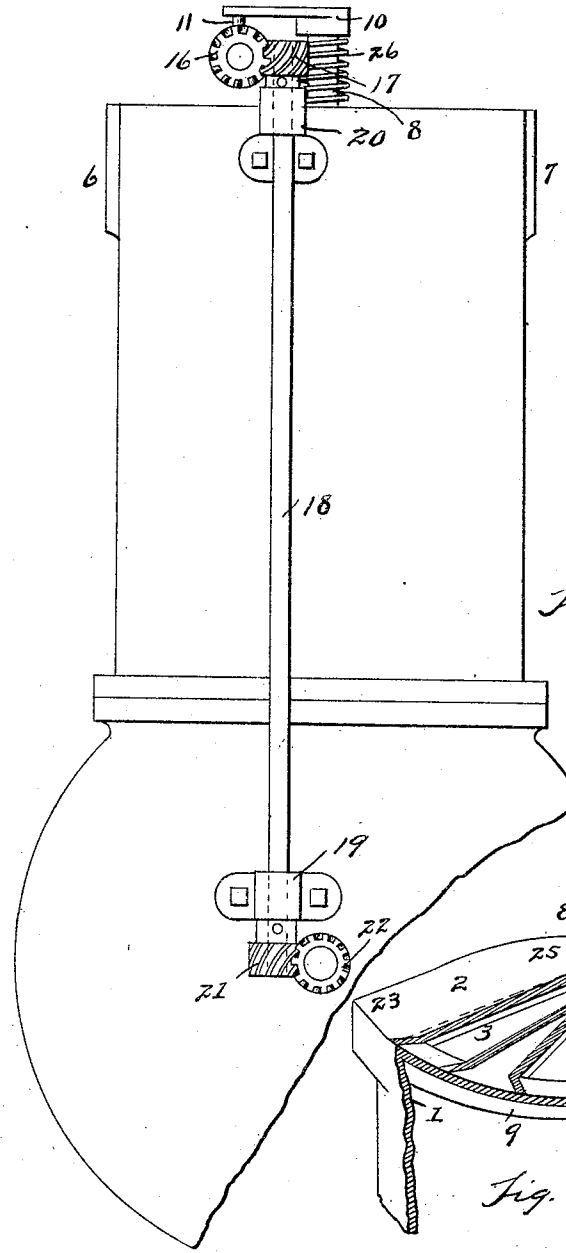

Fig. 3.

Fig. 4.

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1,007,491. INTERNAL-COMBUSTION ENGINE. Robert A. Reynolds, Detroit, Mich. Filed Mar. 15, 1909. Serial No. 483,347.

To all whom it may concern.

Be it known that I, Robert A. Reynolds, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Internal-Combustion 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.

This invention relates to internal combustion engines.

The particular object of the invention is to provide an oscillating valve, which alternately covers the induction and eduction ports, and is actuated to control the introduction of fuel and the expulsion of the products of combustion produced in the engine.

In the drawings:—Figure 1, is a plan view of two cylinders, provided with oscillating valves. Fig. 2, is a sectional elevation at the line *a*—*a* of Fig. 1. Fig. 3, is a side elevation. Fig. 4, is a perspective of a single valve.

The invention is shown as applied to a pair of cylinders, but it is equally applicable to single cylinders, or to any multiple number of cylinders.

Across the top of the cylinder 1 is a diaphragm 2, terminating the combustion chamber of the cylinder, and perforated with passages 3 and 4 which are, respectively, the intake and exhaust passages of the cylinder. Beyond the diaphragm 2 the perforation is continued as a passage into the exterior water jacket 5, and communicating through side passage 6, on the one side, with the feed supply, and through passage 7 on the opposite side with the exhaust conduit. Through the head of the cylinder is inserted a valve stem 8, which, on the interior end, has secured to it a segment shaped valve 9. On its outer side it has secured to it a crank arm 10, which crank arm is provided at its extremity with a wrist pin 11, that engages in the race 12 of a cam 13. The cam is driven in rotation by a shaft 14, mounted in bearings across the axis of the engine, and carrying at its end 15, which projects beyond the cylinder body, a spiral gear 16, which meshes with a spiral gear 17 on vertical shaft 18. The vertical shaft has its axis parallel with the axis of the cylinder, and is supported in suitable bearings 19 and 20 on the engine casing, and at its lower end is provided with a spiral gear 21 that meshes with the spiral gear 22 on the engine shaft. The several spiral gears are proportioned to produce the desired timing of oscillation of the valve 9, which is determined by the character of the engine with which the valve is used. If the engine be of the two cycle variety, the oscillation of the valve should be one complete oscillation for each revolution of the crank. If the engine is of the four cycle variety, there should be one oscillation of the valve for two revolutions of the crank.

It is desirable that in addition to timing the valve to oscillate as above described, it should also be arranged to produce a differential movement in its oscillation, so that there may be quick opening, a long duration of opening, and quick shutting of both the intake and the exhaust ports, and this is provided for by giving to the valve an irregular movement of oscillation by the cam connection of the arm 10, and the cam 13. I prefer to extend the valve nearly across the entire upper face of the cylinder, and in order that the valve may be so extended, provision is made at the side of the cylinder for the full oscillation of the valve, which swings into the pockets 23 and 24. The upper face of the valve is lubricated by oil that passes in through the oil conduits 25, and reaches the upper face of the valve near its connection with the stem 8. The oscillation of the valve forces the oil on the surface of it by centrifugal action over the entire face. Where more than a single cylinder is used, the shaft 14 is provided with a driving cam for each cylinder. A second driving cam is illustrated at 33 in Fig. 1. Preferably the valve stem 8 has a slight freedom of longitudinal movement through its bearings, and the valve is held up in close relation to its seat by spring 26, which surrounds the stem outside the cylinder; it is not desirable that the provision for the longitudinal movement of the valve stem be such that the valve can move more than a very limited distance, simply enough to permit a free clearance of the valve from its seat at all times in operation, a clearance that is generally completely closed by the oil packing that occurs between the valve and its seat, but which is measured in very small units of measurement.

What I claim is:—

1. In an internal combustion engine, in combination with a cylinder, an oscillating valve pivoted eccentric to the axis of the cylinder and adapted to oscillate across the axis of said cylinder, and means for producing oscillation of said valve, substantially as described.

2. In an internal combustion engine, in combination with a cylinder, a valve pivoted eccentric to the axis of the cylinder and adapted to oscillate across the axis of said cylinder, and means for producing a varying oscillatory movement, substantially as described.

3. In an internal combustion engine, in combination with a cylinder having an inlet

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port and an exhaust port, an oscillating valve pivoted therein at one end of its body portion, controlling both the exhaust and inlet ports, and means for producing oscillation of said valve, substantially as described.

4. In an internal combustion engine, in combination with a cylinder, an oscillatory valve of one wing pivoted at one end thereof to the cylinder wall eccentric of the axis of said cylinder, and means for producing oscillation of said valve, substantially as described.

5. In an internal combustion engine, in combination with a cylinder, an oscillatory valve pivoted within said cylinder eccentrically to the axis thereof, a lubricating conduit adapted to direct lubricating material against the face of said valve near its pivotal connection, substantially as described.

6. In an internal combustion engine, in combination with a cylinder, an oscillatory valve loosely pivoted within the cylinder eccentric to the axis thereof, a lubricating conduit adapted to discharge lubricating material on the face of said valve at its pivotal connection and means for causing the oscillation of the valve, substantially as described.

7. In an internal combustion engine, in combination with a cylinder having an inlet and exhaust port, an oscillating valve having a single wing at one end, pivoted to the cylinder eccentric to the axis of said cylinder, and controlling both the exhaust and inlet ports, and means for producing oscillation of said valve, substantially as described.

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

ROBERT A. REYNOLDS.

Witnesses:
CHARLES F. BURTON,
VIRGINIA C. SPRATT.