W. C. SCHNEIDER.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED JAN. 24, 1912.

1,113,374.

Patented Oct. 13, 1914.

2 SHEETS—SHEET 1.

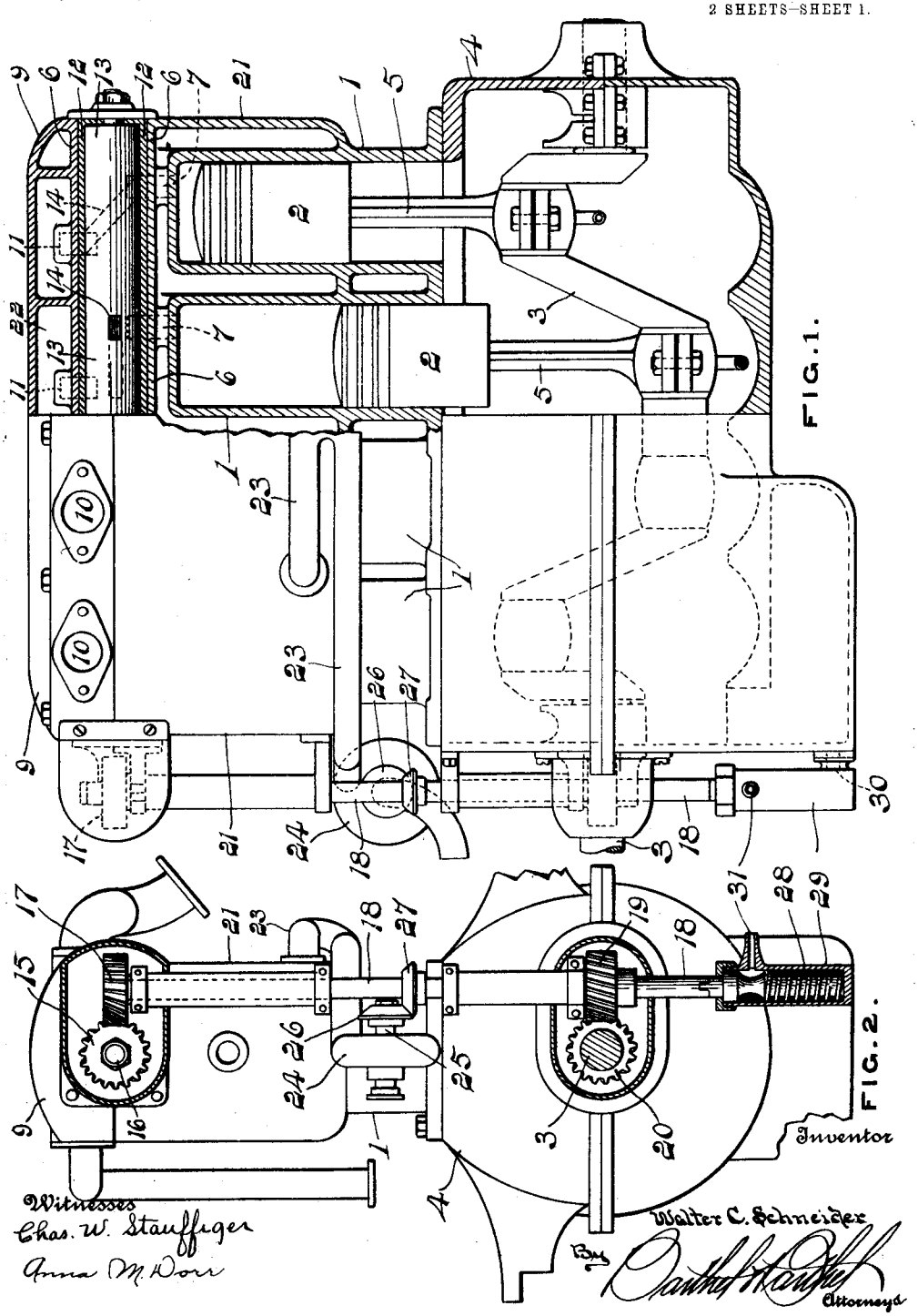


FIG. 1.

FIG. 2.

Witnesses
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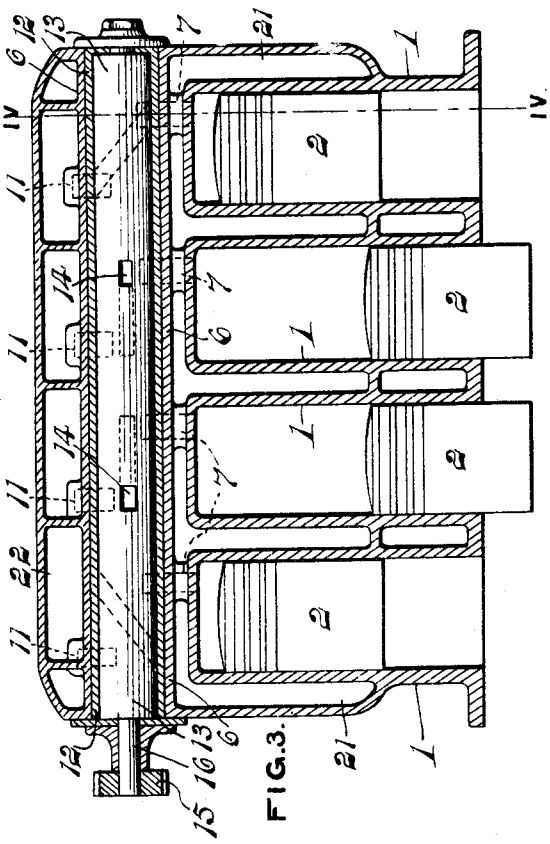


FIG. 3.

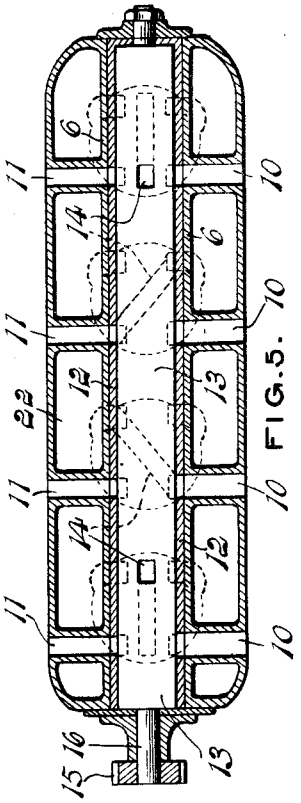


FIG. 5.

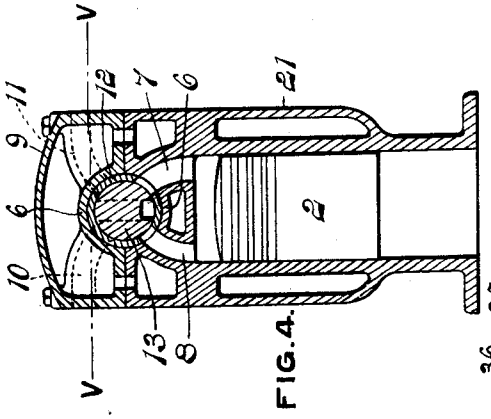


FIG. 4.

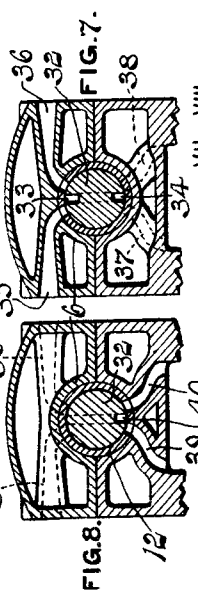


FIG. 7.

FIG. 8.

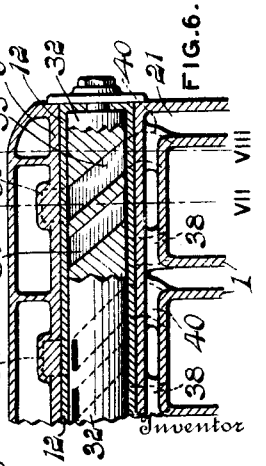


FIG. 6.

Witnesses

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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

1,113,374. Specification of Letters Patent. Patented Oct. 13, 1914.

Application filed January 24, 1912. Serial No. 673,067.

To all whom it may concern:

Be it known that I, WALTER C. SCHNEIDER, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in internal combustion engines and more particularly to a valve for controlling the inlet and exhaust of such engines, and means for actuating the same in timed relation to the movement of the pistons.

The object of the invention is to provide a simple and compact construction which is noiseless and efficient in its operation and to provide certain other new and useful features, the invention consisting in the matters hereinafter more fully set forth and pointed out in the claims, reference being had to the accompanying drawings in which—

Figure 1 is a side elevation of an engine embodying the invention with parts in section to show the construction; Fig. 2 is an end elevation of the same with parts in section; Fig. 3 is a detail showing a longitudinal vertical section through the engine cylinders; Fig. 4 is a transverse vertical section of the same on the line IV—IV of Fig. 3; Fig. 5 is a horizontal section on the line V—V of Fig. 4; Fig. 6 is a sectional detail of a portion of a valve and engine cylinders showing a modified construction; Fig. 7 is a section on the line VII—VII of Fig. 6; and Fig. 8 is a section on the line VIII—VIII of Fig. 6.

A four-cylinder engine of the vertical type is shown for convenience of illustration, but it will be understood that the invention may be applied to an engine having any desired number of cylinders and of any suitable construction. In the drawings 1 represents each of the several cylinders, 2 the pistons therein, 3 the crank shaft mounted in suitable bearings in the crank case 4 and the several cranks of which are connected with the several pistons by connecting rods 5, all constructed and arranged in the usual manner. The cylinders are preferably cast *en bloc* with their upper ends formed with one half of a cylinder or barrel 6 and a suitable inlet port or passage 7 and exhaust port or passage 8 leading from the upper end of each cylinder into the barrel. The upper half of the barrel 6 is formed in a detachable head 9 which is bolted to the upper end of the cylinders and this head is also formed with an inlet passage 10 and an outlet passage 11 opening through the sides of the head and into the barrel. A tubular sleeve 12 is seated in the barrel and formed with ports corresponding to and registering with the several inlet and exhaust passages in the upper end of the cylinders and the head.

A rotary valve 12 fits within the sleeve 12 to turn freely therein and this valve comprises a solid cylindrical member having a connecting passage 14 extending therethrough from side to side thereof opposite each of the cylinders, to connect the passages in the upper ends of the cylinders with the passages in the head. These passages 14 extend diagonally through the valve cylinder from side to side thereof, and the passages 10 and 11 in the head are arranged to register with one end of said passages 14, while the passages 7 and 8 are arranged out of vertical alinement with the passages in the head and register with the opposite end of said diagonal passages. By this diagonal arrangement of the valve passages 14, one end only of each will register with the passages above the valve and the other end will register only with the passages below the valve, and thus, upon a single rotation of the valve, the inlet passages 10 and 7 will be connected by the valve passages, but once during such revolution, and likewise the exhaust passages 8 and 11 will be connected but once during a single revolution of the valve. A single explosive charge is thus admitted to each cylinder by the valve during one of its revolutions and the burned gases of that charge are permitted to escape by the single opening of the exhaust passage of each cylinder. In a four-cycle engine, this valve is therefore turned at one-half of the speed of the crank shaft and the ports and passages are arranged to properly time the opening and closing of the intake and exhaust passages with relation to the movement of the pistons. It will be noted also that the diagonal arrangement of the valve passages obviates the necessity for more than one of such passages for each cylinder when the valve is operated at half the speed of the crank shaft, and the engine is of the four-

cycle type, as said diagonal passages serve to connect the two portions of both the inlet and exhaust passages. Gas is therefore admitted to the cylinders through said diagonal passages and the hot burned gases permitted to escape therethrough, and thus the rotary valve member is cooled by the ingoing charges.

The rotary valve member 13 may be turned in timed relation to the rotation of the crank shaft in any desired manner, but preferably by means of a worm gear 15 secured upon the end of a shaft 16 which is formed integral with the end of the valve member by turning down one end thereof to a suitable diameter. The worm 15 is driven by a worm gear 17 secured upon the end of a vertical shaft 18 mounted in suitable bearings at one end of the crank case and this vertical shaft is driven by means of a worm gear 19 thereon engaging a worm 20 secured upon the adjacent outer end of the crank shaft 3.

The several cylinders of the engine are formed with an integral water jacket 21 in the usual manner, and this water jacket is connected at its upper end with the head 9, which is also formed with a water jacket 22 surrounding the barrel 6 and passages leading thereto. A water pipe 23 leads from the lower end of the water jacket 21 to a pump casing 24 containing a pump which is driven by means of a shaft 25 provided with a beveled gear 26 to engage a similar gear 27 secured upon the vertical shaft 18.

The extreme lower end of the shaft 18 is provided with a screw 28 fitting within a cylindrical casing 29 which is connected by a passage 30 with the lower part of the crank case and has an outlet passage 31 near its upper end to permit the discharge of oil which is elevated by the screw 28. From the outlet 31 the oil may be conducted to the engine bearings or other parts to be lubricated. By this arrangement of drive the rotary valve is directly driven from the crank shaft by a single shaft and worm gears, and said shaft also serves as a drive for the water circulating pump and the oil feed.

In the construction shown in Figs. 6, 7 and 8, the valve is adapted to be turned at one quarter of the speed of the crank shaft, two explosive charges being admitted to each cylinder during one revolution of the valve and the exhaust being twice opened during such revolution. For this purpose the cylindrical valve member 32 is formed with two diagonally arranged passages 33 and 34 for each cylinder, such passages extending through the valve from side to side thereof in parallel relation with the end of one passage opening through one side of the valve and the adjacent end of the other passage opening through the opposite side of the valve in the same transverse plane so that when the valve is rotated, each of these passages will register with a single inlet passage 35 and a single outlet passage 36 for each cylinder. To connect with the opposite ends of these passages at the lower side of the valve, two sets of passages open into the upper end of each cylinder, the passage 34 connecting with an exhaust passage 37 and an inlet passage 38, and the passage 33 connecting with an exhaust passage 39 and an inlet passage 40.

Obviously, changes may be made in the construction and arrangement of parts without departing from the spirit of my invention and I do not wish to limit myself to the particular form or arrangement shown.

Having thus fully described my invention what I claim is:

1. The combination with an engine cylinder, of a barrel forming a valve seat, a rotary valve member in said barrel, inlet and exhaust passages opening into the cylinder and controlled by said valve member, the said passages at one side of the barrel opening into the same in a different plane transverse to the longitudinal axis of the barrel, to that in which the said passages at the opposite side of said barrel open into the same, and said valve member being formed with a passage which opens through the sides thereof and is adapted to register with said inlet and exhaust passages when said member is turned.

2. The combination with an engine cylinder, of a head on said cylinder forming a seat for a rotary valve member and provided with an inlet and an exhaust passage leading from the cylinder and opening through ports in the seat arranged in the same transverse plane, and an inlet and an exhaust passage at the opposite side of said seat opening through ports therein arranged in the same transverse plane and in a different transverse plane to that in which the other ports are located, said last named passages being in communication with the exterior of the head; a rotary valve member engaging said seat to rotate therein and formed with a passage opening through opposite sides thereof with one open end of said passage in the plane of the ports at one side of the seat to register therewith, and its opposite open end in the plane of the ports at the opposite side of said seat to register therewith; and means for turning said valve member in timed relation to the movement of a piston in said cylinder.

3. In an engine, the combination of a cylinder, a head on the cylinder, said head and cylinder being formed with a barrel forming a seat for a rotary valve and said cylinder being formed with an inlet and an exhaust passage opening through the seat and

the head being formed with an inlet and an exhaust passage opening through the seat, a rotary valve member in the barrel and provided with a passage extending therethrough from side to side thereof diagonally to the longitudinal axis of said valve member to connect at one end with the passages of the cylinder and at its opposite end with the passages in the head, and means for rotating said member in timed relation to the movement of a piston in the cylinder.

4. In an engine, the combination of a plurality of cylinders, pistons in said cylinders, a head extending across the cylinders and formed with a seat for a rotary valve, inlet and exhaust passages opening into the cylinders and through the barrel and inlet and exhaust passages in the head extending from the barrel to the exterior of the head, a valve member rotatable within the barrel and formed with transverse passages, one passage opposite each cylinder extending through the valve member diagonally to the longitudinal axis of said member and adapted to register at one end with the passages leading to the cylinders and at the opposite end with the passages in the head, a vertical shaft, means for transmitting motion to said shaft in timed relation to the movement of the pistons, a gear on said shaft, and a gear secured to the valve member to engage said gear.

In testimony whereof I affix my signature in presence of two witnesses.

WALTER C. SCHNEIDER.

Witnesses:

OTTO F. BARTHEL,

LEWIS E. FLANDERS.