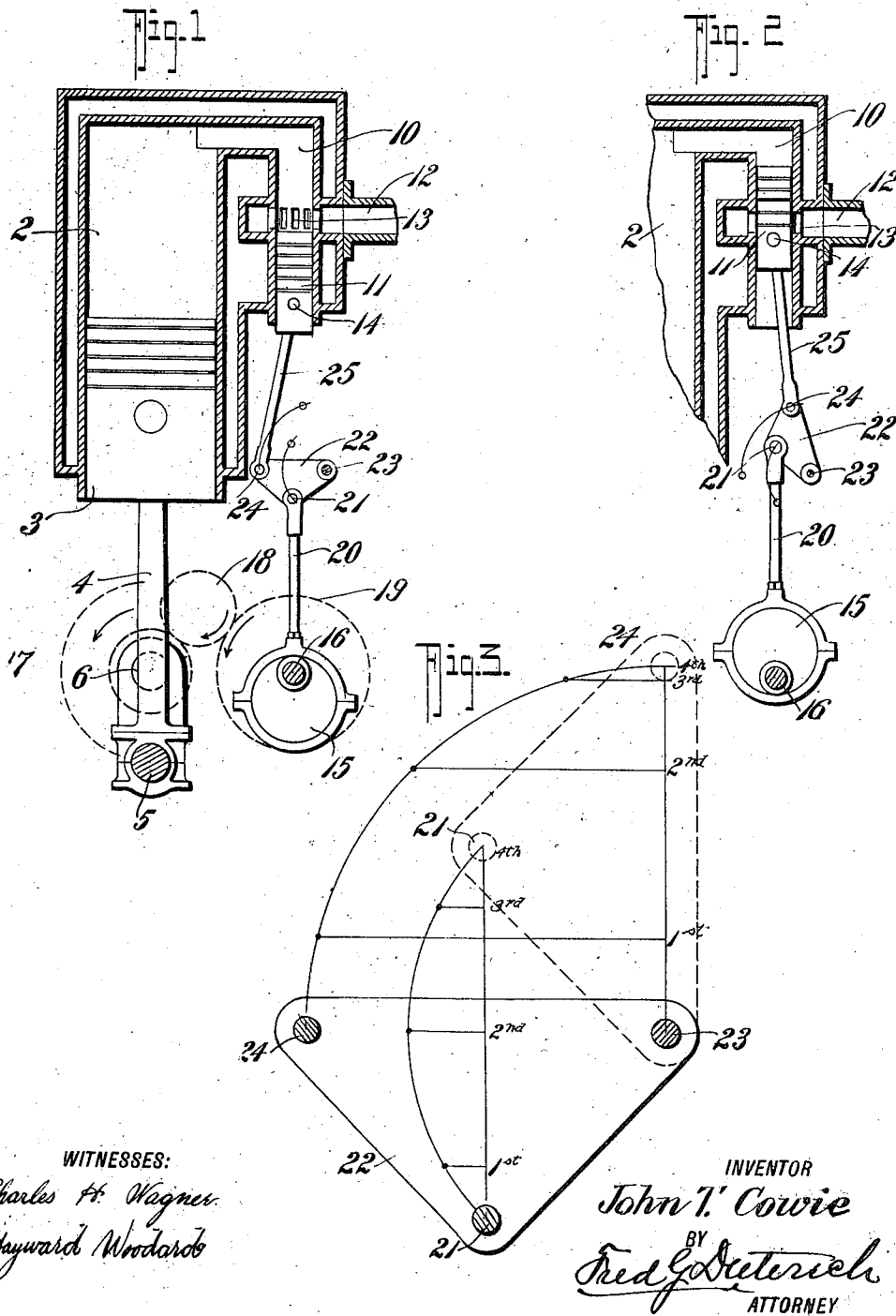


987,860.

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WITNESSES:
Charles H. Wagner
Hayward Woodard

INVENTOR
John T. Cowie
BY
Fred Goetz
ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN T. COWIE, OF NEW WESTMINSTER, BRITISH COLUMBIA, CANADA, ASSIGNOR OF
ONE-HALF TO HENRY SCHAAKE, OF NEW WESTMINSTER, CANADA.

GAS-ENGINE.

987,860.

Specification of Letters Patent. Patented Mar. 28, 1911.

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To all whom it may concern:

Be it known that I, JOHN T. COWIE, a citizen of the Dominion of Canada, residing at New Westminster, in the Province of British Columbia, Canada, have invented a new and useful Gas-Engine, of which the following is a specification.

This invention relates to a gas engine of the four cycle class and my object has been to dispense with the usual puppet valves operated by cams, and to substitute therefor piston valves operated by ordinary eccentrics.

Piston valves operated by eccentrics have been previously used in gas engines, but in order to prevent the force of the explosion being transmitted to the eccentric rods, and to attain a rapid opening of the gas admission and exhaust ports connecting the valve chamber to the explosion cylinder these ports have been situated about midway in the travel of the valves. This arrangement although it may have attained the objects desired has been unsatisfactory in that the body of the valve and its packing rings have been directly exposed to the hot gases of the explosion. These objections have been overcome in the valve operating mechanism which is the subject of this application by effecting the cut off of the admission and exhaust by the upper edge only of the piston valve, and by operating that valve through the intervention of a lever system that will not only vary the motion of the eccentric to the valve in a manner to afford a full and rapid opening of the port during the period of admission and exhaust, but will also transmit the greater part of the force of the explosion on the valve area to the fulcrum of the lever system and save it from being delivered to the eccentric rod. The means by which I effect these results is particularly set forth in the following specification and illustrated in the drawings by which it is accompanied in which;

Figure 1. is a vertical section through the gas engine cylinder and its exhaust valve chamber, showing the valve when full open to exhaust at the completion of the working stroke. Fig. 2. a similar section through the valve chamber showing the position of the valve at the moment of explosion, and Fig. 3. a diagram showing how the pressure on the valve is transmitted to the lever fulcrum.

In these drawings 2 represents one engine cylinder and 3 its piston, connected by a rod 4 to the crank 5 of the crank shaft 6.

The admission and the exhaust valves are alike each operated in a separate cylindrical chamber and are directly connected to the explosion end of the cylinder 2. Being alike the description will be confined to one of them, the exhaust valve. Its chamber 10 is bored to receive a cylindrical valve 11 and is connected by radial ports 13 with the exhaust passage 12. Each valve is operated by an eccentric 15 on a shaft 16 which is driven by gears 17 18 and 19 that will rotate the valve shaft from the crank shaft 6 in the same direction but at half the speed. The eccentric 15 is connected by an eccentric rod 20 to a triangular lever 22 mounted on a fulcrum pin 23 which may extend as a shaft throughout the length of the engine and will serve as does the valve shaft 16 for all the admission and exhaust valves of the engine. The eccentric rod 20 and valve rod 25 are so connected to this lever 22 that while the eccentric pin 21 oscillates, under the throw of the eccentric, equally on each side of the fulcrum 23, the pin 24 to which the valve rod 25 is connected, oscillates entirely on the valve side of the fulcrum 23. A diagram of this movement to an enlarged scale is shown in Fig. 3 from which it will be seen that from the arrangement of the connections of the eccentric rod at 21 and of the valve rod at 24 in relation to the fixed fulcrum 23, the first half of the eccentric movement to the valve is considerably increased while the latter half is lessened. Comparison of these movements is indicated in Fig. 3 where the line 21, 21 represents the movement of the eccentric pin and 23, 24 that of the valve rod pin; the intermediate positions of each at the 1st, 2nd, 3rd and 4th quarters of the half revolution of the eccentric being so indicated on each. From this it will be seen that where the first and second half of the movement of the eccentric pin 21 are alike the first half of the movement of the valve pin 24 is considerably in excess of the latter. It is this acceleration of the first half of the valve movement that opens and closes quickly the admission or the exhaust port. It will be noticed further as shown in Fig. 2 and in the diagram in Fig. 3 that when the valve is at the further

limit of its movement, as at the moment of explosion, the connecting pin 24 of the valve rod is almost directly over the fulcrum 23 and that therefore the greater part of the strain due to the pressure of the explosion on the area of the valve is thrown upon the fulcrum 23 and does not come upon the eccentric rod.

The advantages of an eccentric operated piston valve over the usual cam operated puppet valve with its springs are both in simplicity of construction and of operation self evident, and the only known objections to their use are effectually overcome in the mechanism just described.

Having now particularly described my invention and the manner of its operation I hereby declare that what I claim as new and desire to be protected in by Letters Patent is;

1. In a gas engine, a piston valve, a cylindrical valve chamber for said valve, one end of said valve chamber having port connections with the explosion end of the engine cylinder and the other end of said valve chamber having port connections with a gas passage, means for imparting endwise movement to said valve, said valve moving means comprising an eccentric, a rotatable shaft on which said eccentric is mounted; a rod connected to said eccentric, a fulcrumed lever connected to said rod, a rod connecting said fulcrumed lever to the respective valve, all being arranged that when the valve is at the limit of its movement toward the explosion end of the cylinder, the connection between the valve rod and the lever will be approximately over the fulcrum, substantially as shown and for the purposes described.

2. In a gas engine, a piston valve, and an eccentric, a fulcrumed lever, rod connections between said eccentric and said fulcrumed lever, a valve rod connection between said fulcrumed lever and the respective valve, said rod and said fulcrumed lever being so relatively connected and fulcrumed that the eccentric rod pin vibrates equally on each side of the fulcrum of the lever, while the valve rod pin vibrates entirely between the fulcrum and the valve, and pins for said eccentric and valve rod.

3. In a gas engine, the combination with a piston valve and an eccentric, of transmission mechanism between said eccentric and said valve, said transmission mechanism comprising a triangular member pivoted at one corner, a piston rod pivoted to said triangular member at the corner directly opposite to said first mentioned pivot, an eccentric rod pivoted to said triangular member at the third or apex corner, all being arranged that when said eccentric rod is at the limit of its movement in one direc-

tion, said pivot between said eccentric rod and said triangular member will lie a given distance beneath the pivot of said triangular member, and the pivotal connection between said piston rod and said triangular member will lie in horizontal alinement with the pivot of said triangular member, and when said eccentric rod is at the other limit of its movement, the pivot between said eccentric rod and said triangular member will lie a distance above the pivot of said triangular member equal to said given distance and the pivot between said piston rod and said triangular member will lie still farther above said pivot of said triangular member.

4. In a valve gear for explosive engines and the like, the combination with the reciprocating valve and the eccentric, of a triangular member pivoted at one corner, a valve rod connecting said valve and pivot to another corner of said triangular member directly opposite said pivot thereof, an eccentric rod pivoted to said triangular member at another corner, all being arranged that when said eccentric is at the limit of its movement in one direction the pivotal connection between said eccentric rod and said triangular member will lie a given distance to one side of said triangular member pivot and when said eccentric rod is in the limit of its movement in an opposite direction, said pivotal connection between said rod and said triangular member will lie a distance to the other side of said triangular member pivot equal to said given distance, and said triangular pivotal connection between said piston rod and said triangular member will always lie to one side of said pivot of said triangular member.

5. In a gas engine, the combination with a piston valve and an eccentric, of transmission mechanism between said eccentric and said valve, said transmission mechanism comprising a triangular member pivoted at one corner, a piston rod pivoted to said triangular member at the corner directly opposite to said first mentioned pivot, an eccentric rod pivoted to said triangular member at the third or apex corner, said eccentric rod and said piston rod extending substantially in the same longitudinal direction as the direction of movement of said piston, all being arranged that when said eccentric rod is at the limit of its movement in one direction said pivot between said eccentric rod and said triangular member will lie a given distance beneath the pivot of said triangular member, and the pivoted connection between said piston rod and said triangular member will lie in horizontal alinement with the pivot of said triangular member, and when said eccentric rod is at the other limit of its movement the pivot between said eccentric rod and said triangular member will lie a

distance above the pivot of said triangular member equal to said given distance and the pivot between said piston rod and said triangular member will lie still farther above said
5 pivot of said triangular member, substantially as shown and for the purposes described.

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

JOHN T. COWIE.

Witnesses:

ROWLAND BRITTAIN,
A. G. WOOLSEY.