

996,357.

Patented June 27, 1911.

3 SHEETS-SHEET 1.

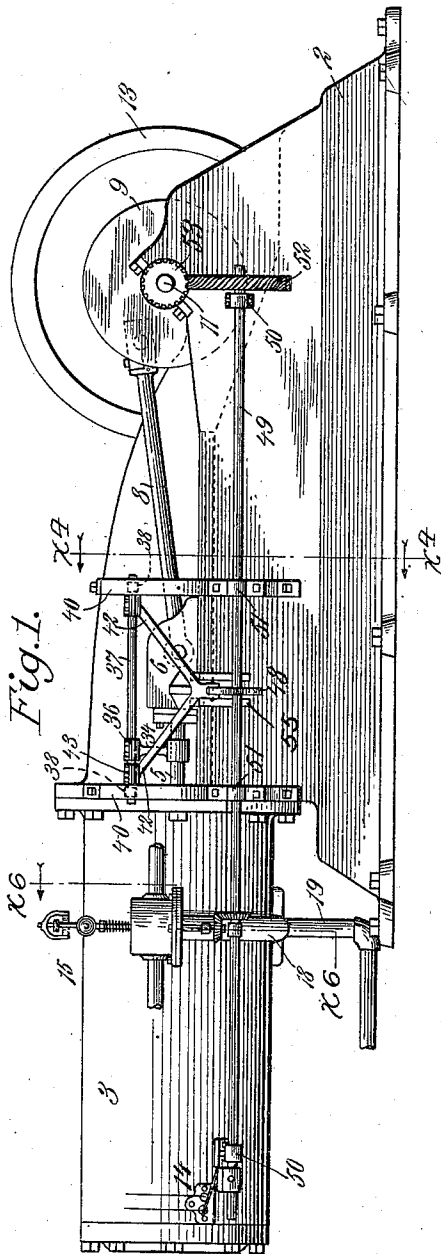


Fig. 1.

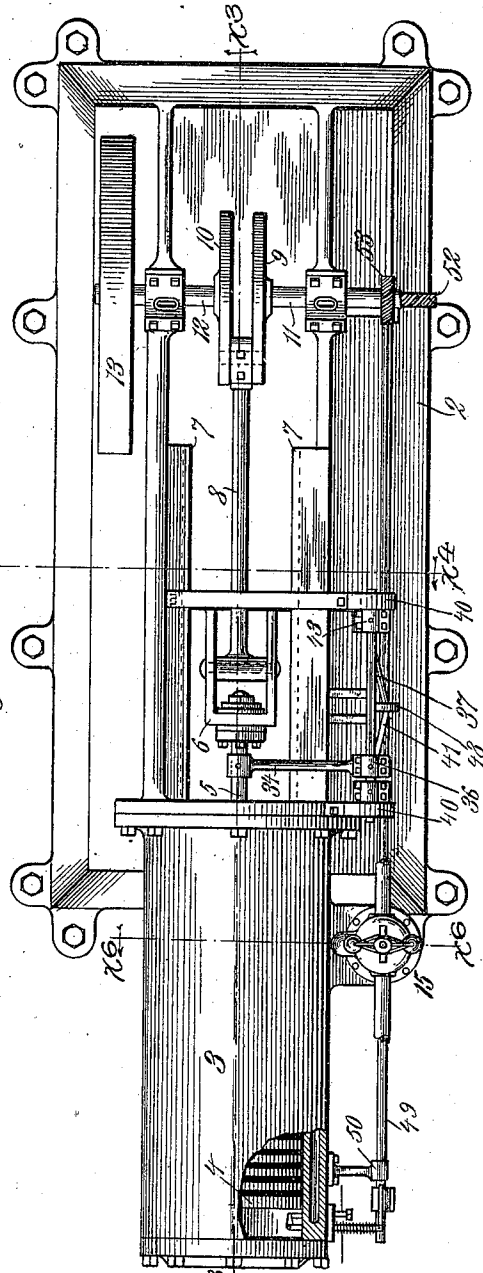


Fig. 2.

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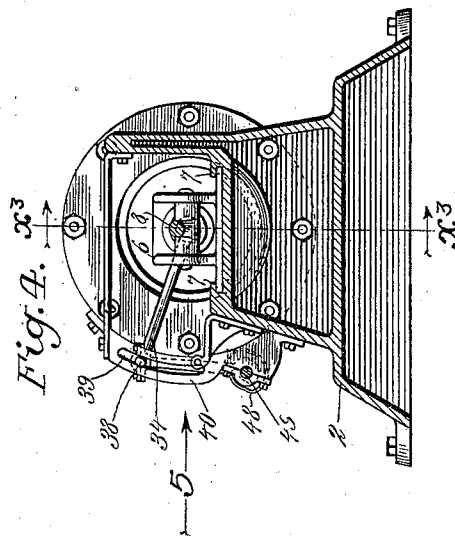
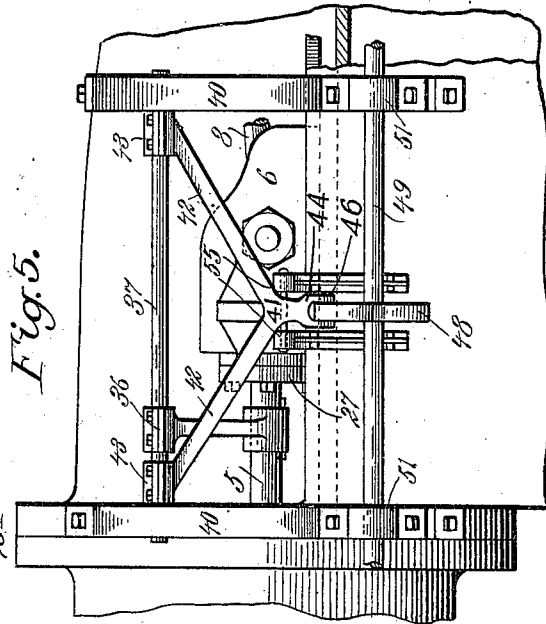
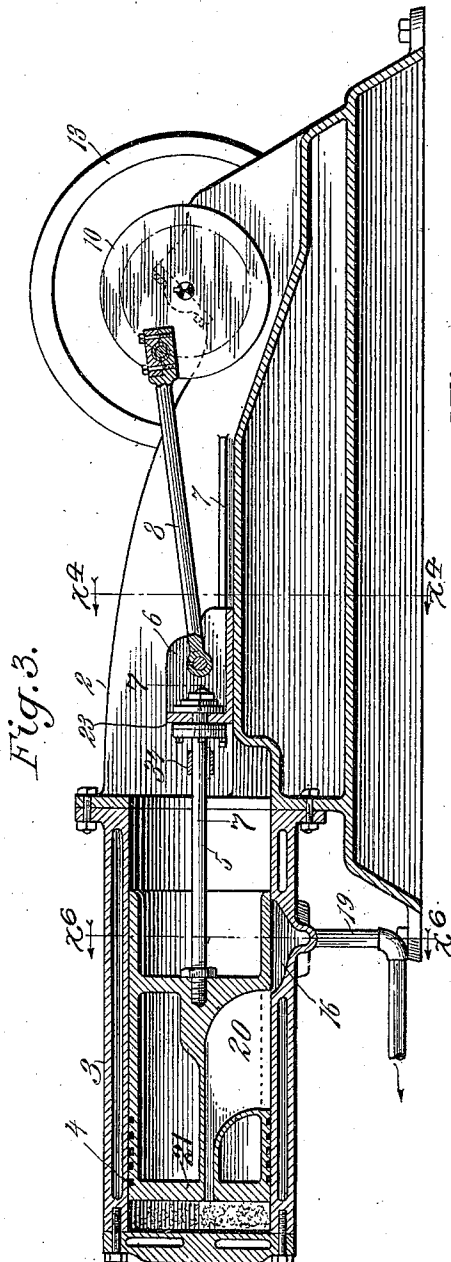
ENGINE.

APPLICATION FILED MAY 11, 1910.

996,357.

Patented June 27, 1911.

3 SHEETS-SHEET 2.



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APPLICATION FILED MAY 11, 1910.

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3 SHEETS—SHEET 3.

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Fig. 7.

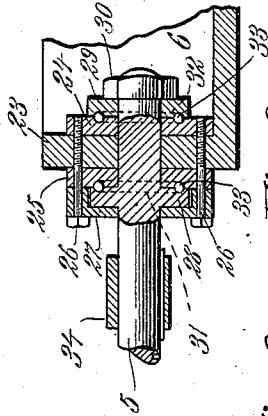


Fig. 8.

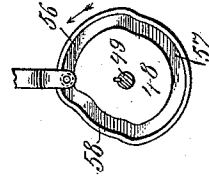


Fig. 9.

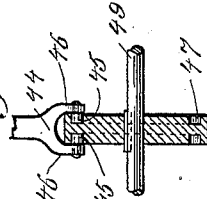
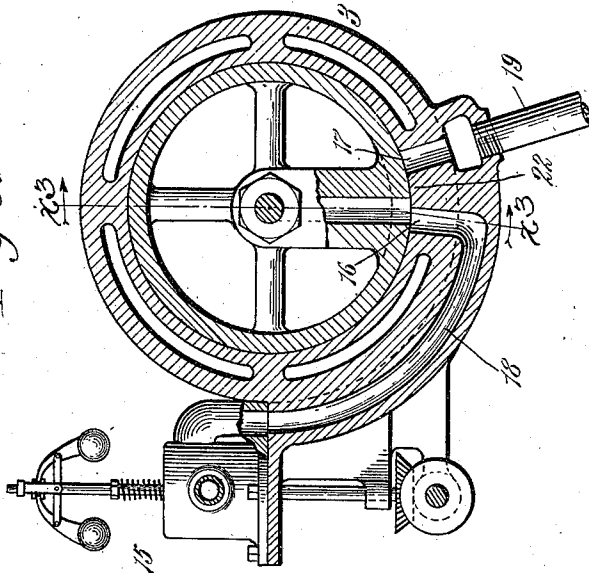


Fig. 6.



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UNITED STATES PATENT OFFICE.

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ENGINE.

996,357.

Specification of Letters Patent. Patented June 27, 1911.

Application filed May 11, 1910. Serial No. 560,747.

To all whom it may concern:

Be it known that I, JOSEPH A. MENARD, a citizen of the United States of America, residing at Los Angeles, in the county of Los Angeles, State of California, have invented a certain new and useful Engine; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to engines, either gas, steam or fluid-pressure engines; and consists mainly in a novel and advantageous construction and combination of parts, hereinafter described and claimed, whereby the piston may be automatically partially rotated at the proper times to effectively open or close communication, through the single passageway in the piston, between the cylinder and the inlet and outlet ports.

Objects of the invention are to provide simple and effective means whereby the gas, steam or fluid can be admitted to and pass out of the cylinder; to dispense with the ordinary valves and thereby avoid the troubles attendant upon their use; to provide a construction whereby wear in the cylinder is minimized and evenly distributed and whereby the piston rests well over the ports and acts to keep clean the interior wall of the cylinder adjacent to the ports; to minimize the end thrust on the piston rod at the time the piston is being rotated and to provide simple and effective means whereby the piston rod is rotatively connected with the sliding crosshead; and to provide novel and effective means which shall act positively to rotate the piston to various predetermined positions and permit of the best results with respect to opening and closing communication between the inlet and outlet ports and the cylinder.

Other objects and the advantages of the invention will be apparent to those skilled in the art from a consideration of the following description of one of the forms of construction for a gas engine embodying the invention, taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of the engine. Fig. 2 is a plan view of the same with parts broken away. Fig. 3 is a view taken on the line X^3-X^3 of Figs. 2, 4 and 6, some of the parts being shown in full. Fig. 4 is a cross-sectional view taken on the line X^4-X^4 of

Figs. 1, 2 and 3. Fig. 5 is an enlarged view of the major portion of the mechanism for rotating the piston, looking in the direction of the arrow 5 in Fig. 4. Fig. 6 is a cross-sectional view taken on the line X^6-X^6 of Figs. 1, 2 and 3. Fig. 7 is a partially sectional view of the means for connecting the piston rod rotatively with the sliding crosshead, taken on line 7—7 of Fig. 3. Fig. 8 is a view of one side of the cam and associated parts of the mechanism for rotating the piston. Fig. 9 is a central sectional view of the parts shown in Fig. 8, some of the parts being shown in full.

The frame 2, of any approved form, may have mounted thereon the cylinder 3 containing the piston 4 to which is attached the piston rod 5 rotatively connected with the cross head 6 which latter may be slidably mounted in the guideways 7 in the frame. To crosshead 6 is pivotally affixed the connecting rod 8 which may be operatively connected with the cranks 9 and 10 on shafts 11 and 12 to the last of which may be secured fly wheel 13.

At 14 is indicated any suitable or approved ignition mechanism, and at 15 is indicated any suitable or approved mechanism for governing the amount of the explosive mixture admitted to the cylinder.

As shown in Fig. 6 the admission port 16 and the exhaust port 17 are both preferably substantially equidistant from the head of the cylinder and located side by side at the lower front end of cylinder 3; the intake conduit 18 leading to port 16 and the pipe 19 leading from port 17. The piston 4 (see Fig. 3) is provided with a single passageway 20 leading from the underside of the piston through the head 21 thereof to the interior of the cylinder 4, which passageway, when the piston has been rotated as herein-after described, is adapted during the admission and exhaust strokes of the piston to register respectively with the port 16 and the port 17 and is adapted during the compression and explosion strokes of the piston to be covered by the portion 22 of the cylinder.

In order to permit of rotation of the piston 4 and at the same time minimize the effect of end thrust, the piston rod 5 is preferably connected with the crosshead 6 as follows: The end portion of the piston rod passes freely through the crosspiece 23 of the crosshead as also through the hardened

bearing blocks 24 and 25 arranged respectively at the front and rear sides of the crosspiece; the bearing blocks 24 being held in position by means of bolts 26 passing
 5 through a gland 27 fitting over a shoulder 28 on the piston rod and extending through bearing block 25 and crosspiece 23 and threaded in bearing block 24. Adjacent to bearing block 24 is arranged the washer 29
 10 and bearing thereagainst is the nut 30 on the end of the piston rod. Ball raceways 31 and 32 with balls 33 disposed therein are respectively provided in the opposed sides of shoulder 28 and bearing block 25 and in
 15 the opposed sides of bearing block 24 and washer 29.

To permit of automatic rotation of the piston 4 to control the position of the passageway 20 therein to open and close communication between the admission and exhaust ports and the interior of the cylinder, the mechanism preferably employed is as follows: An arm 34 secured at one end thereof to piston rod 5 is provided at the other
 25 end thereof with a sleeve 36 slidably mounted upon a rod 37, arranged in parallel with the piston rod and which is provided at its ends with rollers 38 adapted to travel in the arc slots 39 in the brackets 40 which are
 30 suitably secured to frame 2. Between the brackets 40 is arranged a yoke 41 provided with arms 42 connected with the rod 37 by means of sleeves 43 adjacent to the brackets and also provided with a bifurcated head 44
 35 and a roller 45 on each bifurcation 46 adapted to travel in a groove 47 near the perimeter of the cam 48 secured to the shaft 49 which is journaled in bearings 50 and 51 respectively on frame 2 and brackets 40. On
 40 shaft 49 is secured a spiral gear wheel 52 which is adapted to mesh with a pinion 53 on shaft 11; the pinion having one-half the number of teeth that are on the wheel 52. Bracket guides 55 are adapted to steady the
 45 yoke 41 in its movement.

With the above described construction the engine may operate as follows: Assuming that the cam is rotated in the direction indicated by the arrow in Fig. 8, then as the
 50 rollers 45 are traveling to portion 56 of the grooves 47 farthest from the axis of the cam the yoke 41 will move rod 37 and arm 34 upwardly and cause partial rotation of the piston rod to thereby bring the passageway 20 in the piston into alinement with the admission port 16, where it remains until
 55 completion of the admission stroke whereupon the rollers 45 travel to portion 57 of the grooves which is nearer the axis of the cam, and the rod 37 and arm 34 are moved downwardly causing partial rotation of the piston rod and piston to bring the passageway 20 into alinement with portion 22 of the cylinder, which latter covers it during
 60 the compression and explosion strokes of the

piston; after which the rollers 45 travel to portion 58 nearest to the axis of the cam, and the rod 37 and arm 34 are moved farther downward causing partial rotation of the piston rod and piston to bring the passageway 20 into alinement with exhaust port 17.
 70 At completion of the exhaust stroke the rollers 45 again travel to portion 56 of the grooves farthest from the axis of the cam and the piston rod and piston are again
 75 partially rotated to bring the passageway 20 into alinement with the admission port to repeat the cycle of operations above described.

As will be noted (Figs. 3 and 6) the ports 80 16 and 17 are made oblong; they being considerably longer than wide, and the end of the passageway 20 adjacent to the ports is also made oblong, the length thereof preferably being such that the interior of the
 85 cylinder is in communication with the ports 16 and 17 respectively during practically the whole of the admission and exhaust strokes of the piston whereby the cylinder may be effectively charged with the explosive
 90 mixture and whereby the spent gas resulting from explosion of the mixture may be effectively exhausted from the cylinder, and whereby is minimized also the thrust on the connection between the piston rod
 95 and sliding crosshead to thereby diminish the power required to partially rotate the piston as above set forth. It is to be understood that on account of the ports 16 and 17 being made narrow the wear of the cylinder
 100 adjacent thereto is minimized; also it will be seen that the ports being on the forward underside of the cylinder the piston seats well thereover and keeps clean the interior wall of the cylinder adjacent thereto.
 105

While one form of construction in which the invention may be embodied has been illustrated and described, it will occur to those skilled in the art that the particular construction admits of various changes and
 110 modifications and the right is therefore reserved to all such changes and modifications as do not depart from the spirit and scope of the invention.

I claim:

1. In a valve gear for an engine, the combination of a cylinder provided with a port upon one side thereof, a piston mounted within the cylinder to have both a sliding and a rotary movement, the said piston being formed with a laterally opening passage adapted to be turned into and out of registry with the before mentioned port, a piston rod projecting from the piston, a lateral arm rigid with the piston rod, a shaft having a
 125 cam member thereon, means for driving the shaft, and an operative connection between the cam and the lateral arm for turning the piston.

2. In a valve gear for an engine, the com- 130

5 bination of a cylinder provided in one side thereof with a port, a piston mounted within the cylinder to have both a sliding and rotary movement, the said piston being formed with a laterally opening passage adapted to be turned into and out of registry with the before mentioned port, a shaft having a cam member thereon, an operative connection between the engine and the shaft for driving the latter, and means actuated by the cam member for rotating the piston.

10 3. In a valve gear for an engine, the combination of a cylinder provided in one side thereof with a port, a piston mounted within the cylinder to have both a sliding and a rotary movement, the said piston being formed with a laterally opening passage adapted to be turned into and out of registry with the port, a piston rod projecting from the piston, a movably mounted guide rod arranged parallel to the direction of movement of the piston, a lateral arm rigid with the piston rod and having a sliding connection with the guide rod, and means for moving the guide rod to rotate the piston.

15 4. In a valve gear for an engine, the combination of a cylinder provided in one side thereof with a port, a piston mounted within the cylinder to have both a sliding and a rotary movement, the said piston being formed with a laterally opening passage adapted to be turned into and out of registry with the port, a piston rod projecting from the piston, a bracket provided with curved guide-ways concentric with the axis of the piston, a guide rod arranged parallel to the direction of movement of the piston and movably mounted upon the curved guideways of the bracket, a lateral arm rigid with the piston rod and having a sliding connection with the guide rod, and means for moving the guide rod to rotate the piston.

20 5. In a valve gear for an engine, the combination of a cylinder provided in one side thereof with a port, a piston mounted within the cylinder to have both a sliding and a rotary movement, the said piston being formed with a laterally opening passage adapted to be turned into and out of registry with the said port, a piston rod projecting from the piston, a movably mounted guide rod arranged parallel to the direction of move-

ment of the piston, a lateral arm rigid with the piston rod and having a sliding connection with the guide rod, a cam member, and means actuated by the cam member for moving the guide rod to rotate the piston.

6. In a valve gear for an engine, the combination of a cylinder provided in one side thereof with a port, a piston mounted within the cylinder to have both a sliding and a rotary movement, the said piston being formed with a laterally opening passage adapted to be turned into and out of registry with the said port, a piston rod projecting from the piston, a movably mounted guide rod arranged parallel to the direction of movement of the piston, a lateral arm rigid with the piston rod and having a sliding connection with the guide rod, a shaft geared to the engine, a cam member upon the shaft, and a member pivotally connected to the guide rod and engaging the cam member so as to move the guide rod and rotate the piston.

7. In a valve gear for an engine, the combination of a cylinder provided in one side thereof with a port, a piston mounted within the cylinder to have both a sliding and a rotary movement, the said piston being formed with a laterally opening passage adapted to be turned into and out of registry with the said port, a piston rod projecting from the piston, a movably mounted guide rod arranged parallel to the direction of movement of the piston, a lateral arm rigid with the piston rod and having a sliding connection with the guide rod, a shaft parallel to the guide rod, means for driving the shaft, a cam member upon the shaft, and a yoke member, one end of the yoke member being pivotally connected to the guide rod while the opposite end has an operative connection with the cam member for moving the guide rod to rotate the piston.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses at Los Angeles, county of Los Angeles, State of California, this 6th day of May, A. D. 1910.

JOSEPH A. MENARD.

Witnesses:

ALEX CURRIE,

ALEX. H. LIDDERS.