May 3, 1927. 1,627,427

C. L. COOK

GAS OR VAPOR ENGINE, PARTICULARLY STEAM ENGINE

Filed Oct. 20. 1920 5 Sheets-Sheet 1

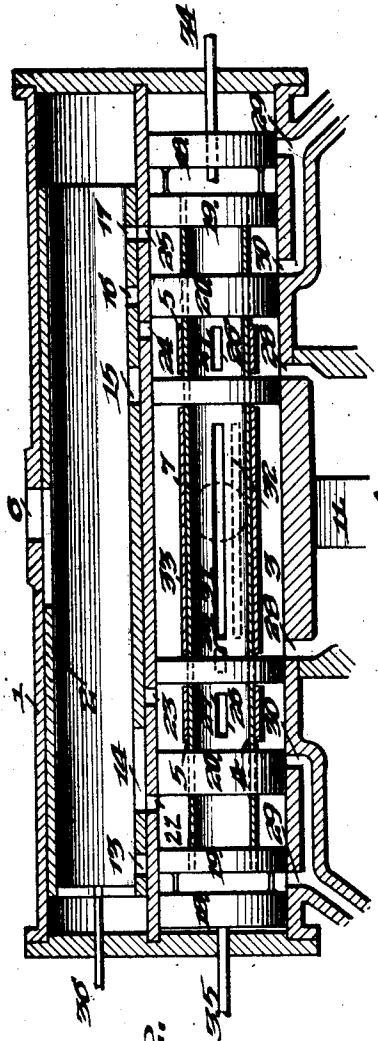

Fig. 2.

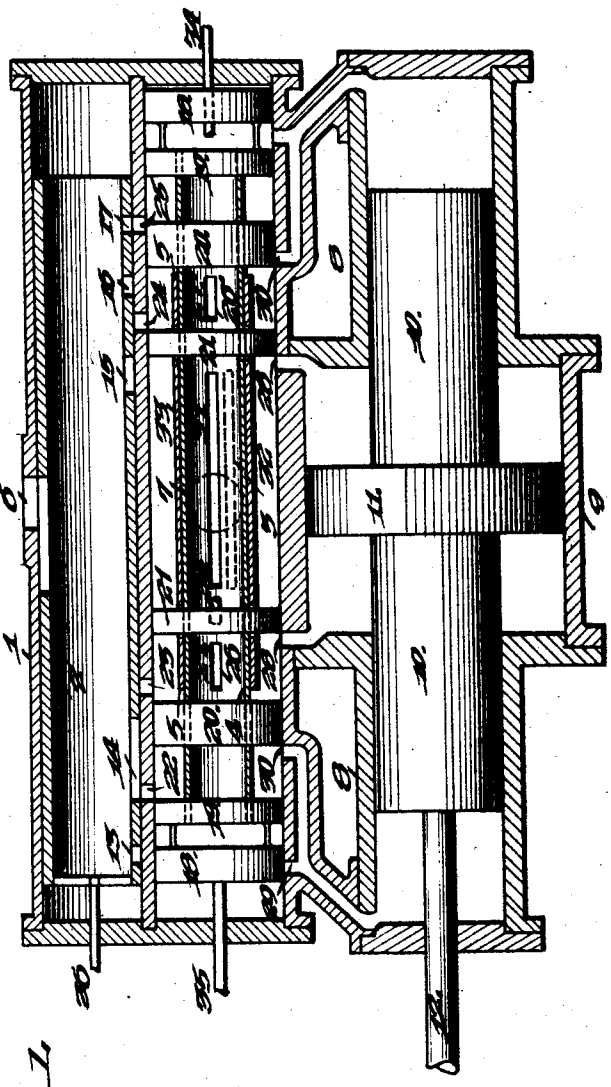

Fig. 1.

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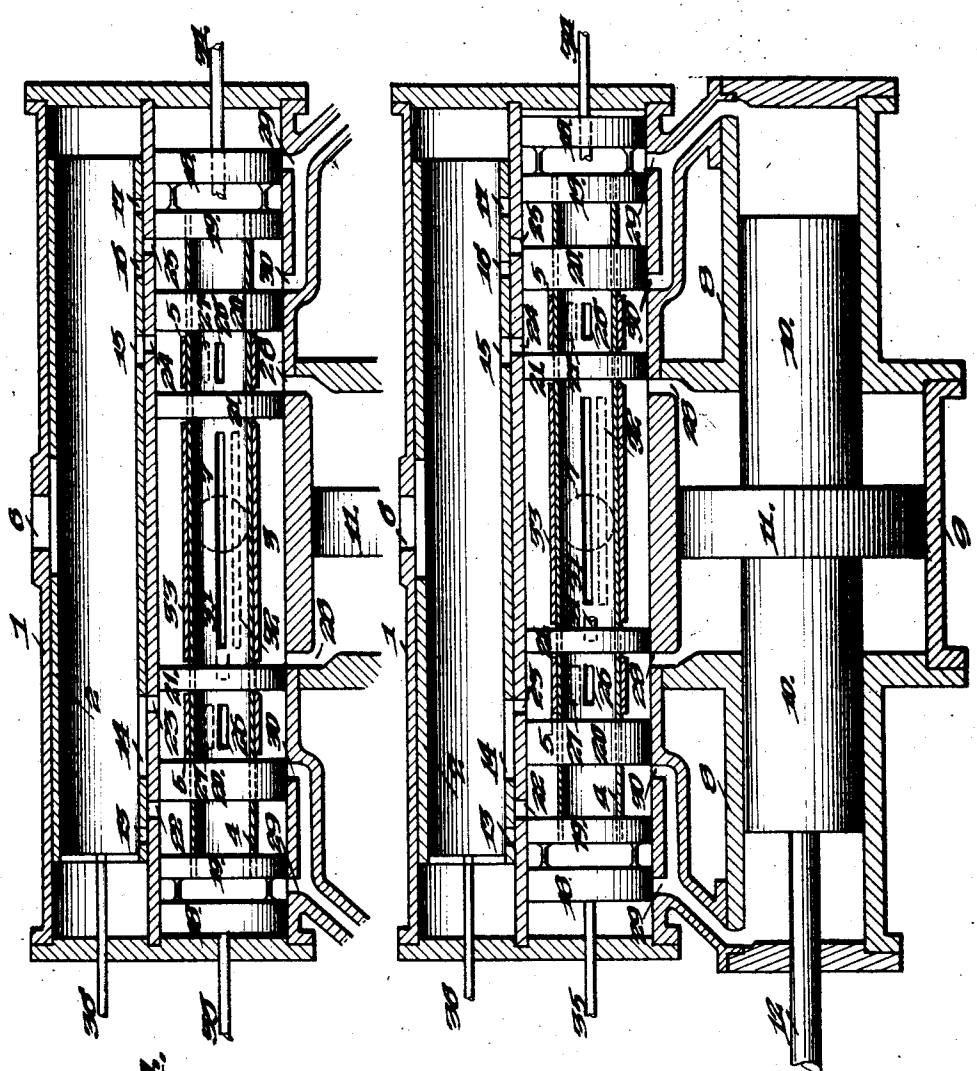

Fig. 4.

Fig. 5.

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GAS OR VAPOR ENGINE, PARTICULARLY STEAM ENGINE

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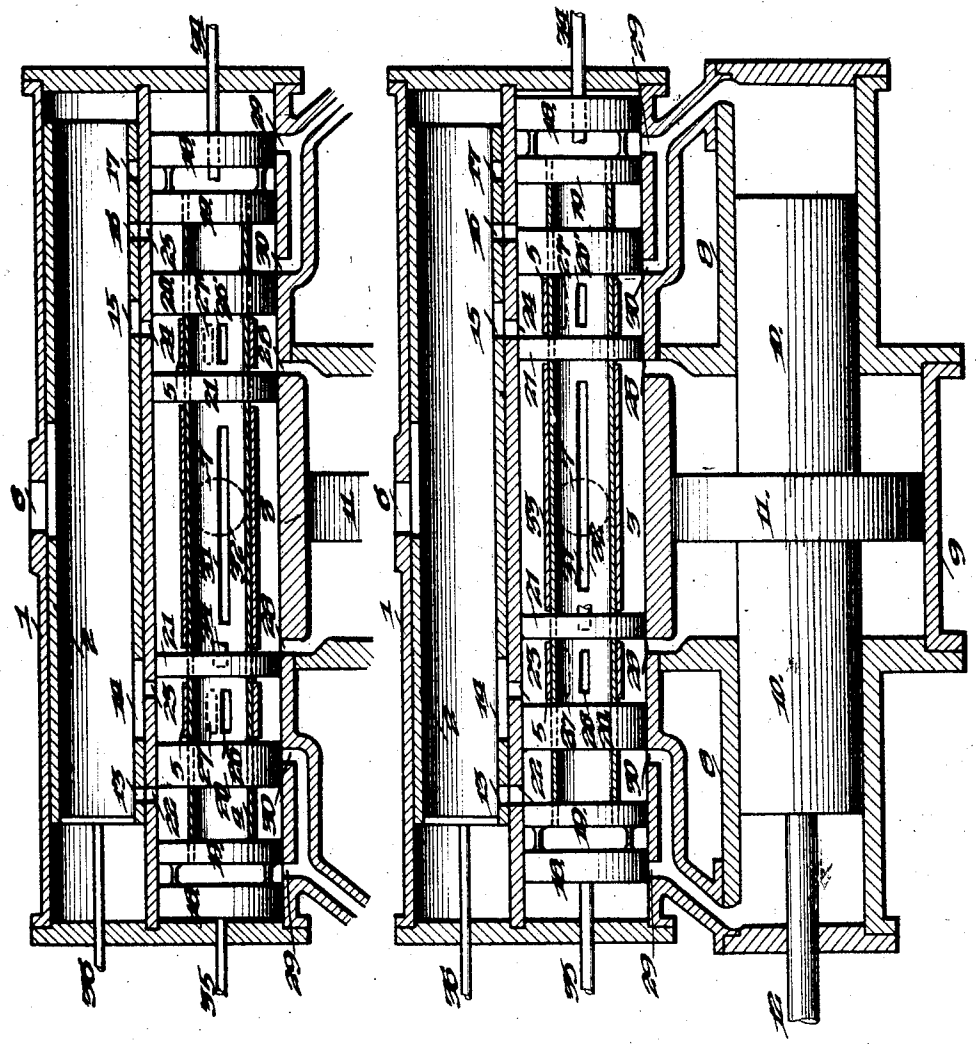

Fig. 6.

Fig. 5.

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GAS OR VAPOR ENGINE, PARTICULARLY STEAM ENGINE

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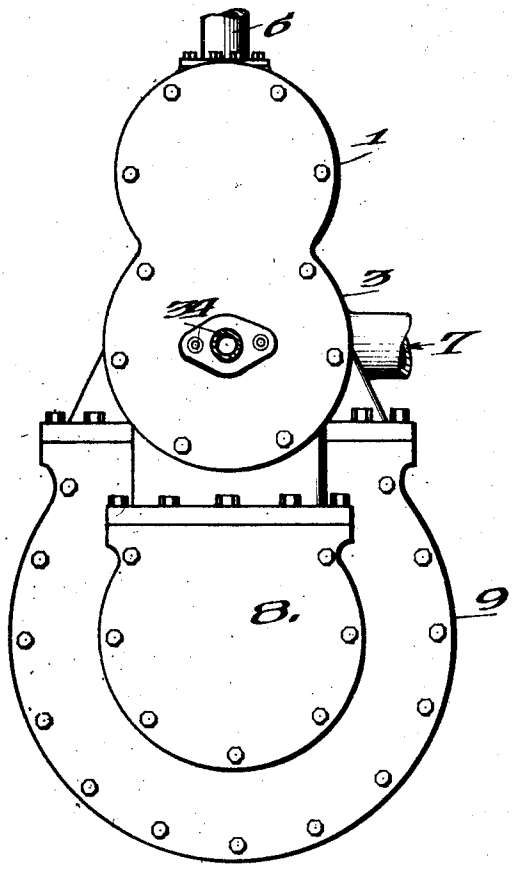

Fig. 8.

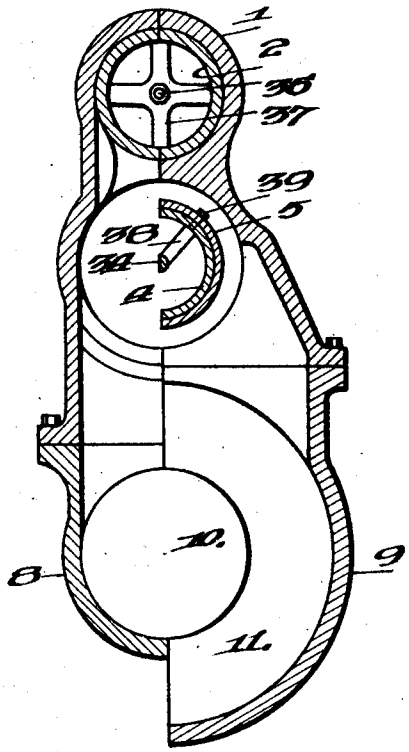

Fig. 7.

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Fig. 9.

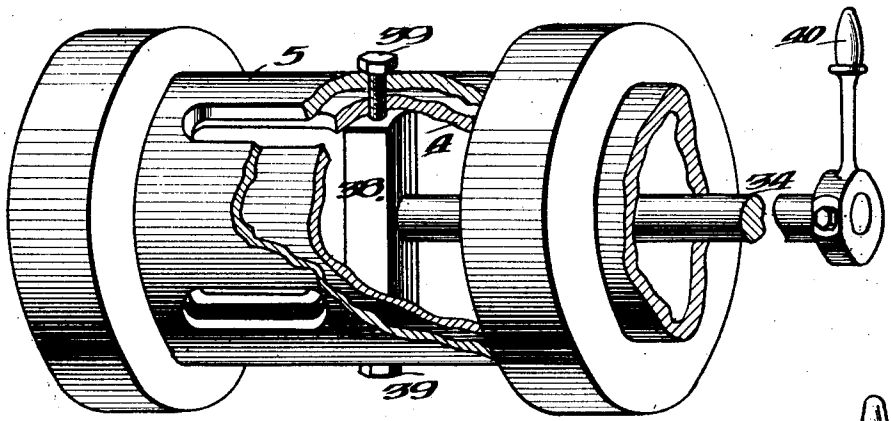
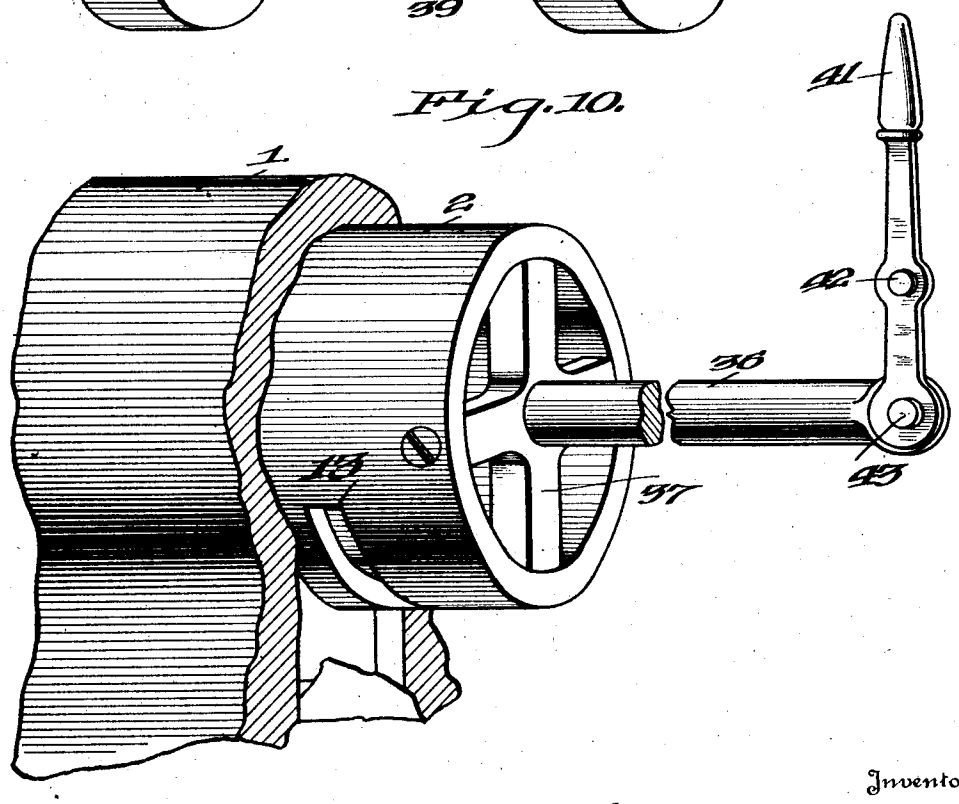


Fig. 10.



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Patented May 3, 1927. 1,627,427

UNITED STATES PATENT OFFICE.

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GAS OR VAPOR ENGINE, PARTICULARLY STEAM ENGINE.

Application filed October 20, 1920. Serial No. 418,293.

My invention relates to compound steam or gas engines, particularly to those used on locomotives. An object of my invention is to provide valve controlling means such that the engine may be operated as a compound high and low pressure engine, as a high pressure engine of maximum power, or as a high pressure engine of lesser power.

Another object of my invention is to provide such means that will be simple in construction but efficient in operation, and can be readily and quickly changed from one type to another.

Other objects will be apparent from the following detailed description and the appended claims.

In the drawings:

Figure 1 is a vertical longitudinal section through the device, with the parts set to act as a compound high and low pressure engine and with the reciprocating valve mechanism in its extreme right hand position.

Figure 2 is a similar view with the mechanism in its extreme left hand position.

Figure 3 is a similar view with the parts set to operate as a high pressure engine of reduced power and the reciprocating valve mechanism in its extreme right hand position.

Figure 4 is a similar view with the mechanism in its extreme left hand position.

Figure 5 is a similar view with the parts set to operate as a high pressure engine of maximum efficiency and the reciprocating valve mechanism in its extreme right hand position.

Figure 6 is a similar view with the mechanism in its extreme left hand position.

Figure 7 is a section of the cylinder, steam chest and auxiliary valve chest taken at right angles to the previous figures, the right hand half showing a section through the large diameter cylinder and the left hand half showing a section through the small diameter cylinder.

Figure 8 is an end view of the device.

Figure 9 shows a perspective view of part of the reciprocating valve mechanism with parts broken away to show the internal construction.

Figure 10 shows a perspective view of one end of the steam chest, with parts broken away to show the reciprocable valve mechanism.

The steam chest 1 is provided with a reciprocable sleeve 2, which acts as a valve and may be set to a plurality of positions through any desired mechanism. As shown in Figure 10, this may comprise a handle 41 pivoted at 42 to any desired support and having a pivotal connection at 43 with a rod 36 attached by a spider 37 to the sleeve 2. A steam pipe may connect with this steam chest as indicated at 6. In the lower wall of the sleeve 2 are formed a series of openings 13, 14, 15, 16 and 17 for purposes hereinafter described.

The lower wall of the steam chest 1 is preferably also the upper wall of the main valve chamber 3. In this wall are openings 22, 23, 24, and 25 with which communicate under varying conditions the openings 13 to 17 inclusive above mentioned. The two series of openings provide direct communication from the steam chest 1 to the valve chamber 3.

In the valve chamber 3 is a tube 4 mounted in three pairs of disks 19, 20 and 21, the chamber, tube and disks having a common axis. At each end of the chamber a disk 18 is spaced from the disk 19, but carried thereby. The valve stem 34 passes through the disks 18, 19, 20 and 21 at one end of chamber and bears in the other disk 21. A central sleeve 33 and attached sleeves 5 at each end thereof are rotatable on the outside of the tube 4. Arms 38 attached to the valve stem 34 have screw bolts 39 attached thereto which move in slots in the tube 4 and are attached to the sleeves 5 and 33. A handle 40 at the end of the valve stem 34 permits rotary adjustment of the sleeves as desired.

In the opposite end of the valve chamber 3 is a rod 35 attached to the end disk 18 and having a sliding bearing in the end of the chamber 3. The entire internal valve mechanism is thus reciprocated lengthwise of the chamber 3 by the rod 35 which is given its reciprocating motion by the usual eccentric mechanism operated from the piston rod 12 of the engine, but which forms no part of my invention.

The exhaust pipe 7 is positioned at the longitudinal center of the valve chamber 3 and in the outer wall thereof.

From the foregoing, it is evident that the reciprocating valve 2 may be manually set to a plurality of positions, and that the rotary valve mechanism comprising the sleeves 5 and 33 may also be set to a plu-

rality of positions entirely independent of the other adjustment.

The compound cylinder consists of the central cylinder 9 of larger diameter and two cylinders 8 of smaller diameter extending in line therewith from each end. In the central cylinder is the double faced piston 11 and extending from each side thereof and fixed thereto are pistons 10 of smaller diameter and of sufficient length to maintain a constant bearing in each smaller cylinder and perform the functions of a piston rod. Fixed to one of the pistons 10 is the main piston rod 12.

The tube 4 has openings 26, 26′ and 31, and the sleeves 5 are provided with openings 27 and 27′ that may be brought into register with the openings 26 and 26′, while the sleeve 33 has an opening 32 that may be brought into register with the opening 31, all as desired and by rotation of the valve stem 34. When 26 and 26′ register with 27 and 27′, then 31 and 32 do not register, and vice versa. The lower wall of the valve chamber is provided with pairs of openings 28, 29 and 30 leading into the cylinders.

When the sleeve 2 in the steam chest 1 is in set position to the left and the openings 26 and 26′ register with 27 and 27′, as shown in Figures 1 and 2 of the drawings, the parts are in position to operate as a compound high and low pressure engine. In Figure 1 the reciprocating valve mechanism is shown at the extreme right of its stroke. The passage 13 is closed and the steam is admitted through port 14, passage 22 to the chamber between disks 19 and 20 and thence through passage 30 to the small cylinder at one end. This admission of high pressure steam continues through a fixed portion of the stroke of the piston in one direction as is usual in steam engines. At the same time the high pressure steam in the small cylinder 8 at the opposite end, which has completed its work, passes through the port 29 into the valve chamber between the disks 18 and 19 at that end, thence through tube 4, openings 26 and 27 into the chamber between the disks 20 and 21 and through the port 28 to the left hand side of the large piston 11, which now functions as a low pressure piston. On the other side of the piston 11 the low pressure steam exhausts through the passage 28 into the chamber between the disks 21 and 21, and thence through the exhaust pipe 7 into the outer air. On the return stroke a corresponding action takes place, the steam being admitted through passages 17, 25 and communicating passages as described above.

When the sleeve 2 is set in its middle position lengthwise of the steam chest, the parts are in position to operate as a high pressure engine of reduced power. This is shown in Figures 3 and 4. In Figure 3 when the reciprocating valve mechanism is at its right hand position, the passage 13 is closed and the openings 26, 26′; 27, 27′, and 31, 32 are all out of register. High pressure steam is admitted directly through ports 14, 23 and 28 to the large diameter cylinder. On the other side of the piston the high pressure exhausts through the port 28 into the chamber between disks 21 and 21, exactly as in the preceding position. A corresponding action takes place on the return stroke of the piston, the steam being admitted through passages 15, 24 and corresponding passages.

When the sleeve 2 in the steam chest 1 is in its extreme right hand position, the parts are in position to operate as a high pressure engine of maximum power. This is shown in Figures 5 and 6. At this time the ports 26 and 26′ are out of register with 27 and 27′ but 31 and 32 are in registering position. Steam now passes through 13, 22 and 30 into the left hand cylinder 8 and at the same time through 14, 23 and 28 into the left hand side of the cylinder 9. The exhaust from the small cylinder takes place through port 29, chamber between disks 18 and 19, tube 4, ports 31 and 32 into chamber between disks 21 and 21, and thence into the exhaust pipe 7. The exhaust from the large cylinder takes place through port 28 into chamber between disks 21 and exhaust pipe 7. A corresponding action takes place on the return stroke, the steam being admitted through passages 15 and 24 and through 16 and 25 into the corresponding ports and chambers.

It is evident from the above description that the sliding valve 2 may be set to three different positions, and that the rotary valve comprising the sleeves 5 and 33 may also be set to three positions, and that by a suitable choice of these positions, the engine may be made to operate in three distinct ways. Obviously various details of structure may be changed or modified without departing from the spirit of the invention, and the invention is limited only by the terms of the appended claims.

I claim as my invention:

1. A gas or vapor engine comprising a compound cylinder, a compound reciprocating piston provided with piston heads of different diameters, and valve control mechanism for directing the gas or vapor either wholly into the larger diameter portions of the cylinder or wholly into the smaller diameter portions of the cylinder, said mechanism comprising a reciprocable valve adapted to be set in different positions and a reciprocating valve provided with a rotary control sleeve adapted to be set in different positions.

2. A gas or vapor engine comprising a compound cylinder, a compound reciprocating piston provided with piston heads of

different diameters, and valve control mechanism for directing the gas or vapor either wholly into the larger diameter portions of the cylinder, or wholly into the smaller diameter portions of the cylinder, or into both larger diameter and smaller diameter portions of either end thereof simultaneously, said mechanism comprising a reciprocable valve adapted to be set in different positions and a reciprocating valve provided with a rotary control sleeve adapted to be set in different positions.

3. A gas or vapor engine comprising a compound cylinder formed with a central cylinder of larger diameter and cylinders of smaller diameter extending from each end thereof, a compound piston comprising a two-faced piston head in said large cylinder and a cylindrical extension into each smaller cylinder providing piston heads therein, and valve control mechanism comprising a reciprocable valve and a reciprocating valve provided with a rotary control sleeve.

4. A gas or vapor engine comprising a multiple chambered cylinder, a multiple faced reciprocating piston, and valve control mechanism for directing motive fluid in different paths to the chambers of the cylinders comprising a cylinder with ports and a reciprocable sleeve having ports adapted to be brought into and out of register with the first named ports and a reciprocating valve comprising an auxiliary cylinder having ported sleeves, one of which is rotatable.

5. A gas or vapor engine comprising a multiple chambered cylinder, a multiple faced reciprocating piston, and valve control mechanism for directing motive fluid in different paths to the chambers of the cylinders comprising a cylinder with ports and a manually operable reciprocable sleeve having ports adapted to be brought into and out of register with the first named ports, and a reciprocating valve comprising an auxiliary cylinder with ported sleeves, one of which is manually rotatable.

6. A gas or vapor engine comprising a multiple chambered cylinder, a multiple faced reciprocating piston, a steam chest, a sliding valve therein that may be set to either of three positions, a reciprocating valve mechanism, and means for directing motive fluid to the chamber of the cylinder comprising an auxiliary rotary valve within said valve mechanism that may be set to either of three positions.

7. A gas or vapor engine comprising a multiple chambered cylinder, a multiple faced reciprocating piston, and means for directing motive fluid to the chamber of the cylinder, comprising a steam chest, a sliding valve therein settable to either of three positions, a reciprocating valve mechanism having three chambers over each end of said compound piston, and an auxiliary rotary valve mechanism within said reciprocating valve mechanism that may be set to either of three positions.

CHARLES LEE COOK.