

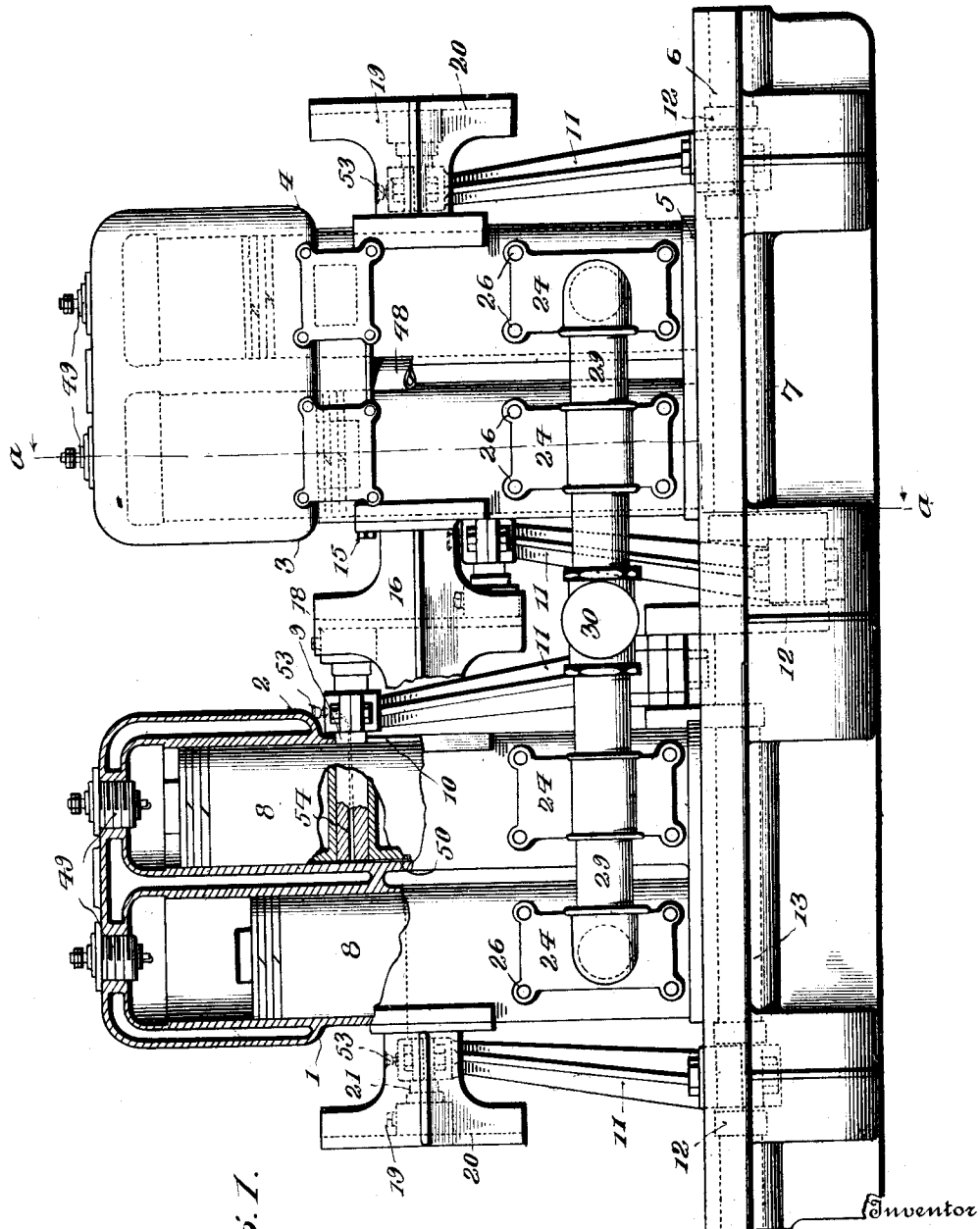
W. F. STONE.
VAPOR ENGINE.

APPLICATION FILED MAY 12, 1911. RENEWED NOV. 1, 1912.

1,063,475.

Patented June 3, 1913.

3 SHEETS—SHEET 1.



Witnesses

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Fig. 1.

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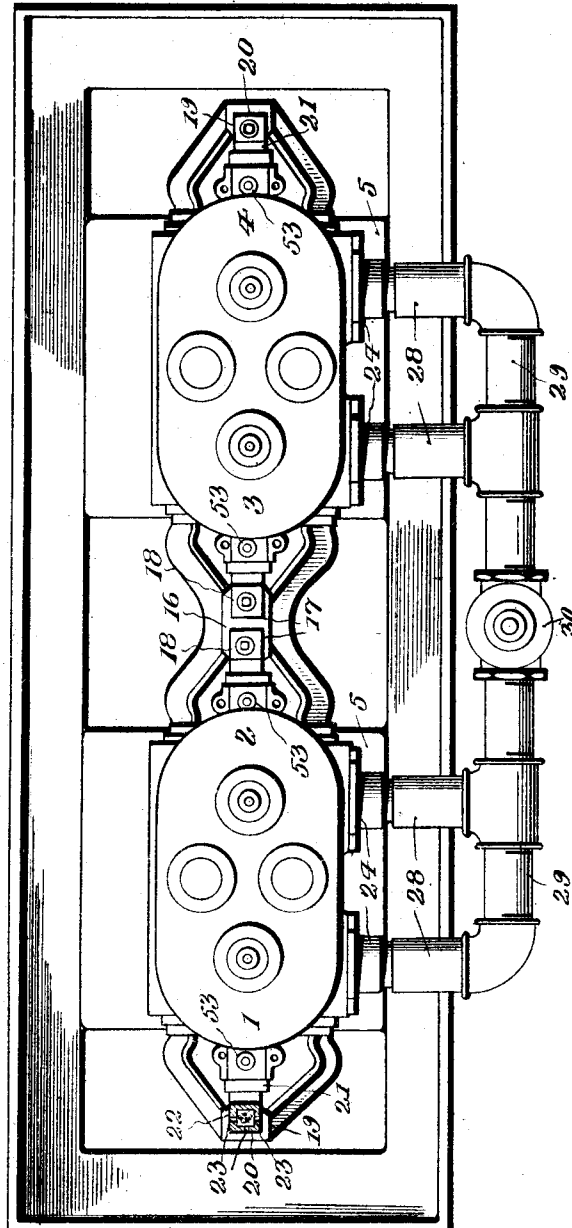
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3 SHEETS—SHEET 2.

Fig. 2.



Witnesses

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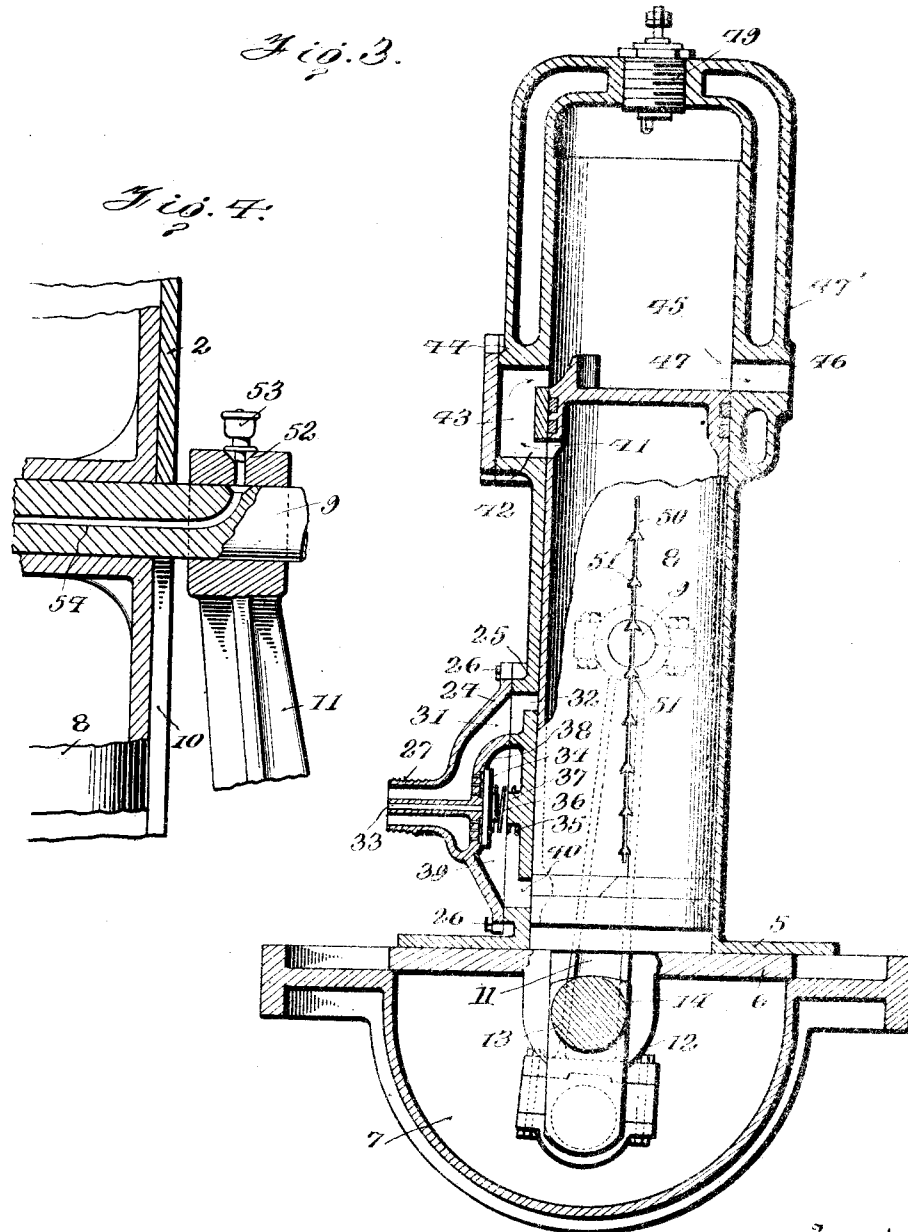
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3 SHEETS-SHEET 3.

Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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VAPOR-ENGINE.

1,063,475.

Specification of Letters Patent.

Patented June 3, 1913.

Original application filed February 18, 1911, Serial No. 609,477. Divided and this application filed May 12, 1911, Serial No. 626,847. Renewed November 1, 1912. Serial No. 729,041.

To all whom it may concern:

Be it known that I, WILLIAM F. STONE, a citizen of the United States, residing at Woodbury, in the county of Gloucester and State of New Jersey, have invented certain new and useful Improvements in Vapor-Engines, of which the following is a specification.

The invention relates to vapor-engines; and it seeks, generally, to improve the construction and efficiency of the class of engines described in an application filed by me February 18, 1911, Serial Number 609,477, of which the present application is a division; one of the chief objects being to provide an engine having but a single valve for each cylinder, thus providing a construction in which the necessity for having to provide for the adjustment and timing of a number of valves is entirely obviated, thereby materially decreasing the cost of construction, and avoiding the uncertainty in operation of such parts.

Another object of the invention is to provide an engine wherein the transmission mechanism is situated exteriorly of the cylinders, so as to render the same readily accessible for repairs.

Still another object of the invention is to provide an engine in which the operative parts are so connected that vibration of the parts will be reduced to a minimum.

In the drawings Figure 1 is a front elevation, partly in section, showing one embodiment of my invention, the same being a four-cylinder, two-cycle engine; Fig. 2 is a plan view of the engine showing one of the trunnion-heads in section, to show a means for lubricating the trunnion guides; Fig. 3 is a vertical section through one of the cylinders and crank case, taken on line *a-a* of Fig. 1, looking in the direction of the arrow; Fig. 4 is a broken detail showing the manner of conducting oil through the pitman rods through the trunnions of the pistons, to the cylinders.

General construction.—Referring to the drawings, the numerals 1, 2, 3 and 4 designate the cylinders which are preferably cast or formed in pairs, with flanges 5 at their lower ends by which they are firmly attached to the upper plate 6 of the crank

case 7, the plate also forming the lower head of the cylinder.

The numeral 8 designates the pistons which are alike in all of the cylinders and each piston is provided with a trunnion 9 which extends through an elongated slot 10 in the side of each cylinder. These trunnions are connected with pitmen or connecting rods 11, whose lower ends are connected with cranks 12 on the driving shaft 13, mounted in suitable bearings 14 in the crank case. The arrangement of the cranks on the shaft is such that the connecting rods of the two intermediate cylinders will be in extreme up and down positions, whereas the end-cranks will be in horizontal position or approximately so.

Interposed between the intermediate cylinders and securely attached to the cylinders by means of bolts 15 is a guide bracket 16, provided with guide ways 17 into which extend the trunnion heads 18, thus insuring a true vertical movement for the pistons. Each end-cylinder has a guide bracket 19 secured thereto, provided with guide-ways 20 that receive the trunnion heads 21 of the trunnions of the pistons in the outer cylinders. Preferably the trunnion heads are hollow, as at 22, shown more clearly in Fig. 2 of the drawing. Communicating with the space or chamber in the trunnion heads, is a plurality of perforations 23. The spaces in the trunnion heads are for the reception of waste or other absorbent material which may be supplied with lubricant, for lubricating the guide-ways of the brackets. Each of the trunnion heads is provided with a screw cap, thus providing for the ready access for renewing the absorbent material when required.

I employ but one valve for each cylinder, through which the major part of the explosive charge is admitted. These valves and their cases are identical in construction and merely duplicated in each cylinder, consequently a description of one will apply to all.

Referring particularly to Fig. 3, the numeral 24 designates the valve case, which is securely attached to a boss 25 by bolts 26. Each valve case is provided with a threaded nipple 27 to which is attached a connec-

tion 28, which, in turn is connected with the manifold 29 having centrally located therein a suitable carbureter 30. The valve case is provided with an auxiliary fuel supply passage 31, registering with a port 32 in the wall of the cylinder. The inner wall of the valve case is bored centrally for the passage of the stem 33 of a disk valve 34, which is kept normally seated by a spiral spring 35 interposed between a boss 36 on the valve and a similar boss 37 on the cylinder casting. This valve normally covers a plurality of perforations 38 made in the inner wall of the valve case. A chamber 39 is formed between the valve case and the wall of the cylinder, which at its lower end has a port 40 entering the lower end of the cylinder and through which the main fuel charge is admitted. This port 40 is adapted to be opened and closed by the movement of the piston. The piston is hollow and in its side near the upper end, I provide a port 41 adapted to register at times with a port 42 of a chamber 43, communicating with which is a port 44, leading to the explosive chamber 45 of the cylinder. Opposite the port 44 is an exhaust port 46. Each piston is provided with a deflector 47 by means of which the live charge of fuel is deflected away from the exhaust port or prevented from driving directly toward said port.

The explosive chambers are provided with the usual water-jacket 47', fed from a suitable pump, not shown, through water connections 48. In the top of each cylinder I provide a spark plug 49 of any approved construction. It will be noted that when the piston is in its lowermost position, or in the position when the transfer of the precompressed charge is made from the lower portion of the cylinder to the explosion chamber, at the upper end of the cylinder, the piston entirely cuts off the intake port, thus preventing the impulse of the moving charge from the lower to the upper end of the cylinder, from in any way operating upon or affecting the intake or check valve.

Oiling.—The numeral 50 designates a groove made in the outer wall of the piston. At intervals, this groove is provided with downwardly extending pockets 51 adapted to hold the oil. As shown in Fig. 1, and in sectional detail, Fig. 4, the upper end of each pitman rod is provided with a hole 52 above which and communicating therewith, are preferably oil cups 53. The trunnions of the various pistons are bored longitudinally, providing an oil hole 54 which extends vertically near the end of the trunnion and registers with the hole 52. The hole 54 extends entirely through the trunnions and opens into the groove 50, thus supplying oil to the pistons, and cylinders.

During the rapid movement of the pistons, the lubricant will be lifted from pocket to pocket in the groove 50 and keep the cylinders and pistons uniformly lubricated. Any approved method of oiling the cranks and crank shafts may be adopted, such as filling the crank case with oil, as is usual.

Operation.—In operation, the carbureter being properly adjusted for delivering a predetermined quantity and character of mixture, the upward stroke of the piston will draw into the lower end of the cylinder a charge of fuel, and will continue to draw this charge through the port 40 and through the valve 34 until the end of the piston has uncovered the port 32, when an additional or auxiliary charge will be drawn in through the passage 31. The suction through the ports 40 will, when the ports 32 are open, be instantly diminished or cut off, permitting the valves 34 to close. Upon the down stroke of the pistons, assuming an explosion to have taken place in the explosion chambers, as the result of firing previous charges, the charges in the lower ends of the cylinders will be compressed until the ports 41 and 42 in the pistons and cylinders respectively register (as shown in Fig. 3), when the charge will be delivered through the chambers 43 and ports 44 to the explosion chamber to be compressed and fired upon the upward movement of the pistons, it being understood that the live charge quickly displaces the charge that has been fired on a previous up-stroke, forcing the same through the exhaust 46. In the extreme outward position of the pistons, the ports 32 and 40 will close. This action takes place successively in the various cylinders, the pistons being so arranged that when the two central pistons occupy their extreme positions, one up and the other down, the end pistons will occupy positions about intermediate of the positions of the central ones.

Having thus described my invention, what I claim is:

1. A vapor engine, having in combination a cylinder closed at both ends and having a fuel port adjacent its lower head and two fuel transfer ports above said fuel port, a hollow piston having a port therein adapted to register with the lower fuel transfer port in the final downward position of the piston, to permit a charge to pass to the explosion chamber, said piston being adapted to close the fuel port at the lower end of the cylinder in the lowermost position of the piston, so that a full charge contained in the piston is transferred to the explosion chamber, a crank shaft and mechanism connected with the piston for transmitting motion to said crank shaft.

2. A vapor engine having in combination, a cylinder closed at both ends and having a

fuel port adjacent its lower head, a valve
for controlling the supply of fuel through
said port, said cylinder also having two
fuel transfer ports above the fuel port, a
5 hollow piston having a port therein adapt-
ed to register with the lower fuel transfer
port in the final downward position of the
piston, to permit the charge to pass to the
explosion chamber, said piston being adapt-
10 ed to close the port at the lower end of the
cylinder in its lowermost position so that a

full charge contained in the piston is trans-
ferred to the explosion chamber, a crank
shaft and exterior mechanism connected
with the piston for transmitting motion to 15
the crank shaft.

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

WILLIAM F. STONE.

Witnesses:

FRANCIS B. DAVIS,
EDWARD LOVE.