(No Model.)

A. ROLLASON & J. H. HAMILTON.

GAS OR VAPOR ENGINE.

No. 457,332. Patented Aug. 4, 1891.

Fig. 1.

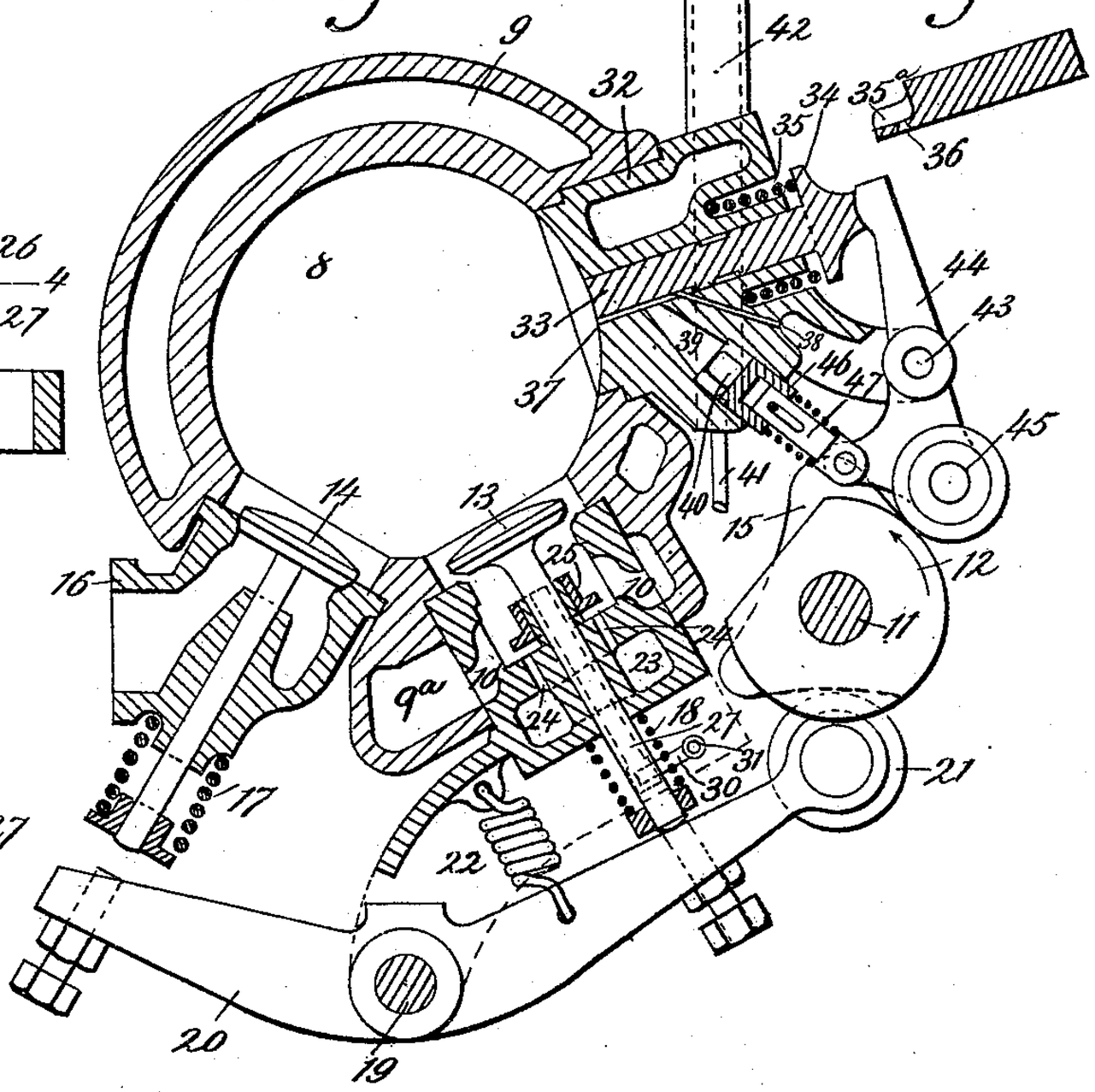

Fig. 8.

Fig. 3.

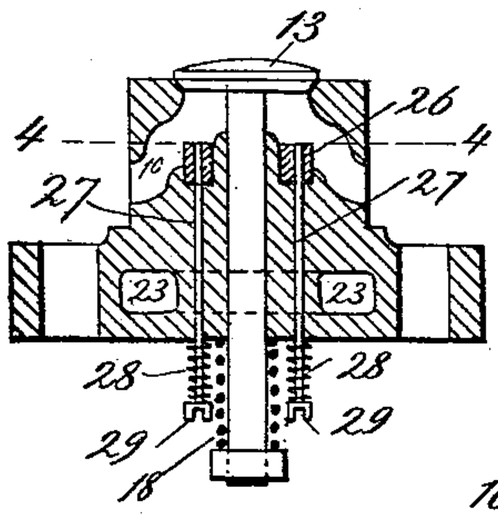

Fig. 4.

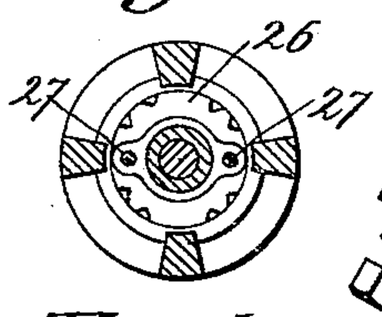

Fig. 5.

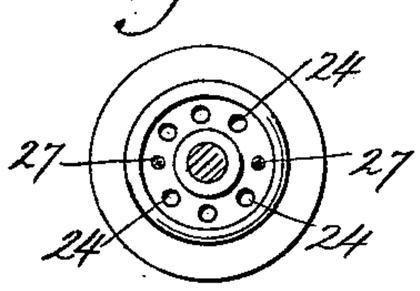

Fig. 6.

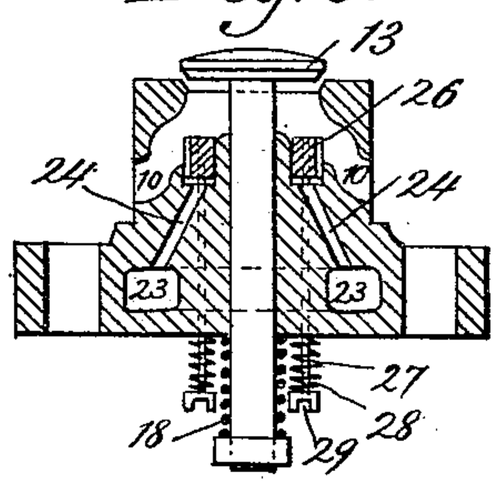

Fig. 7.

Fig. 2

Attest:

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UNITED STATES PATENT OFFICE.

ARTHUR ROLLASON AND JOHN HENRY HAMILTON, OF SANDIACRE, ENGLAND.

GAS OR VAPOR ENGINE.

SPECIFICATION forming part of Letters Patent No. 457,332, dated August 4, 1891.

Application filed March 26, 1891. Serial No. 386,530. (No model.) Patented in England October 18, 1889, No. 16,434.

To all whom it may concern:

Be it known that we, ARTHUR ROLLASON and JOHN HENRY HAMILTON, both British subjects, residing at Sandiacre, in the county of Derby, England, have invented certain new and useful Improvements in Gas or Vapor Engines, (patented in Great Britain under date of October 18, 1889, No. 16,434;) and we 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 certain new and useful improvements in gas or vapor engines, and particularly to the construction, arrangement, and operation of the ignition-chamber and admission and exhaust ports thereof, and to auxiliary devices for starting the engine by hand.

In the accompanying drawings the invention is illustrated as applied to a three-cycle engine wherein the valves are operated from a lay-shaft extending parallel to the cylinder, said lay-shaft being operated from the crank-shaft of the engine, as shown, for instance, in United States patent to Arthur Rollason, No. 391,338, dated October 16, 1888. It will be evident, however, to those skilled in the art that the improvements hereinafter described are applicable not only to three-cycle engines, but to two-cycle engines as well, and indeed generally to compressive gas or vapor engines.

In the drawings, Figure 1 represents in cross-section a three-cycle engine embodying the improvements. Fig. 2 represents in cross-section a modification of the ignition-chamber and the means for obtaining by hand a compressed charge in starting the engine. Fig. 3 represents in vertical section a modification of the admission-port. Fig. 4 represents a horizontal section on the line 4 4 of Fig. 3. Fig. 5 represents a top plan view of the gas-admission port with the gas-port valve removed. Fig. 6 represents a vertical section, taken on a plane at right angles to that of Fig. 3, of the admission-port shown in said figure, the gas-valve being slightly raised from its seat. Fig. 7 represents a cross-section of the ignition-chamber piston of Fig. 2, and Fig. 8 represents a longitudinal section of a modification of the piston-valve of the ignition-chamber.

Similar numerals of reference indicate similar parts throughout the several views.

Referring to the drawings, 8 indicates the explosion or combustion chamber of the gas or vapor engine surrounded with the usual water-jacket 9, and having the passage 9ª through which the air enters on its way to the air-admission ports 10. The piston of the cylinder may be connected to the crank-shaft and the crank-shaft to the lay-shaft 11 in the usual manner well known in the art, and which is therefore not illustrated herein.

The lay-shaft 11 is provided with a cam 12 for operating the igniting devices, and a second cam 15 for governing the admission-valve 13 and exhaust-valve 14 through the intermediacy of controlling-levers hereinafter described. The exhaust-valve 14 is preferably located within a separate fitting 16, and is held normally to its seat, as shown, by means of the spring 17. A similar spring 18 is provided for the stem of the admission-valve 13, and both valves are of the lifting type, and are preferably arranged in radial positions on the combustion-chamber and at any suitable angle, the admission-valve being preferably the nearer to the lay-shaft 11. Between the center lines of the exhaust-valve 14 and admission-valve 13 is located a fixed fulcrum-pin 19, upon which is centered the rocking lever 20. This lever carries at one end a roller 21, which is kept pressed against the cam 15 by means of a spring 22, attached to the lever 20 and of sufficient strength to overcome the resistance of the spring 18 of the admission-valve 13. When the cam 15 forces the roller 21 outwardly in opposition to the spring 22, the lever 20 is rocked, whereby its opposite end strikes the stem of the valve 14, thereby lifting said valve from its seat, while at the same time the pressure of the lever being relieved from the stem of the valve 13 said valve 13 is seated by the expansive action of the spring 18. Thus the permissive movement of the lever in one direction opens the admission-valve and the positive movement in the opposite direction opens the exhaust-valve, the movement of the lever

being determined by the cam 15 upon the lay-shaft.

The admission-chamber is provided with air-ports 10, communicating with the external atmosphere through the passage 9^a and with a gas-chamber 23, communicating with the source of gas-supply, and having ports 24, governed by a lift-valve. One form of this lift-valve is shown at 25 in Fig. 1. Another form is that shown at 26 in Figs. 3, 4, and 6. In both cases, however, the lift-valve or gas-port valve 25 or 26 is annular in form and concentric with the admission-valve 13, and is secured to two valve-operating spindles 27, having springs 28, whereby the valve is normally seated, so as to close the ports, said spindles having slotted ends 29, whereby they may be operated from a rocking arm 30, secured to a shaft 31, said shaft being actuated to lift the gas-port valve from time to time, as required, and preferably by means of a drop-bar governor, as shown and described in the applications for Letters Patent of the United States filed of even date herewith.

In the form of gas-port valve shown in Figs. 3, 4, and 6 the valve when seated fits within a countersunk recess in the body of the admission-chamber, and is provided with a series of peripheral slits or grooves cut in its edge, so as to divide the gas issuing therefrom into separate streams, thereby obtaining a better admixture with the air entering from the air-admission ports 10. The fact that the gas-port valve is provided with two valve-operating spindles 27, oppositely arranged with respect to each other, insures the rectilinear movement of the valve and prevents it being tilted or inclined, so as to stick or jam during its movement.

For effecting the ignition of the explosive charge entering through the admission-valve 13 there may be adopted any suitable igniting apparatus in common use. Thus we may employ the form of ignition-chamber illustrated in the drawings. The said ignition-chamber consists, primarily, of a fitting 32, having a central passage-way within which is fitted the piston-valve 33, having a head 34, against which presses the spring 35, the tendency of said spring being to force the piston-valve 33 in an outward direction with respect to the combustion-chamber 8. The piston-valve may be of the form shown in Fig. 8, consisting of a solid main body portion cut away at its inner end 35^a, as shown, and provided with an opening 36 in its side, as shown. It is preferably, however, of the form shown in Figs. 1, 2, and 7, consisting of a solid body portion, provided with a longitudinal edge groove 37, into which projects the end of a tongue or wiper 38, whose function is to keep the groove 37 constantly clear of obstructions. The groove 37 communicates with the outer air by means of the passage 39 and air-port 40, outside of which burns a master-light or gas flame 41, the products of combustion passing up through a funnel or chimney 42. Upon a fixed pin 43 is centered a three-armed rocking lever 44, one of whose arms carries a roller 45, actuated by the cam 12. Another of the arms of the rocking lever actuates the piston-valve 33, and a third arm actuates a piston-valve 46, fitting within a chamber into which opens the air-port 40. It will be observed that the connection between the third arm of the rocking lever and the valve 46 is made by means of a link 47, having a slot 48, and a cross-pin 49, connected to the valve 46 and working in said slot. A spring 50 is also interposed between the valve 46 and the link 47, as shown.

The mode of operation of the parts described is as follows: As the explosive mixture is compressed in the combustion-chamber a small portion thereof escapes by the groove 37 into the passage-way 39, passing thence through the port 40 into the funnel or chimney 42, where it is ignited by the gas flame 41. The flame of the ignited mixture passes back into the passage-way 39, but the fineness of the groove 37 prevents it from passing into the combustion-chamber 8. When the time of ignition has arrived, the cam 12 permits a quick outward movement of the piston-valve 33 to take place, first closing the air-port 40 by the valve 46, and afterward compressing the spring 50 and opening the smaller end of the passage-way 39 by the completion of the outstroke of the piston-valve 33, whereby the flame is first shut in or confined and then placed in free communication with the contents of the combustion-chamber, thereby effecting the ignition and explosion of the charge in said combustion-chamber. The pressure in the combustion-chamber, acting through the piston-valve 33 upon the three-armed rocking lever 44, tends to keep the valve 46 tight upon its seat.

When the form of piston-valve shown in Fig. 8 is substituted for the piston-valve 33, a small opening 36 may be used. In this case, as the piston-valve should on its instroke completely clean out all products of combustion from the cylinder within which it moves, it is preferred to cause the outward stroke to be effected in two portions, wherein the first brings the hole 36 opposite the end of the passage-way 39, and the second uncovers this end entirely. This is effected by corresponding alterations in the contour of the motor-cam 12.

In some instances the spring 35 may be dispensed with and the compressed charge relied upon to force out the piston-valve 33 at the required period; but in most instances it will be preferable to employ the spring 35 to assist the outward movement of the piston-valve.

In Fig. 2 are shown means for starting by hand the larger engines. For this purpose a separate hand-pump 51 is connected with a gas-supply pipe 52, provided with check-valves 53, whereby a sufficient quantity of gas may be injected into the combustion-chamber 8 to

form an explosive mixture. To effect the ignition of this mixture, the igniting device shown in Fig. 1 may be provided with a releasable catch 54 to hold it in the non-igniting position after the crank has turned the center. In this instance the lever 44 may be provided with a handle 55, whereby it may be pressed in or pulled out by hand, as required. If the mixture be burning in the passage-way 39, the release of the catch 54 will cause the ignition and explosion of the contents of the combustion-chamber 8.

Having thus described the invention, what we claim is—

1. In a gas or vapor engine, the combination, with the combustion-chamber, of admission and exhaust valves radial to the chamber and located in a plane transverse thereto, and a rocking lever for operating both valves, substantially as described.

2. In a gas or vapor engine, the combination, with the combustion-chamber, of admission and exhaust valves, springs normally seating said valves, a rocking lever governing both valves, said rocking lever being provided with a spring soliciting it toward the admission-valve, and a cam-shaft for operating the rocking lever in opposition to the lever spring, substantially as described.

3. In a gas or vapor engine, the combination, with the combustion-chamber, of admission and exhaust valves, a rocking lever fulcrumed between and governing said valves, a spring soliciting the lever to act upon the admission-valve, and a cam-shaft for rocking the lever in opposition to said spring, substantially as described.

4. In a gas or vapor engine, the combination, with the combustion-chamber, of an exhaust-valve normally closed, an admission-valve, a rocking lever, a spring tending to rock the lever toward the admission-valve, and a cam-shaft for rocking the lever so as to open the exhaust-valve and permit the admission-valve to close, substantially as described.

5. In a gas or vapor engine, the combination, with the combustion-chamber, of admission and exhaust valves, springs tending to seat said valves, a rocking lever fulcrumed between the valves, a spring tending to rock the lever toward the admission-valve and stronger than the seating-spring of said admission-valve, and a cam-shaft for rocking the lever away from the admission-valve so as to permit the latter to close, substantially as described.

6. In a gas or vapor engine, the combination, with the combustion-chamber, of spring-seated admission and exhaust lift-valves having projecting stems, a rocking lever fulcrumed between the valves, so that the valve-stems shall be in its path of movement, a spring stronger than the seating-spring of the admission-valve and tending to rock the lever toward the stem of said admission-valve, and a cam-shaft for rocking the lever in the opposite direction, substantially as described.

7. In a gas or vapor engine, the combination, with the combustion-chamber, of spring-seated admission and exhaust lift-valves radial to the cylinder, a rocking lever fulcrumed between the lift-valves and governing them, and a cam-shaft parallel to the cylinder for rocking the lever, substantially as described.

8. In a gas or vapor engine, the combination, with the combustion-chamber, of an admission-chamber provided with air and gas ports, a valve governing the opening between the combustion-chamber and admission-chamber, a spring-seated annular valve governing the gas-ports and concentric with the admission-valve stem, and simultaneously-operated gas-valve stems disposed at opposite sides of the gas-valve so as to prevent it from binding, substantially as described.

9. In a gas or vapor engine, the combination, with the combustion-chamber, of an admission-chamber provided with air and gas ports, a valve governing the opening between the combustion-chamber and admission-chamber, and an annular spring-seated valve governing the gas-ports, said valve fitting within a recess formed in the body of the admission-chamber and having valve-stems extending to the exterior of the chamber, substantially as described.

10. In a gas or vapor engine, the combination, with the combustion-chamber, of an admission-chamber provided with air and gas ports, a valve governing the opening between the combustion-chamber and admission-chamber, and an annular spring-seated valve governing the gas-ports, said valve fitting within a recess formed in the body of the admission-chamber, and said valve being provided with peripheral slits and having valve-stems extending to the exterior of the chamber, substantially as described.

11. In a gas or vapor engine, the combination, with the combustion-chamber, of an admission-chamber opening centrally into said combustion-chamber, the inlet-opening being provided with a lift-valve, radial air-ports leading into the chamber behind the valve, gas-ports located centrally with respect to the air-ports and provided with a gas-valve, and means for operating the said admission-valve and gas-valve independently of each other, substantially as described.

12. In a gas or vapor engine, the combination, with the combustion-chamber, of an ignition-chamber having a main passage-way containing a piston or valve, an auxiliary igniting passage-way leading from the main passage-way, said passage-way containing a valve controlling its communication with the external air, and mechanism for operating both valves, substantially as described.

13. In a gas or vapor engine, the combination, with the combustion-chamber, of an ignition-chamber having a main passage-way

containing a piston or valve, an auxiliary igniting passage-way leading from the main passage-way, a small channel or groove affording constant communication between the combustion-chamber and igniting passage-way, and mechanism for operating the said piston or valve, substantially as described.

14. In a gas or vapor engine, the combination, with the combustion-chamber, of an ignition-chamber having a main passage-way containing a piston or valve, an auxiliary igniting passage-way leading from the main passage-way, said passage-way containing a valve controlling its communication with the external air, and mechanism for operating both valves, said mechanism comprising a three-armed pivoted lever in operative connection with the valves, and a cam-shaft for actuating the lever, substantially as described.

15. In a gas or vapor engine, the combination, with the combustion-chamber, of an ignition-chamber having a main passage-way containing a piston or valve, an auxiliary igniting passage-way leading from the main passage-way, a small channel or groove affording constant communication between the combustion-chamber and igniting passage-way, and mechanism for operating the said piston or valve, said mechanism consisting of a three-armed lever in operative connection with the valves, the connection to the igniting passage-way valve being an intermediate spring, a slotted link and pin, and a cam-shaft for actuating the lever, substantially as described.

16. In a gas or vapor engine, the combination, with the grooved or channeled reciprocating valve of the ignition-chamber, of a wiper projecting into the channel, whereby the channel is cleaned out during the piston-stroke, substantially as described.

17. In a gas or vapor engine, the combination, with the combustion-chamber, of a pump for forcing gas into the same, an igniting device, and a releasable catch for holding the igniting device in the non-igniting position until sufficient gas is forced in to make the mixture explosive, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

ARTHUR ROLLASON.
JOHN HENRY HAMILTON.

Witnesses:
JOSEPH GEORGE NADEN,
GEORGE EDWARD BORWICK.