No. 612,258. Patented Oct. 11, 1898.

F. S. MEAD.

GAS OR OIL ENGINE.

(Application filed June 25, 1897.)

(No Model.)

Fig. 1.

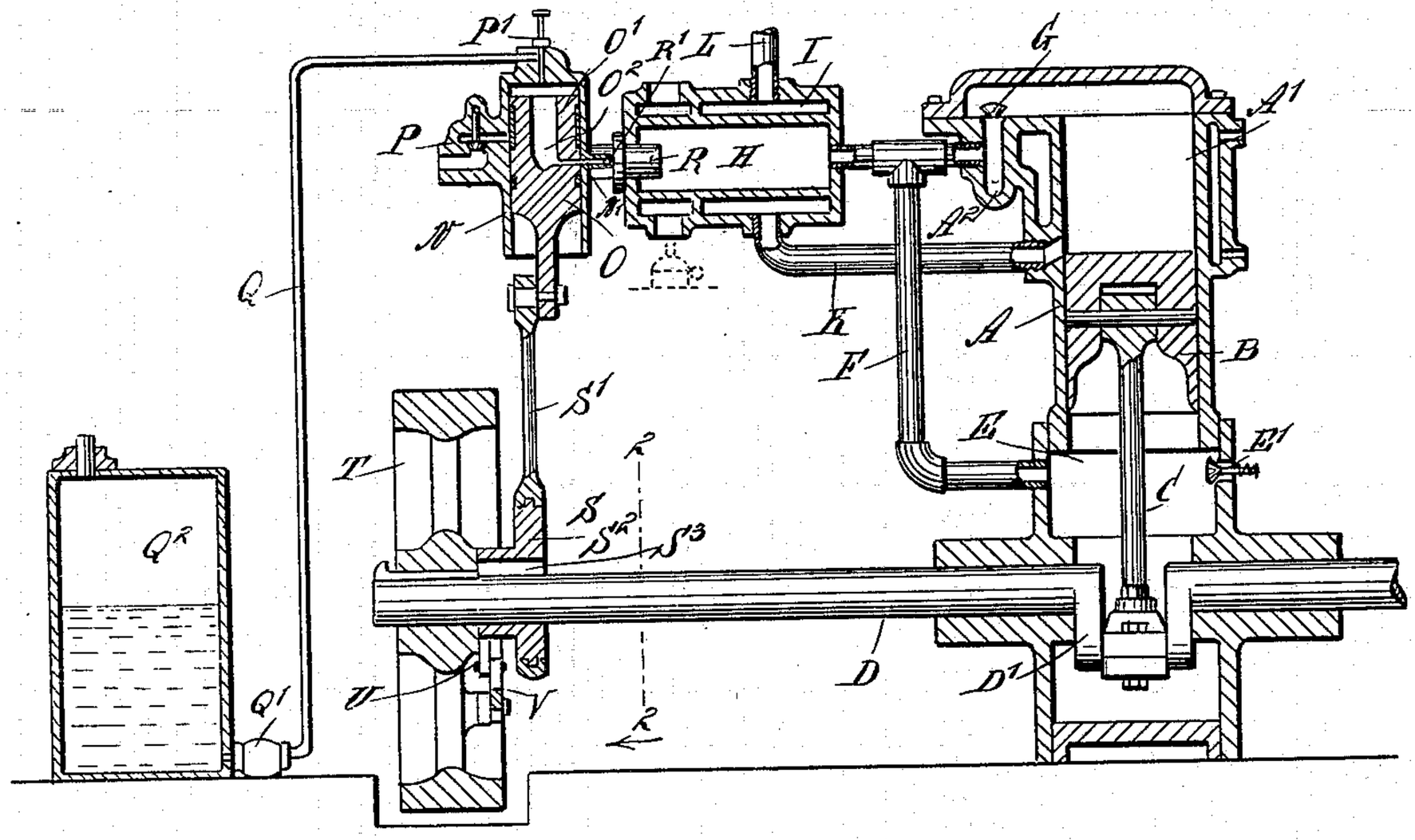


Fig. 5.

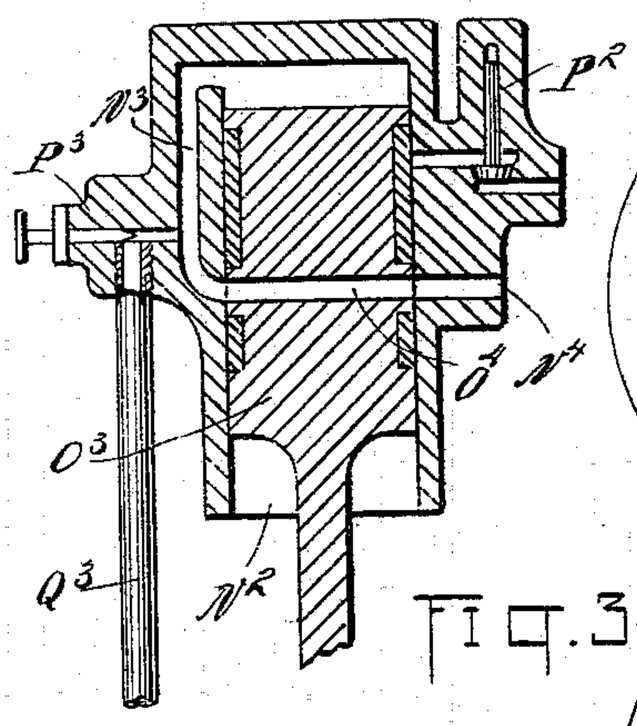


Fig. 2.

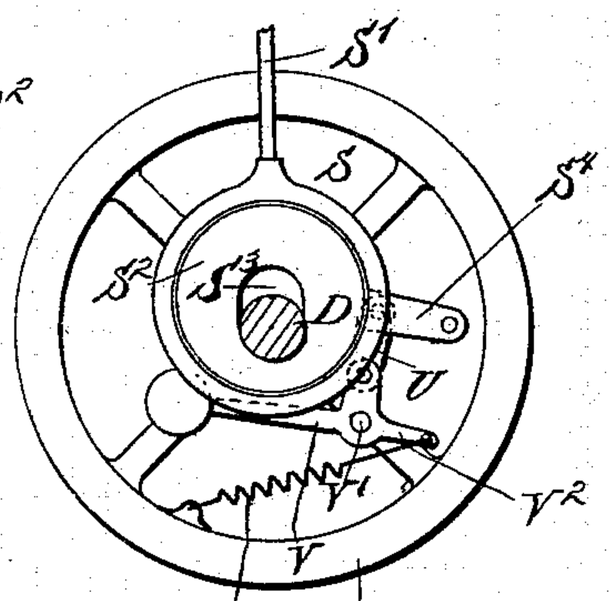


Fig. 4.

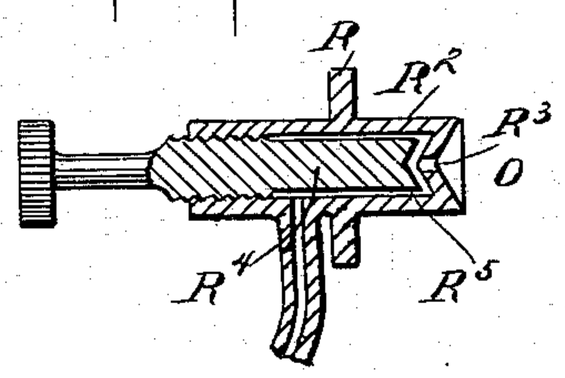
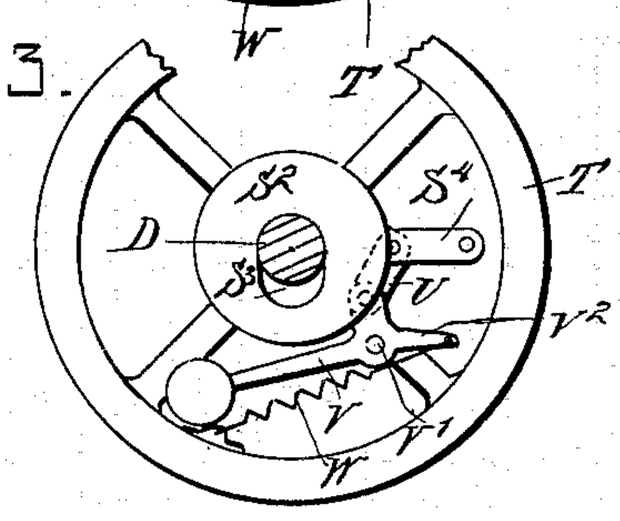


Fig. 3.



WITNESSES:

H. Hellyer.

Geo. J. Hoosteen

INVENTOR

F. S. Mead.

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

FRANK S. MEAD, OF MONTREAL, CANADA.

GAS OR OIL ENGINE.

SPECIFICATION forming part of Letters Patent No. 612,258, dated October 11, 1898.

Application filed June 25, 1897. Serial No. 642,259. (No model.)

To all whom it may concern:

Be it known that I, FRANK S. MEAD, a citizen of the United States, residing in Montreal, Province of Quebec, and Dominion of Canada, have invented a new and Improved Gas or Oil Engine, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved gas or oil engine adapted to be run either by gaseous or liquid fuel and arranged to properly feed the gas to and mix it with fresh air upon entering the working chamber of the power-cylinder, the amount of fuel used being completely controlled by a governor according to the amount of work to be performed, and at the same time maintaining an even speed under varying conditions of the load.

The invention consists of certain parts and details and combinations of the same, as will be fully described hereinafter, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of the improvement. Fig. 2 is a transverse section of the governor on the line 2 2 of Fig. 1. Fig. 3 is a similar view of the same with parts in a different position. Fig. 4 is an enlarged sectional plan view of the spraying device, and Fig. 5 is an enlarged sectional side elevation of a modified form of pump.

The engine is provided with the usual cylinder A, in which reciprocates a piston B, connected by a pitman C with the crank-arm D′ of the main driving-shaft D, as is plainly shown in the drawings.

The upper end of the cylinder A forms the working chamber A′, and the lower end of said cylinder opens into an air-compression chamber E, provided with a spring-pressed inlet-valve E′, and forms part of the engine-frame. A discharge-pipe F leads from the chamber E to connect with a passage A^2, opening into the working chamber A′ of the cylinder A, the said passage containing a check-valve G, opening on the downstroke of the piston B, but closing on the upstroke thereof. The pipe F also connects at its upper end with the interior of a vaporizing-chamber H, surrounded by a jacket I, connected by a pipe K with the lower end of the working chamber A′ in the cylinder A, so that products of combustion can pass from the said cylinder into the pipe K at the time the piston B is in a lowermost position and uncovers the opening leading to the said pipe K. The pipe K discharges the products of combustion into the jacket I, so as to heat the vaporizing-chamber and insure a transformation of the liquid fuel into a gaseous state. The jacket I is provided with an exhaust-pipe L for finally carrying off the products of combustion to the outer air.

Adjacent to the vaporizing-chamber H is arranged a pump N, containing a pump piston or plunger O, formed at its upper end into a valve O′, adapted to open and close a valved air-inlet P and to actuate by suction and pressure a needle-valve P′, connected by a pipe Q, having a check-valve Q′, with a tank or reservoir Q^2, containing the liquid fuel. The needle-valve P′ opens toward the pump-cylinder N. The valve O′ is provided with a central bore O^2, adapted to register at its lower end with a port N′, formed in the pump-cylinder N and connected with an inlet R′, formed in the casing R^2 of a spraying device R, connecting the pump N with the interior of the vaporizing-chamber H. The casing R^2 is provided at its end with a small opening R^3, through which the fuel passes in a spray into the vaporizing-chamber H. The casing R^2 contains a screw-plug R^4 for forming a narrow annular passage in the said casing for the oil and air to pass through from the inlet R′ to the outlet R^3.

The piston O of the pump is connected with the eccentric-rod S′ of an eccentric S, having its disk S^2 formed with an elongated slot S^3 for the passage of the shaft D or any other shaft driven by the engine. The eccentric disk S^2 is provided with an arm S^4, pivoted on a wheel T, secured on the shaft D, and the said arm is pivotally connected by a link U with one arm of a three-armed weighted lever V, fulcrumed at V′ on one of the spokes of the wheel T. A spring W is secured at one end to the wheel T and with its other end on the outermost arm V^2 of the lever V, so as to hold the weighted end of the said lever normally in an innermost position, as is plainly

indicated in Fig. 2, the spring being expanded upon the weighted lever swinging outward by centrifugal force on an increase of the speed of the engine.

In the pump shown in Fig. 5 the cylinder N^2 has its piston O^3 provided with a port O^4, adapted to register on one side with a channel N^3, opening into the upper end of the cylinder and connected with a needle-valve P^3, connected with a supply-pipe Q^3, through which passes the liquid fuel. The air-inlet valve P^2 is adapted to be opened on the downstroke of the piston O^3 at the time the port O^4 is out of register with the channel N^3 and with the discharge-port N^4, connected with the spraying device at the inlet R'.

The operation is as follows: The piston B, as shown in Fig. 1, has just passed into a lowermost position and compressed in the chamber E a certain amount of fresh air previously drawn in at the valve E'. When the piston is near the lower end of its stroke, this compressed air passes through the pipe F and passage A^2 into the working chamber A' of the cylinder A to force out the products of combustion through the pipe K into the jacket I and through the pipe L to the outer air. At the same time the piston or plunger O in the pump N rises, and when near the end of its upward stroke opens the port N', so that the contents of the pump are discharged through the bore O^2, port N', and port R' into the spraying device R and through the latter into the vaporizing-chamber H. The fuel is at once vaporized therein, as the said chamber is heated, as previously explained, by the burned products of combustion, and the gas now passes into the upper end of the pipe F and passage A^2, so as to mix with the column of compressed air passing into the working chamber of the cylinder by way of the pipe F, as previously explained. Further revolution of the shaft D brings the piston B from the position shown in Fig. 1 to the end of its uppermost stroke, thus immediately closing the valve G and compressing the mixed fuel and air contained in the cylinder A, and which mixture is then ignited, so as to drive the piston B down and repeat the above-described operation. The piston O of the pump N at the end of its uppermost stroke causes the valve O' to register with the port N', as previously explained, so that as the piston descends its first action is to close the said port N', then draw the liquid fuel into the cylinder through the needle-valve P' until finally the air-inlet valve P is uncovered to allow air to pass freely into the upper end of the cylinder during the remainder of the downstroke of the piston O, thus destroying or stopping further action of the valve P'. As the piston rises the liquid fuel is in the bore O^2 until the upstroke is so far completed as to connect with the port N', at which time the compressed air rushes out and carries the liquid fuel to and through the spraying device R, in which the air and oil are thoroughly mixed, to then pass through the heated vaporizing-chamber H to join the compressed air flowing through the pipe F and passage A^2 into the working chamber of the cylinder. The shifting eccentric governor on the shaft D operates in such a manner that when the engine exceeds the desired or normal speed then the eccentric disk S^2 is drawn toward the center of the shaft D, so that the stroke of the eccentric-rod S' is shortened or omitted altogether, and the valve O' is not opened or brought in register with the port N' and the air-inlet P. In this case the contents of the working chamber A' and vaporizer H simply expand as the piston B descends, and no new charge will be drawn into the said vaporizer and working chamber.

As it is desirable that the supply-valve O' should open the port N' fully or not at all, a new construction of the governor is necessary, so as to permit the weighted arm V^2 to move its full limit whenever it moves at all, and to accomplish this the retractile spring W is so placed that it extends approximately at right angles to the movement of the lever V, the arm V^2 holding the said spring as it passes to the rear of the pivot V', upon which the lever V swings, so that as the said lever swings in its outward movement it also draws the spring W closer to the center of motion, thus reducing its leverage, so that when the speed of the engine exceeds its normal speed then the weighted end of the arm V^2 as it is thrown outward has an even resistance from the spring in its entire movement. Thus there is an increase in centrifugal force as the lever passes outward and a decrease in centrifugal force as the lever swings inward, so as to cause the said lever to pass over its entire movement at any change from the desired speed of the engine.

The mode of connecting the weighted arm V^2 to the arm S^4 of the shifting-eccentric disk S^2 by the link U is such as to form a toggle-joint between the parts, so as to bring the thrust of the eccentric directly upon the pivot V' of the weighted arm whenever the supply-valve P' is to be opened, thus leaving the arm free to respond to centrifugal force or to its retractile spring W.

It has been found that vaporizing-chambers placed in the path of the air passing from the air-compression chamber to the power-cylinder in such a manner that the compressed air must pass through them do not maintain sufficient heat for economy, especially when running light, and the explosions are limited, and for this reason I place the vaporizing-chamber so as to be independent of this air-passage, and the only matter passing through this chamber is from the spraying device, and this only as required by the speed of the engine.

These improvements are shown as applied to a two-cycle engine, but are equally applicable to any other form of gas or oil engine.

Having thus fully described my invention,

I claim as new and desire to secure by Letters Patent—

1. An explosive-engine having a power-cylinder and a piston reciprocating therein, an air-compression chamber, a passage from the air-compression chamber to the power-cylinder, a vaporizer arranged for the application of heat and discharging into said passage, and a valve located in said passage between its junction with the vaporizer and the power-cylinder, the vaporizer being located without the path of the compressed air so that the latter will pass to the power-cylinder without passing through the vaporizer.

2. A gas or oil engine having upon its main shaft a shifting-eccentric governor, and a fuel-pump operatively connected to said shifting eccentric, and having an inlet-valve for air and a separate inlet-valve for liquid fuel, and separate passages leading directly from said valves to different ports in the pump-cylinder.

3. In a gas or oil engine, the combination of a pump discharge-valve operated by the pump-piston, an eccentric arranged to drive said pump-piston, and movable upon its shaft from an eccentric position in which it is active, to a central position in which it is inactive and a weighted arm controlled by centrifugal force derived from the speed of the engine, and connected to the said eccentric in a manner to shorten or omit the stroke of said pump-piston.

4. In a gas or oil engine having a power-cylinder, an air-compression pump adjacent thereto, a passage leading from the said pump to the said cylinder, means for supplying liquid fuel to said passage, a piston reciprocating in the power-cylinder and operatively connected to the main shaft of the engine, a disk or wheel mounted on the main shaft, and bearing a weighted arm under control of centrifugal force derived from the speed of the engine, and a shifting eccentric mounted on the wheel or disk, and operatively connected with the pump-piston on the one hand and the weighted arm on the other.

5. In an explosive-engine, a fuel-pump having a pump-cylinder provided with an exit-port and with two inlet-ports, one of which is permanently open to the cylinder, and a pump-piston carrying a valve controlling the other inlet-port and the exit-port.

6. A gas or oil engine having a power cylinder, a fuel-pump adjacent thereto, and communicating with said cylinder and operated by a shifting-eccentric governor having a weighted arm, held toward its center of revolution by a spring so arranged that its power does not increase as the weight is swung outward by centrifugal force.

7. In a gas or oil engine, the combination of a fuel-pump or valve operatively connected to a shifting eccentric held in position by a weighted swinging arm pivoted to a wheel or disk, and a retractile spring so attached to said weighted arm that the spring is drawn toward the fulcrum of the arm as the latter swings outwardly from the center of said wheel or disk so that the retractile action of the spring is not increased during such outward movement.

8. In a gas or oil engine, a fuel-pump having a compression-chamber of suitable size to hold the compressed contents of the pump, and containing a piston-valve arranged to cover successively an inlet and an outlet port to said chamber.

9. In a gas or oil engine, a fuel-pump having a compression-chamber of suitable size to contain the compressed contents of the pump, an outlet-port, an inlet-port for air, and another inlet-port for liquid fuel.

10. In a gas or oil engine, a spraying device consisting of an annular passage turned back upon itself to the center of discharge, and a port for the simultaneous delivery of both air and liquid fuel to said annular passage.

11. In a gas or oil engine, a spraying device consisting of a tube with an inwardly-projecting end perforated in its center, and a solid plug with a concave end so placed within the tube as to leave an annular space between the plug and the tube, retreating near the end to a common center and a port for the simultaneous delivery of both air and fuel to said annular space.

12. In a gas or oil engine, a spraying device consisting of a passage with an inwardly-projecting end perforated at its center, and an adjustable solid rod entering said passage and having a concave end.

13. In a gas or oil engine, a fuel-pump whose compression-chamber is extended in the form of a passage down one side of the piston, a cross-passage in said piston, arranged to connect the said passage with the exit-port of the pump when near the end of its stroke, an air-port, and a separate inlet-port for liquid fuel.

14. In a gas or oil engine, a fuel-pump having an extension of its compression-chamber carried along one side of the piston or plunger to a connection with the discharge-port, and supplied with a port for liquid fuel discharging into said passage.

15. In a gas or oil engine, a fuel-pump supplied with two inlet-ports, an exit-port, a groove or passage in the piston thereof, connecting with said exit-port when near the end of its stroke, and a passage connecting the pump compression-chamber with the cross-passage in the piston.

FRANK S. MEAD.

Witnesses:
LEWIS P. MEAD,
P. GORMAN.