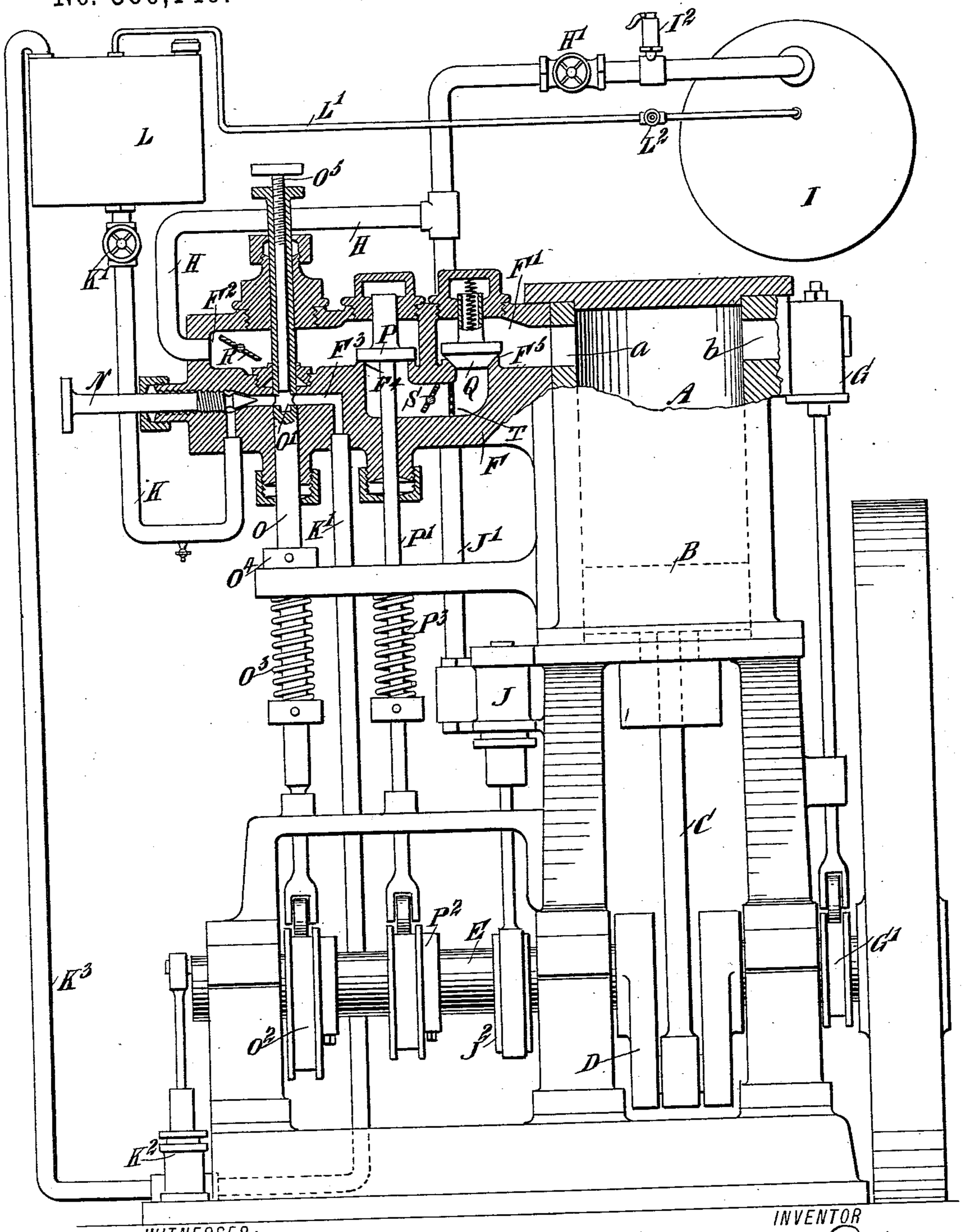
(No Model.)

A. F. ROBER.

VAPOR ENGINE.

No. 560,149. Patented May 12, 1896.



WITNESSES:

H. Walker

Geo. J. Houston, 3

INVENTOR

A. F. Rober

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

ALBERT F. ROBER, OF ILWACO, WASHINGTON.

VAPOR-ENGINE.

SPECIFICATION forming part of Letters Patent No. 560,149, dated May 12, 1896.

Application filed December 2, 1895. Serial No. 570,811. (No model.)

To all whom it may concern:

Be it known that I, ALBERT F. ROBER, of Ilwaco, in the county of Pacific and State of Washington, have invented certain new and useful Improvements in Vapor-Engines, of which the following is a full, clear, and exact description.

The object of the invention is to provide certain new and useful improvements in vapor-engines, whereby the air and vapor are mixed in proper quantity and positively fed into the working cylinder to insure a positive impulse to the piston at each revolution of the main shaft.

The invention consists principally of a valved casing having a channel connected at one end with the working cylinder and at its other end with a compressed-air reservoir, a valve for controlling the oil passing to the said channel, and a valve in said channel and controlled from the main driving-shaft to admit the mixture to the cylinder at the proper time.

The invention also 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 drawing, forming a part of this specification, in which the figure is a partly sectional side elevation of an engine having the improvement.

The improved vapor-engine is provided with a cylinder A, in which reciprocates a piston B, connected by a pitman C with a crank-arm D, held on the main driving-shaft E of the engine. On one side of the cylinder A, and near the upper end thereof, is secured a valve-casing F, provided with a channel F′, connected by a port *a* with the interior of the upper end of the cylinder A, the latter being also provided with an exhaust-port *b*, located opposite the port *a* and controlled by a valve G, moved positively by a cam G′, held on the main driving-shaft E. Thus when the piston B moves into a lowermost position the valve G is actuated to open the port *b* to the atmosphere and permit the products of combustion of the previous explosion to exhaust by passing out of the cylinder by way of the port *b* and the valve G.

The outer end F^2 of the channel F′ is connected by a pipe H with a compressed-air reservoir I, receiving its supply of air from an air-compressor J, actuated by an eccentric J^2 or other means from the main driving-shaft E. The outlet-pipe J′ of the air-compressor J connects with the reservoir I. In the pipe H is arranged a valve H′ and a safety-valve I^2 for preventing a too high pressure in the reservoir I. In the valve-casing F is arranged a second channel F^3, connected at one end by a pipe K with an oil-tank L, containing the gasolene or other material to be vaporized and mixed with the compressed air from the reservoir I.

The pipe K is provided with a valve K′ for cutting off the pipe K whenever desired and for stopping the flow of oil to the channel F^3. The other end of the channel F^3 is connected by a pipe K′ with an oil-pump K^2, driven from the main shaft E and connected by a pipe K^3 with the top of the tank L, so that when the engine is in operation and the pump K^2 is working then the oil contained in the tank L is pumped by the pump K^2 through the pipe K, channel F^3, pipe K′ into the pump K^2, and again discharged through the pipe K^3 back into the tank L. There should be the same pressure in the tank L as in the reservoir I, and for this purpose I connect the closed tank L by a pipe L′ with the reservoir I, as indicated in the drawing. The pipe L′ is preferably provided with a valve L^2 for cutting off the air whenever desired. The amount of oil passing through the channel F^3 by the action of the pump K^2 is regulated by a needle-valve N, and part of the oil passing through said channel F^3 is taken by a valve O and moved into the rear end of the channel F^3, to be engaged and mixed with the air entering the said channel by the pipe H. To effect such a transfer of oil the valve O is fitted to slide vertically in the valve-casing F and is provided with an aperture O′, adapted to register with the channel F^3, as indicated in the drawing, so that said aperture fills with oil passing through the channel.

The lower end of the valve O is actuated by a cam O^2, secured on the shaft E, and the cam imparts a vertical movement to the valve to move the oil contained in the opening O′ upward into the channel F′. A return stroke of the valve O is insured by a spring O^3, pressing with one end on a bracket of the casing

F and with its other end on a collar held on the stem of the valve O. The downward movement of the valve is limited by a collar O^4, held on the stem of the valve and adapted to rest on the bracket of the casing F.

The amount of oil in the opening O′ is regulated by a screw-rod O^5, screwing in the upper end of the valve O, so that by moving the screw-rod farther down or farther out less or more oil passes into the opening O′ as the latter, by the movement of the screw-rod, is decreased or increased in size. As the screw-rod O^5 extends with its upper end to the outside, it permits the operator to adjust said screw-rod while the engine is running, so that more or less oil can be fed into the channel F′ whenever desired.

In the channel F′ next to the valve O is arranged a valve-seat F^4, normally closed by a valve P, having its valve-stem P′ actuated by a cam P^2 on the shaft E, a spring P^3 being provided for holding said valve normally to its seat. Between the valve-seat F^4 and the port *a* is arranged a second valve-seat F^5, on which is seated a spring-pressed check-valve Q, adapted to be opened by the force of the mixture passing through the channel F′ at the time the valve P is opened.

In the rear end F^2 of the channel F′ is arranged a damper-valve R for directing the flow of the compressed air to the opening O′ when the valve O is raised, so that the compressed air readily takes up and vaporizes the oil and insures a complete mixture of the compressed air and oil. When this takes place, the piston B is beginning its upstroke, and at this very moment the valve P opens by the action of the cam P^2, so that the mixture of oil and air passes along the channel F′, seats the check-valve Q, then passes through the port *a* into the working end of the cylinder A, to be compressed by the rising piston B. When this has been accomplished, the piston B is on its downward stroke, and then the mixture is ignited by a suitable igniting device of any approved construction. The force of the explosion drives the piston B downward, so that the main driving-shaft E is rotated, and when the piston B nears the lower end of its stroke, then the valve G opens the port *b* to exhaust the air, after which the valve G again closes the port *b*, and the cams O^2 and P^2 successively actuate the valves O and P to direct the oil from the channel F^3 into the channel F′ and vaporize the oil by the compressed air from the reservoir I, and then pass the mixture into the upper end of the cylinder A for compression upon the rising of the piston B. The above-described operation is then repeated.

In order to prevent the oil from accumulating in the channel F′, I form the latter between the valve-seats F^4 and F^5 with a depression having an adjustable damper S, so that air passing through that portion of the channel is brought in contact with the oil contained in the bottom of the depression. In the channel F′, between the valve-seats F^4 F^5, I prefer to arrange a wire screen T to insure a complete vaporization of the oil and minute division of the mixture of the vapors and air.

I prefer to construct the engine with a piston having a long stroke—say a stroke double the diameter of the cylinder—to insure a much longer expansion of the gases after the explosion. The exhaust-valve is made of a comparatively large area, and the cam G′ for operating it is so constructed as to open the exhaust-valve at the time the piston is near the lower end of its stroke and keep the exhaust-valve open until the piston has traveled a distance on the upstroke. As soon as the exhaust-valve closes the other valves are actuated and the mixture passes to the cylinder, so that the compression during the upstroke of the piston is about the same as on other engines.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. A vapor-engine, comprising a working cylinder, a piston working therein, a valve-casing supported by the cylinder and having a channel opening into said cylinder, an air-reservoir connected with the other end of said channel, a second channel in said casing, an oil-tank having connection with one end of said second channel, a circulating-pump having connection with the other end of said second channel, a vertically-operating valve for carrying oil from the second to the first-named channel, means for actuating the same, and an air-deflecting damper in said first-named channel, substantially as specified.

2. A vapor-engine provided with a valve-casing having a mixing-channel for air and oil, an oil-channel connected with an oil supply, a vertically-operating valve having an aperture for carrying oil from the oil-channel to the mixing-channel, the valve at its portion above said aperture being tubular, and a screw-rod movable in said tubular portion, to regulate the amount of oil in the aperture, substantially as specified.

ALBERT F. ROBER.

Witnesses:
WILL BRUMBACH,
J. J. BRUMBACH.