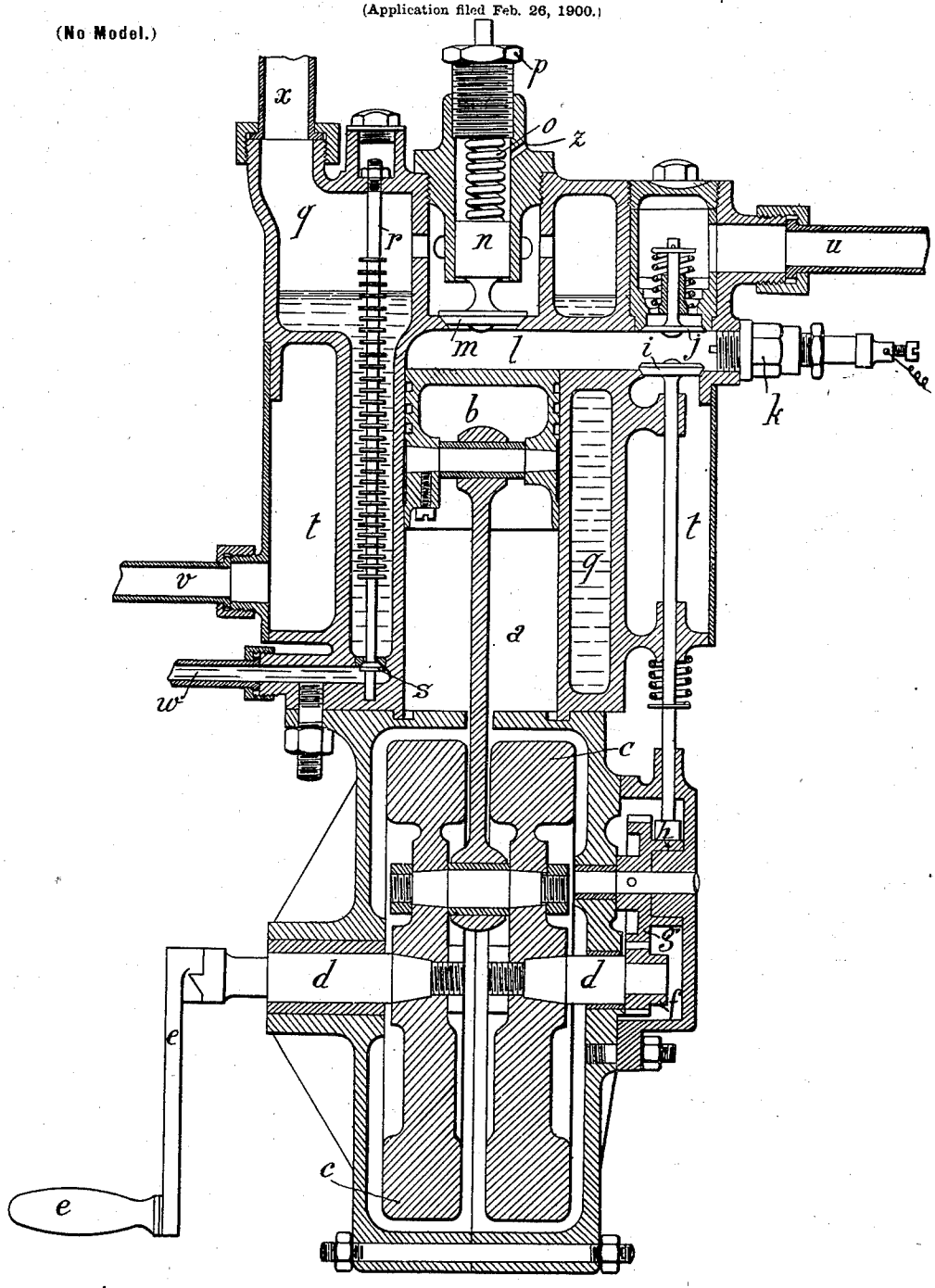
No. 671,236. Patented Apr. 2, 1901.

L. RENAULT.

STEAM GENERATING EXPLOSION ENGINE.

(Application filed Feb. 26, 1900.)

(No Model.)



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UNITED STATES PATENT OFFICE.

LOUIS RENAULT, OF PARIS, FRANCE.

STEAM-GENERATING EXPLOSION-ENGINE.

SPECIFICATION forming part of Letters Patent No. 671,236, dated April 2, 1901.

Application filed February 26, 1900. Serial No. 6,585. (No model.)

To all whom it may concern:

Be it known that I, LOUIS RENAULT, mechanical engineer, a citizen of the Republic of France, residing at 14 Place de Laborde, Paris, France, have invented new and useful improvements relating to explosion-engines and to the utilization of the heat and products of combustion therefrom for the generation of gases or vapors, of which the following is a specification.

My invention consists of an autogenerating apparatus for gases and steam—that is to say, an apparatus by means of which it is possible to obtain without the use of either a compressor or a burner a mixture of heated gases from the cylinder of an explosion-motor and of steam produced by utilizing the heat obtained on the one hand from the wall of the cylinder and on the other hand from the heated gases which escape therefrom and of which a portion is made to circulate in contact with the free surface of the mass of water to be vaporized, the said mixture being intended to be employed in a motor, steam-turbine of any kind, or other apparatus in place of steam produced by an ordinary steam-generator.

An autogenerating apparatus of my system is illustrated, by way of example, in axial longitudinal section in the accompanying drawing.

A form of apparatus constructed in accordance with my invention comprises a vertical cylinder *a*, in which reciprocates a piston *b*, connected, by means of a connecting-rod, to two crank-disks *c c*, which are rigidly fixed upon a shaft *d*, provided at one end with a starting-handle *e* and at the other end with a pinion *f*, engaging a second pinion *g* of twice the diameter of the former. This large pinion is rigidly connected with a cam *h* for actuating the exhaust-valve *i*, in proximity to which are arranged the suction-valve *j* and an electric igniting device *k*, by means of which an electric spark may be produced into the cylinder end *l*.

Above the cylinder *a* is a central valve *m*, the rod of which is provided with a compensating piston *n*, which valve is maintained closed by means of a spring *o*, the pressure of which may be adjusted by means of a nut *p*. Within the intermediate jacket *q* of the cylinder, which is partially filled with water, is fixed at its upper portion an expansion-rod *r*, provided with a valve *s*. The annular space *t*, around the cylinder, communicating with the cylinder end or chamber *l* by means of the valve *i*, serves as an exhaust-chamber, and the cylinder is supplied through a suitable pipe *u* either with illuminating-gas or with gas from a carbureter. The arrangement also comprises a pipe *v*, permitting of the exhaustion of the burned gases, a tube *w*, through which water is supplied to the jacket *q*, and a pipe *x* for conducting the mixture of expanded gases and steam to the apparatus in which it is intended to be utilized.

The operation is as follows: Assuming the piston *b* to be at the upper extremity of its stroke and the handle *e* to be then rotated, the piston in descending draws into the cylinder *a* a certain quantity of combustible gas coming from the inlet-pipe *u* and passing through the valve *j*, which opens under the influence of the vacuum produced by the said piston. This latter in again rising compresses the explosive mixture in the cylinder end *l*, and the said mixture is prevented from escaping through the central valve *m* by the spring *o*, which is so adjusted as to permit of the opening of the valve *m* only under the influence of a pressure greater than that of the maximum compression. As soon as the piston *b* has again reached the upper extremity of its stroke a spark is produced by the electric igniting device *k*, causing the explosion of the gas, accompanied by an increase of pressure sufficient to cause the valve *m* to rise and permit a portion of the burned gases to escape into the annular space *q*. This explosion at the same time exerts upon the piston *b* a force which starts the motor and enables it, owing to the momentum acquired by the fly-wheels *c c*, to continue to rotate in order to complete the cycle. When the piston *b* reaches the bottom of the cylinder *a*, the exhaust-valve *i* opens and the excess of the burned gases passes into the annular space *t* in order to escape into the open air through the outlet-pipe *v*. The piston *b* rises owing to the velocity acquired by the fly-wheels *c c*, the exhaust-valve *i* remaining open until the termination of the ascending stroke of the piston, after which this latter

again descends, producing a fresh suction of gas through the valve *j*, the cycle of four phases being reproduced indefinitely. The volume of the cylinder end *l* and the strength of the spring *o* acting on the central valve *m* are calculated in such a manner as to leave a sufficient pressure in the said cylinder end, and consequently upon the piston *b*, in order to permit the latter to compress a fresh quantity of gas, so as to complete the cycle. The small piston *n*, the upper face of which is in communication with the atmosphere by means of a passage *z*, serves to counteract the pressure produced in the chamber *q* by the gases which have escaped through the central valve *m* during the preceding explosions, which pressure tends to maintain the said valve closed. The heating of the cylinder *a* and the circulation of the hot gases in the space *q* convert into steam the water contained in the space or jacket *q*, the effect of which is to lower the temperature of the gases and increase their volume. The hot gases escape through the valve *i*, circulate in the jacket *t*, and heat the water to be vaporized, thus still further increasing the efficiency of the apparatus. The mixture of expanded gases and steam thus obtained escapes through the pipe *x*, whereby it is conducted to to the apparatus in which it is intended to be utilized. The water contained in the jacket *q* is renewed through the pipe *w*, the flow through which is regulated by means of the expansion-rod *r*. If the temperature rises in the said jacket, this rod *r* lengthens, the valve *s* opens, and a certain quantity of water is introduced. The temperature then falling, the rod *r* becomes shortened and the valve *s* again closes. The introduction of the water may be effected by means of a pump actuated by the shaft of the motor and provided with an exhaust-valve arranged in the force-pipe and enabling the water to be returned to the trough when the valve *s* is closed. The adjustment of the rod *r* is effected by means of a screw-thread and of a nut provided at its upper extremity.

The igniter may be of any suitable construction.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. An engine provided with a casing normally closed at the bottom and adapted to contain a liquid, a valve controlling the admission of the liquid into the casing, a heat-sensitive member controlling the valve and extending into the liquid-receiving part of the casing so as to be in contact with the liquid contained therein, and a connection from the exhaust from the engine to the upper portion of said casing.

2. An engine having a casing forming a water-jacket around the cylinder, another casing surrounding the first-named casing and forming a heating-chamber, a connection from the cylinder-exhaust to said heating-chamber, an outlet for the escape of the exhaust from the heating-chamber, and an outlet for the escape of the steam formed in the water-jacket.

3. An engine having a casing forming a water-jacket around the cylinder, another casing surrounding the first-named casing and forming a heating-chamber, a connection from the cylinder to lead the exhaust into said heating-chamber, a second connection from the cylinder to conduct a portion of the heated driving medium into the water-jacket and outlets for the escape of the exhaust from the water-jacket and from the heating-chamber respectively.

4. An explosive-engine having a cylinder with a working chamber provided with an exhaust-port and with a valved supplementary outlet located in the cylinder-head, a casing surrounding the cylinder and forming a jacket adapted to contain liquid, a connection from the supplementary outlet to said jacket, a valve controlling the admission of liquid into said casing, a heat-sensitive member controlling said valve and extending into the jacket so as to be in contact with the liquid contained therein, and another casing surrounding the jacket and forming a heating-chamber connected with the exhaust-port of the cylinder.

5. An explosive-engine having a cylinder with a working chamber provided with an exhaust-port and with a valved supplementary outlet located in the cylinder-head, a casing surrounding the cylinder and forming a jacket adapted to contain liquid, a connection from the supplementary outlet to said jacket, and another casing surrounding the jacket and forming a heating-chamber connected with the exhaust-port of the cylinder.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

LOUIS RENAULT.

Witnesses:

GEORGES DELOM,

EDWARD P. MACLEAN.