(No Model.)

E. KORTING.

METHOD OF AUTOMATIC IGNITION IN GAS ENGINES.

No. 417,924. Patented Dec. 24, 1889.

Fig. 1.

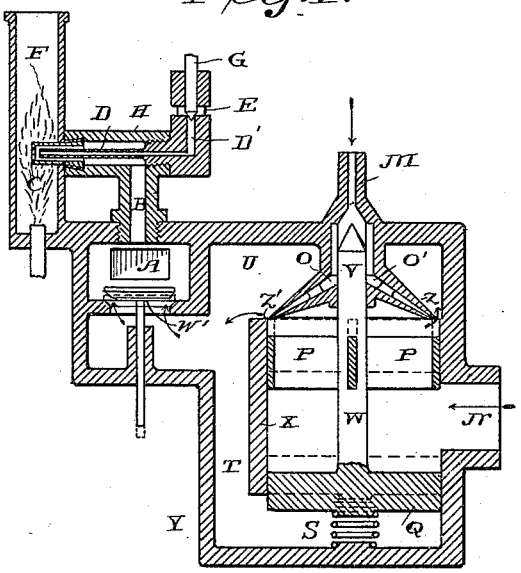


Fig. 2.

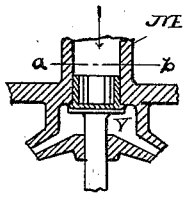


Fig. 3.

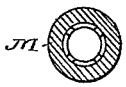
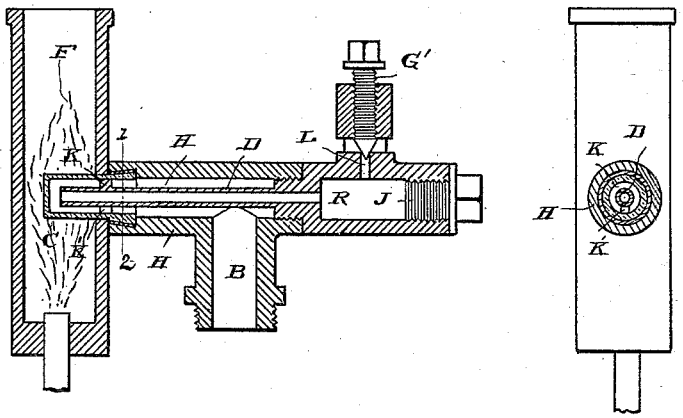


Fig. 5.

Fig. 4.



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UNITED STATES PATENT OFFICE.

ERNST KORTING, OF HANOVER, PRUSSIA, GERMANY, ASSIGNOR TO THE KORTING GAS ENGINE COMPANY, (LIMITED,) OF NEW YORK, N. Y.

METHOD OF AUTOMATIC IGNITION IN GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 417,924, dated December 24, 1889.

Application filed March 28, 1889. Serial No. 305,100. (No model.) Patented in Switzerland May 8, 1888, No. 808; in France May 12, 1888, No. 194,590, and in Belgium May 12, 1888.

To all whom it may concern:

Be it known that I, ERNST KORTING, a subject of the King of Prussia and Emperor of Germany, residing at Hanover, in the Kingdom of Prussia, Germany, have invented certain new and useful Improvements in the Method of Automatic Ignition in Gas-Engines, (for which I have obtained a patent in France, No. 194,590, granted May 12, 1888; in Belgium, patent granted May 12, 1888, and in Switzerland No. 808, granted May 8, 1888;) and I 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.

My invention consists in the method of automatically igniting a charge of combustible gases in the cylinder of a gas-engine, hereinafter to be described and claimed.

In the drawings, Figure 1 is a sectional view showing the general arrangement of valves and one form of ignitor. Fig. 2 is a detail view showing a modification of the gas-inlet valve. Fig. 3 is a horizontal section on line A B of Fig. 2. Fig. 4 is a sectional view showing the preferred form of the ignitor. Fig. 5 is a section on line 1 2 of Fig. 4.

My invention is intended to be employed with gas-engines of the general type illustrated in a prior patent granted to me July 27, 1886, No. 346,374, and in subsequent patents issued to me. In this type of engine the piston first draws in the charge; second, compresses it; third, combustion takes place, and, fourth, the burned gases are discharged.

My improved method of ignition enables me to produce combustion of the charge in the engine-cylinder at a predetermined period in the operation of the engine with absolute certainty and without danger of blowing out the constantly-burning jet from which ignition is produced.

My method depends upon the principle that through gases of a known composition combustion can be transmitted only at a known speed. Consequently if a small stream of the gases which compose the combustible charge undergoing compression in the engine-cylinder is discharged into any suitable igniting-chamber at a speed greater than that at which combustion can be transmitted through said gases from molecule to molecule the charge in the engine-cylinder will not be ignited; but if at any moment and by any means the speed of the issuing stream of gases is reduced to less than that velocity at which combustion is transmitted through the mixture, at that moment combustion will be communicated from the igniting-chamber to the engine-cylinder and the charge in said cylinder ignited. An arrangement of inlet and mixing valves for producing a mixture of the correct proportions of gas and air and for introducing the same into the engine-cylinder, as also several forms of apparatus by which my automatic method of ignition can be carried out, are illustrated in the drawings annexed hereto.

In Fig. 1, N represents the air-inlet, and M the gas or oil inlet. Y is the valve-casing. X is a cylindrical casing within the main casing Y, and in it the valve-stem W slides up and down, carrying the piston Q and the ring-shaped valve P. The end of the valve-stem W is ground to a conical point V, which rises against a corresponding conical valve-seat, and thereby closes the gas or oil inlet M.

As the gas or oil enters through the inlet M it passes on to the annular chamber O, formed by the flaring sides O′ and Z, and is compelled to issue through the narrow circular slit Z′, left between the parts O′ and Z.

The interior U of the valve-casing is connected with the cylinder of the gas-engine (not shown) by the passage-way A. Communication between the chamber U and the passage-way A is controlled by a check-valve W′. When the piston of the engine is drawing in the charge, it produces a partial vacuum in the passage-way A, which lifts the check-valve W′ and produces a similar partial vacuum in the valve-chamber U and the passage-way T connected therewith. In consequence the atmospheric pressure on the upper side of the piston Q compresses the spring S, lowers the valve-stem W, and lowers the valves V and

P from their respective seats. Consequently the gas or oil entering through the passage M passes on through the chamber O and through the narrow slit Z′. At that point the oil or gas meets the current of air rushing onto the passage-way A, as shown by the arrow, and is vaporized or intimately commingled with the said current of air, thereby forming the combustible charge, which is drawn into the engine-cylinder through the passage-way A. When the engine-piston begins to compress the said charge, the check-valve W′ is closed, an equilibrium of pressures is established on the two sides of the piston Q, and the spring S forces the valves V and P up to their seats, thereby shutting off all further admission of air and of oil or gas.

When petroleum or other hydrocarbon oil is to be used, I employ the form of valve V shown in Fig. 1. When a gas is to be used, I employ the form of valve V having a cage, as shown in Figs. 2 and 3.

The igniting portion of my device is connected to that previously described by a passage-way B. This passage-way terminates in a chamber H, which is closed by a cap C of any refractory material, such as porcelain or lava. Passing through the chamber H and projecting into the cap C is a slender tube D, which communicates with an outlet D′, which is closed by a valve G, which may be lowered upon the valve-seat E. The cap C is kept in a state of incandescence by a jet of flame F.

The valve G, as above described, forms simply one modification of my invention, the preferred form of which is shown in Fig. 4. The tube D communicates with a chamber R, which may be adjusted to greater or less capacity by the screw-plug J. This chamber R has an outlet L, which may be more or less restricted by the pointed valve G′, which may be screwed up or down, and thereby open or close the orifice L.

The operation of the automatic ignitor is as follows: During the first part of the period of compression of the charge in the engine-cylinder the passage-way B, the chamber H, and tube D are filled with the incombustible gases resulting from the combustion of the previous charge. When these have been driven out by the stream of combustible gases forced out of the engine-cylinder by the compression produced therein, the heat of the incandescent chamber, formed by the interior of the porcelain cap C, ignites the said combustible gases; but the combustion is not transmitted back through the passages B and A to the engine-cylinder, because the speed of the stream of gases flowing through the narrow passages of the chamber H is greater than that at which combustion is transmitted through the said gases. If the velocity of this stream of gas is sufficiently checked, the combustion will be transmitted back to the cylinder of the engine and the desired explosion will be there produced. This checking of the speed of the stream of gas may be accomplished, as shown in Fig. 1, by the valve G, which is automatically operated by the engine through the agency of a crank or eccentric or any other well-known means. In my preferred construction, however, as shown in Fig. 4, the velocity of the said stream of gases is checked by the back-pressure generated by the accumulation of gas in the intermediate chamber R. The period at which a sufficient back-pressure to accomplish this shall be produced in the chamber R is dependent upon the capacity of said chamber or upon the readiness with which the gases can escape from it through a given outlet, or upon both. I have therefore provided a screw-plug J, by which the capacity of the intermediate chamber R can be adjusted, and also the screw-valve G′, by which the outlet L may be more or less restricted. A proper adjustment of the plug J and the valve G′ will result in the generation of the proper amount of back-pressure in the chamber R at the proper time, so that the combustion going on within the cap C will be transmitted to the charge in the engine-cylinder, and the combustion of the latter begin just as the crank passes the dead-point.

In order to insure the necessary speed of the current of gases sufficient to prevent the premature transmission of combustion to the charge in the engine-cylinder, I place the collar K, having the small perforation K′, about the tube D, as shown in Figs. 4 and 5. By increasing or decreasing the diameter of the perforation K′ the speed of the issuing stream of gas can be accordingly decreased or increased to the required degree.

The cap C may be cemented into the chamber H, or otherwise attached to the metal portions of the engine so as to prevent leakage.

Some of the evident advantages of my method are the simplicity of the various forms of apparatus by which it may be carried out, the possibility of doing away with all moving parts in the igniting apparatus, the impossibility of blowing out the constantly-burning flame from which ignition is produced, &c.

It is evident that various forms of apparatus for checking the velocity of the stream of gas at the proper moment other than the apparatus described herein could be devised without departing from the principle of my method and the spirit of my invention. I therefore do not wish to be restricted to the apparatus described, but claim the method, broadly, as hereinbefore and hereinafter set out.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

The method of automatically igniting the combustible charge in the cylinder of a gas-engine, which consists in, first, forcing a small stream of the gases composing the

charge from the cylinder into an incandescent chamber at a speed greater than that at which combustion is propagated through said gases; second, in automatically checking the speed of said stream after a determinate period by the back-pressure of the discharged gases which are allowed to accumulate in a second chamber of adjustable capacity and which has an adjustable outlet-valve, substantially as described.

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

ERNST KORTING.

Witnesses:
WM. G. SPALDING,
JOHN KRACKE.