(No Model.)

M. V. SCHILTZ & E. QUACK.

IGNITING APPARATUS FOR GAS AND PETROLEUM ENGINES.

No. 366,346. Patented July 12, 1887.

Fig. I.

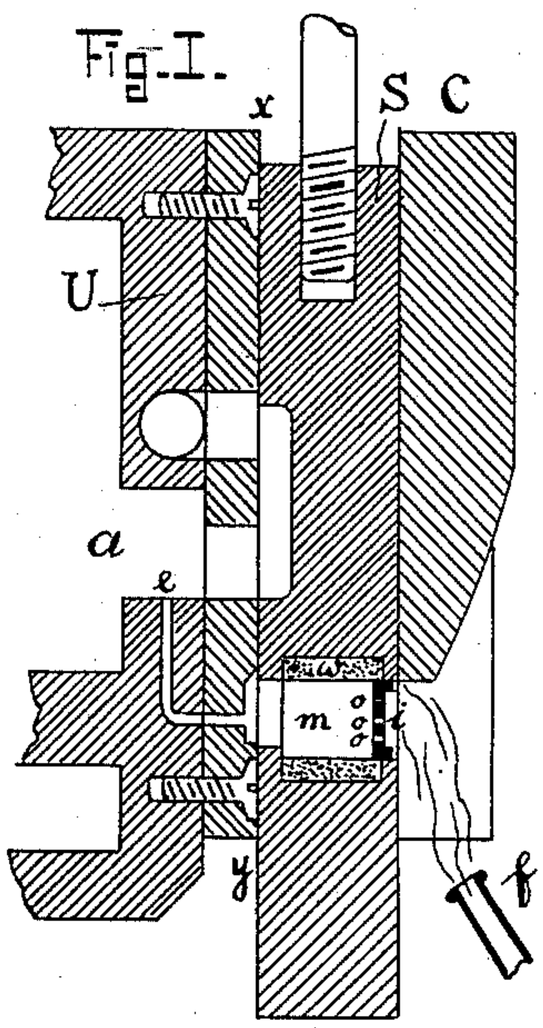


Fig. III.

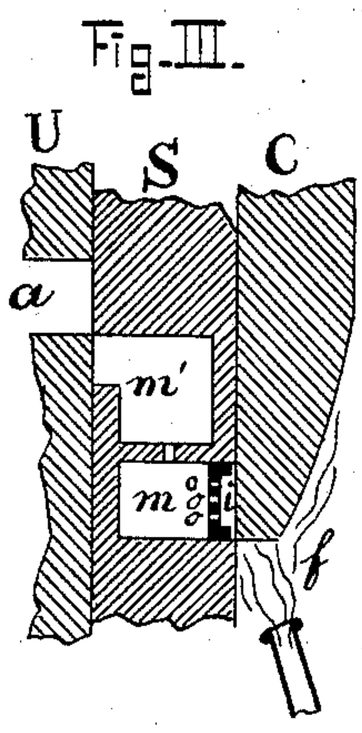
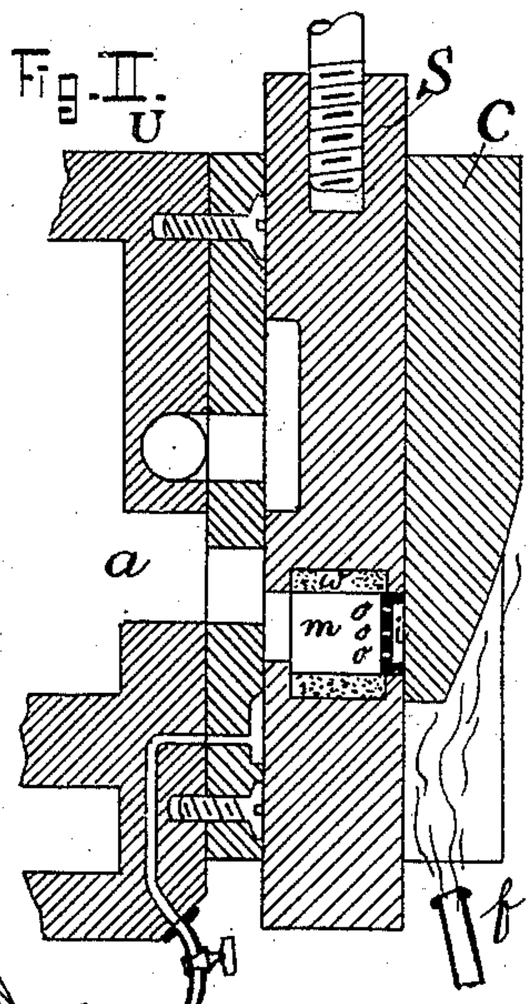


Fig. II.



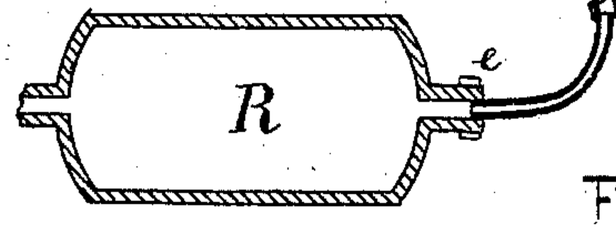


Fig. V.

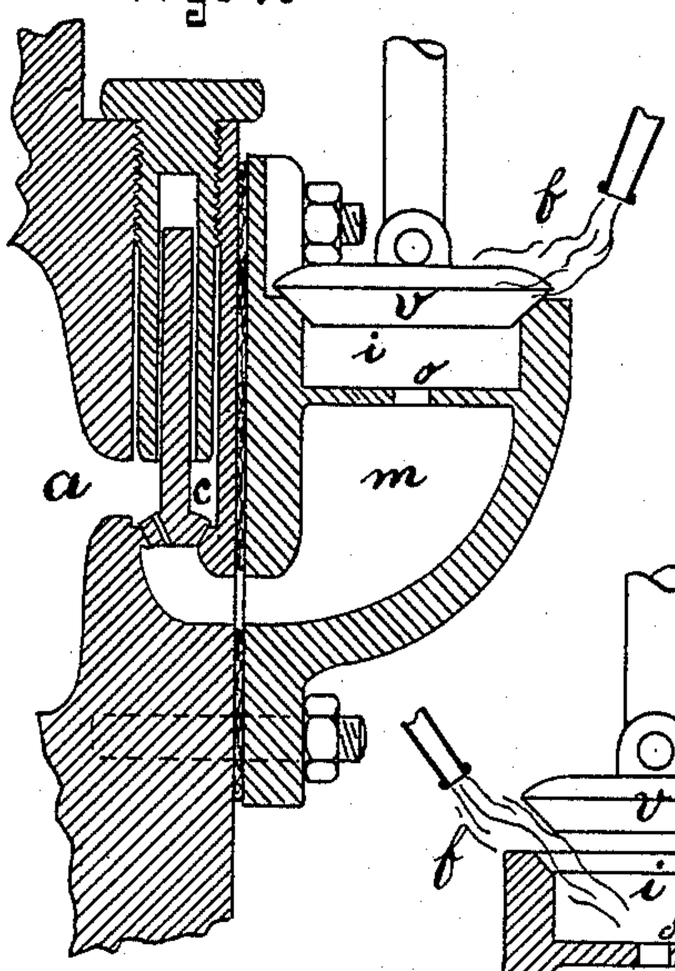


Fig. IV.

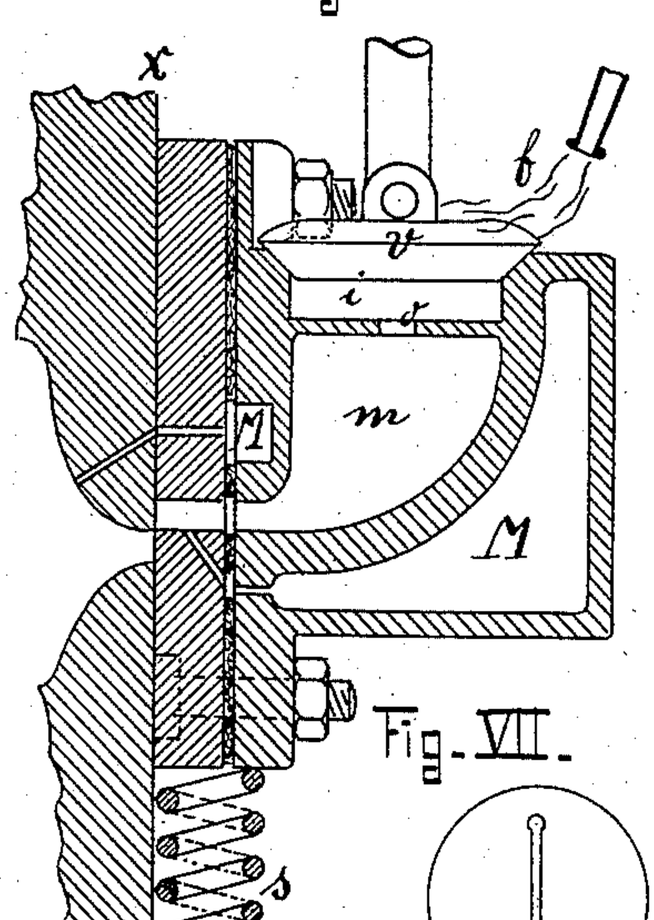


Fig. VI.

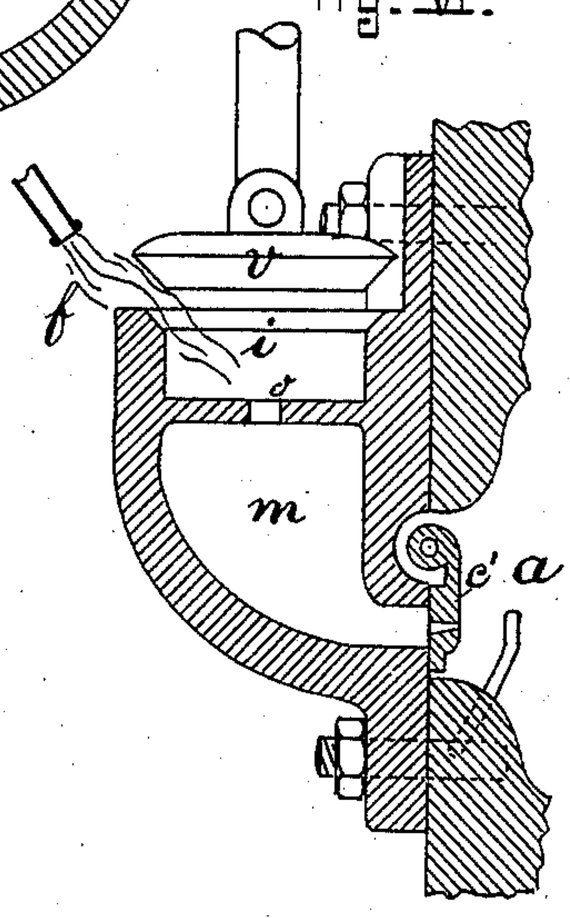
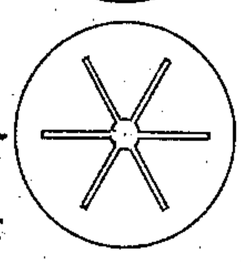


Fig. VII.

Fig. VIII.



Witnesses:

Chas. Farnsworth

Fred'k Crane

Inventors:

M. V. Schiltz

E. Quack

by Fairfax & Wetter

Attorneys

UNITED STATES PATENT OFFICE.

MATHIAS VITALIS SCHILTZ AND EDUARD QUACK, OF COLOGNE, GERMANY; SAID QUACK ASSIGNOR TO SAID SCHILTZ.

IGNITING APPARATUS FOR GAS AND PETROLEUM ENGINES.

SPECIFICATION forming part of Letters Patent No. 366,346, dated July 12, 1887.

Application filed November 10, 1886. Serial No. 218,504. (No model.) Patented in Germany December 30, 1884, No. 33,675; in Belgium August 12, 1885, No. 69,892; in France August 12, 1885, No. 170,620; in England August 27, 1885, No. 12,896; in Austria-Hungary November 10, 1885, No. 30,369, and in Italy February 4, 1886, No. 19, 209.

To all whom it may concern:

Be it known that we, MATHIAS VITALIS SCHILTZ and EDUARD QUACK, both subjects of the Emperor of Germany, and both residing at Cologne, in the Empire of Germany, have invented certain new and useful Improvements in Igniting Apparatus for Gas and Petroleum Engines, (for which we have received Letters Patent in Germany No. 33,675, dated December 30, 1884; in Belgium No. 69,892, dated August 12, 1885; in France No. 170,620, dated August 12, 1885; in Great Britain, No. 12,896, dated August 27, 1885; in Austria-Hungary No. 30,369, dated November 10, 1885, and in Italy No. 19,209, dated February 4, 1886;) and we hereby declare the following to be a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to the ignition of a compressed combustible mixture of illuminating-gas or petroleum-vapor and air by means of an external flame. If such a combustible mixture of best quality and in a compressed state is contained in a receptacle and allowed to escape into the atmosphere through an opening of the same, the mixture escaping from the orifice may be ignited by an external flame; but the mixture only burns at some distance from the discharge-opening and not in the immediate neighborhood of the latter, while still less will the flame strike through the discharge-opening into the interior of the closed receptacle. These phenomena are known, and are explained by the fact that a mixture having a strong whirl motion will not burn until this motion has been abated, and that in this condition the speed at which the ignition will propagate itself is slower than the motion of the flowing mixture.

The essential feature of my invention consists in causing the compressed mixture to flow through one or more apertures into a small antechamber, and increasing the pressure in the latter by tightly closing the said antechamber until the pressure in the latter and that in the reservoir containing the mixture are equal, in consequence of which the ignition will proceed through the aperture to the other mixture, and the latter will burn with explosion. If this explosion spreads at the same time into another and larger receptacle, which is filled with the compressed mixture, this latter mixture will also be ignited and consumed with explosion. It is immaterial as regards this principle of our invention whether the closing of the antechamber against the external flame, as well as the communication between the igniting-chamber and the working-chamber of the cylinder, is effected by a sliding motion or by a valve.

In the accompanying drawings, Figures I, II, and III show a slide-valve mechanism embodying our new method of ignition; and Figs. IV, V, and VI represent the application of new method our by means of a lifting-valve.

Fig. I is a section showing the position of the slide-valve S during its operation. In this position the igniting-chamber *m* is filled with combustible material or mixture through a fine canal, *e*, from any convenient source of supply—for instance, from the working-chamber *a*—the said mixture driving out the products of combustion which have remained from the previous ignition. From the chamber *m* the mixture flows through one or more orifices, *o*, into the antechamber *i*, and is then ignited by the external flame, *f*; but the combustion will not spread through the orifices *o* into the chamber *m*, owing to the strong current. The mixture continues to burn in front of the orifices *o* until the slide S has ascended sufficiently to close the antechamber *i* from the outside by the cover C, and almost simultaneously to put the chamber *m* in communication with the working-mixture in the space *a* of the cylinder. This position is represented by Fig. II. The explosion caused in the chamber *m* by covering the slide-valve on the outside spreads to the working-mixture at *a*, and the explosion of the latter drives the piston of the working-cylinder forward. When the slide-valve returns into the position of Fig. I, this process is repeated.

Fig. I shows how the igniting-chamber *m* is filled from the working-chamber *a* through the small canal *e*. In Fig. II the chamber *m* is filled from a separate reservoir, R.

Instead of a single igniting-chamber *m*, several igniting-chambers, *m m'*, connected with one another by small apertures, may be employed, as represented by Fig. III. The last igniting-chamber of the series, *m*, allows the mixture to escape toward the external flame, and the first igniting-chamber, *m'*, is put in communication with the working-chamber *a* at the same moment when the antechamber *i* is closed from the outside—that is to say, against the cover C and the flame *f*—by the shifting of the slide S. This modification may serve to ignite a more strongly-compressed mixture in the working-chamber *a*, because the compression in the chamber *m'* is greater than in the chamber *m*.

The igniting-chamber *m* may be jacketed with a bad conductor of heat, *w*, as illustrated in Figs. I and II, in order to retard the transmission of the heat of the exploded gases to the walls of the igniting-chamber. In this case the combustion will be transmitted from the igniting-chamber *m* to the working-chamber *a*, even if the latter is opened a moment later than the time of closing the antechamber *i*.

The width of the orifices *o*, situated in the partition between the igniting-chamber *m* and the antechamber *i*, must be so chosen that the mixture escaping from *o* and ignited by the flame *f* will burn also in the antechamber, but that the ignition will not extend back through *o* into the chamber *m* before the communication between the flame and the chamber *i* has been cut off. A single orifice *o* will be sufficient, if it is made of a special shape, as indicated in Figs. VII and VIII, so as to combine a wide aperture with one or more narrow slits or very narrow holes.

The current of the mixture flowing from the orifice *o* may be broken by a sieve of wire-gauze secured in front of the orifice *o*.

As already mentioned, the closing of the antechamber *i* may be effected by means of a lifting-valve or its equivalent, and the communication between the igniting-chamber *m* and the working-chamber *a* may likewise be controlled by a slide or a lifting valve, as illustrated by Figs. IV, V, and VI.

In Figs. IV to VI *m* is the igniting-chamber, supplied with compressed mixture from the working-chamber *a* through a fine perforation. This mixture flows from the chamber *m* through the orifice *o* into the antechamber *i*, and when the valve *v* is lifted it is ignited by the outer flame, *f*. As soon as the valve *v* closes the antechamber *i* tightly, being pressed down on the valve-seat by means of a cam or eccentric of the engine, the flame strikes back through the orifice *o* of the partition into the chamber *m*, and the mixture contained in the latter explodes and communicates the ignition to the working-chamber *a*, which is opened at the same moment. This opening of the working-chamber *a*—that is to say, the communication between the igniting-chamber *m* and the working-chamber *a*—may be effected by shifting the igniting-chamber, or by means of a valve or flap.

In the construction represented by Fig. IV the valve *v*, as soon as it closes tightly on its seat, presses down the whole igniting-chamber *m*, which slides air-tight on the surface *x y*, thereby putting the chamber *m* in communication with the working-chamber *a*. When the valve *v* rises, the chamber *m* is again pushed upward by a spring, *s*, in which position the chamber *m* is filled with fresh mixture through a narrow canal, *e*, the products of combustion being driven out and the fresh mixture ignited by the outer flame, *f*, as described above.

In the construction represented by Fig. V the communication between the igniting-chamber *m* and the working-chamber *a* is controlled by an automatic check-valve, *c*, and in Fig. VI by a clack-valve, *c'*, both valves being lifted by the pressure produced by the explosion in *m*, and falling again on their seat by their own weight. This valve *c* contains a fine perforation, through which the fresh combustible mixture flows from the working-chamber *a* into the igniting-chamber *m*.

For igniting a mixture of petroleum-vapor and air, the mixture must be sufficiently heated to evaporate any liquid particles of petroleum, and must be mixed with the required quantity of air. This preliminary heating of the petroleum mixture to facilitate ignition may be effected by jacketing the igniting-chamber *m* with a bad conductor of heat, *w*, as illustrated by Figs. I and II, or by conducting the combustible mixture (from whatever source it may be taken) before its admission to the igniting-chamber *m*, through the jacket M of the igniting-chamber, as illustrated by Fig. IV.

For starting the engine, the igniting-chamber *m* and the jacket M may be temporarily heated by the external flame. Subsequently the jacket M and the igniting-chamber *m* are kept hot by the explosions taking place in the chamber *m*. The superheating of the igniting-chamber, however, must be avoided by well-known means.

Having fully described our invention, what we desire to claim, and secure by Letters Patent, is—

1. An igniting apparatus for gas or hydrocarbon engines, actuated by compressed combustible mixture, the said apparatus comprising in its construction an igniting-chamber adapted to receive explosive mixture and to communicate with the working-cylinder of the engine, an antechamber communicating on one side with the igniting-chamber through small holes and adapted to communicate on the other side with the atmosphere and an igniting-flame situated near the opening of the antechamber, and means for cutting off communication between the antechamber and the atmosphere and simultaneously or in

short succession establishing communication between the igniting-chamber and the working-cylinder, substantially as described.

2. An igniting apparatus for gas or hydrocarbon engines, actuated by compressed combustible mixture, the said apparatus comprising in its construction an igniting-chamber adapted to receive explosive mixture and to communicate with the working-cylinder of the engine, an antechamber communicating on one side with the igniting-chamber through small holes and adapted to communicate on the other side with the atmosphere and an igniting-flame situated near the opening of the antechamber, and a slide-valve with valve-seat and cover, the said slide valve containing the igniting-chamber and antechamber and being adapted to cut off communication between the antechamber and the outer flame by sliding motion between the valve-seat and cover and simultaneously to establish communication between the igniting-chamber and the working-cylinder through an opening situated in the valve-seat, substantially as and for the purpose described.

3. An igniting apparatus for gas or hydrocarbon engines, actuated by compressed combustible mixture, the said apparatus comprising in its construction an igniting-chamber adapted to receive explosive mixture and to communicate with the working-cylinder of the engine, an antechamber communicating on one side with the igniting-chamber through small holes and adapted to communicate on the other side with the atmosphere and an igniting-flame situated near the opening of the igniting-chamber, and a pair of valves and valve gear adapted to cut off communication between the antechamber and the outer flame and simultaneously to establish communication between the igniting-chamber and the working-cylinder, substantially as and for the purpose described.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

MATHIAS VITALIS SCHILTZ.
EDUARD QUACK.

Witnesses:
FRANZ WERTENBRUCH,
CLEMENS HEIKAMPF.