(No Model.)

M. V. SCHILTZ.

HYDROCARBON ENGINE.

No. 406,540. Patented July 9, 1889.

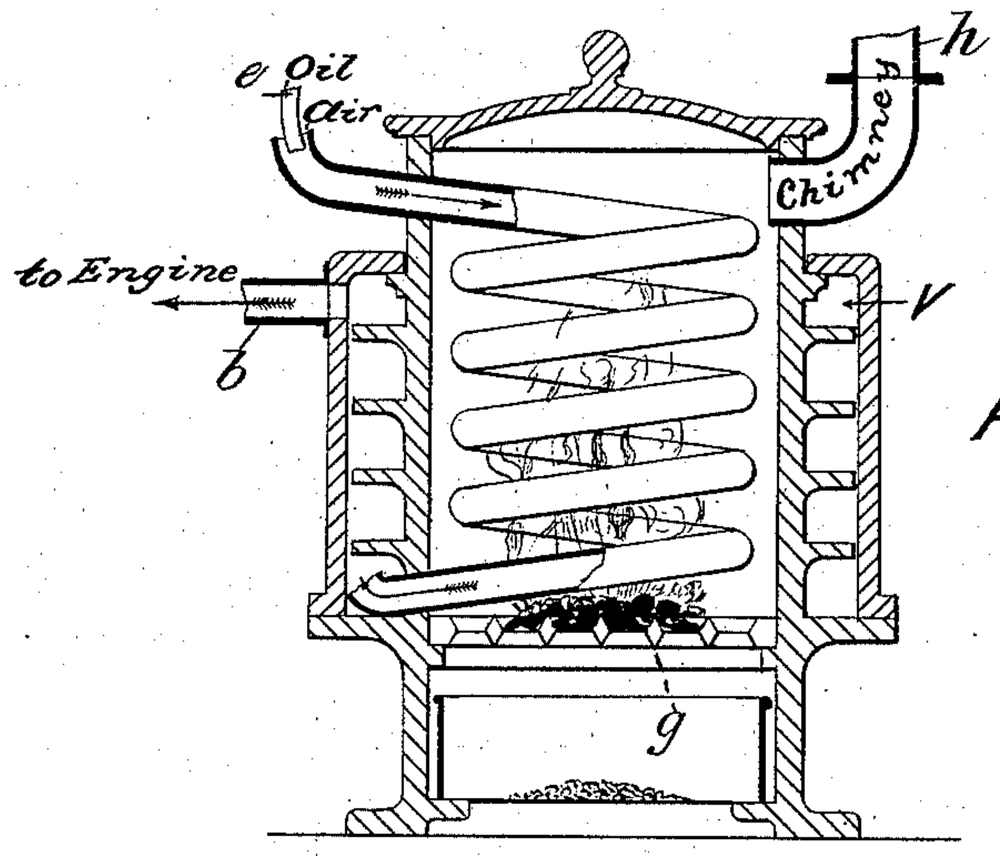

FIG. 1.

FIG. 2.

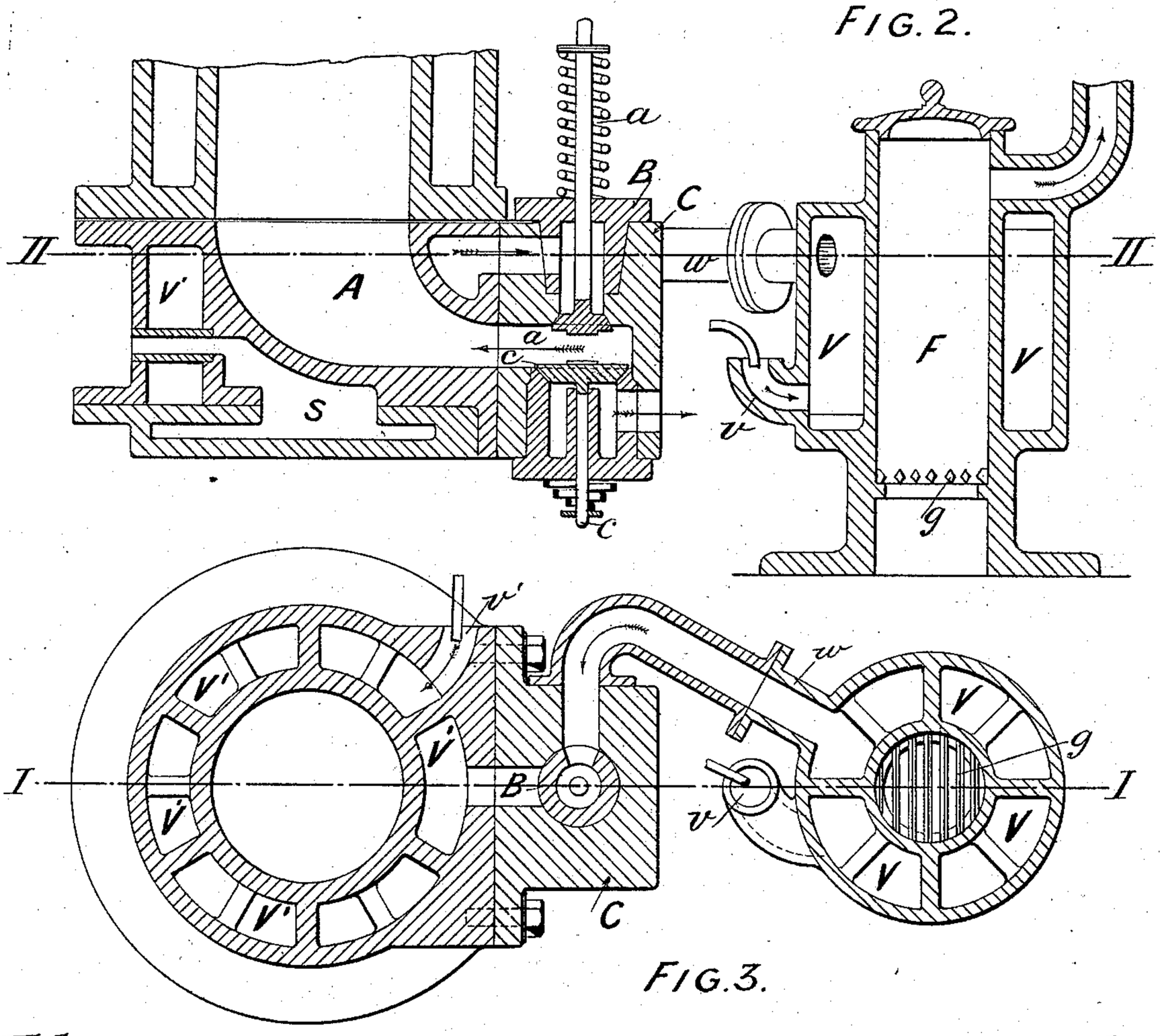

FIG. 3.

Witnesses.
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UNITED STATES PATENT OFFICE.

MATHIAS VITAL. SCHILTZ, OF COLOGNE, PRUSSIA, GERMANY.

HYDROCARBON-ENGINE.

SPECIFICATION forming part of Letters Patent No. 406,540, dated July 9, 1889.

Application filed April 9, 1889. Serial No. 306,742. (No model.) Patented in Germany April 10, 1886, No. 38,121; in Belgium June 30, 1886, No. 73,679; in France July 3, 1886, No. 177,181; in England August 16, 1886, No. 10,480; in Austria-Hungary October 23, 1886, No. 19,835, and in Italy May 10, 1887, No. 20,715.

To all whom it may concern:

Be it known that I, MATHIAS VITALIS SCHILTZ, a subject of the German Emperor, residing at Cologne, in Prussia, Germany, have invented certain new and useful Apparatus for Preparing Explosive Mixtures for Hydrocarbon-Engines, (for which I have obtained Letters Patent in Germany, No. 38,121, dated April 10, 1886; in Belgium, No. 73,679, dated June 30, 1886; in France, No. 177,181, dated July 3, 1886; in Great Britain, No. 10,480, dated August 16, 1886; in Austria-Hungary, No. 19,835, dated October 23, 1886, and in Italy, No. 20,715, dated May 10, 1887,) of which the following is a full, clear, and exact specification.

My invention relates to a new mode of producing a good explosive mixture in hydrocarbon-engines from heavy hydrocarbon oils or other liquid fuel and air; and said mode consists in mechanically dispersing a measured or regulated quantity of liquid fuel by means of a strong air-current in a heated space of coiled or zigzag form, and thus mixing the vapors with the required quantity of air before its admission to the explosion-chamber of the engine.

In application Serial No. 242,474, filed June 25, 1887, patented March 12, 1889, No. 399,569, I have explained some general requirements and principles upon which the present invention is based. In the said application I have described the construction and use of an evaporating-canal, which is heated by immediate contact with the explosion-chamber of the engine. This present application relates to the same method carried into effect by means of an evaporating-canal heated by an independent source of heat, which may be a furnace or a lamp.

To render my invention better understood I will explain some considerations which have induced me to replace an evaporating-canal adapted to utilize the heat of the explosion-chamber of the engine by an independent evaporating-canal constructed and used in the same manner, but heated by an independent source of heat and periodically communicating with the explosion-chamber of the engine.

It is well known that in a gas or petroleum engine the final pressure of the hot gases or products of combustion upon the working-piston depends on the initial pressure and temperature of the mixture and on the final temperature, and may be found by the equation $P=p\frac{T}{t}$, in which p designates the initial and P the final pressure, t the initial and T the final absolute temperature. It is also well known that many heavy oils require for their evaporation a higher temperature than can be supported by the working-organs of the engine, and that therefore the heat allowable in an evaporating-canal heated by the explosion-space of the engine is frequently insufficient for evaporating heavy oils or tar. For this reason I employ an evaporating-canal applied to an independent furnace, in which the temperature required for the evaporation of oils may be as high as required, and coming from this evaporating-canal the combustible may be sufficiently cooled before its admission to the explosion-chamber of the engine. This special evaporating-canal may also be employed in the same manner for starting a petroleum-engine when not yet heated by common illuminating or other heavy petroleum. As soon as the evaporating-canal applied to the explosion-chamber of the engine, as described in my concurrent application, is sufficiently heated by explosions, the special furnace or lamp with the evaporating-canal may be disconnected and the fire extinguished. The said fire of course may be sustained by the combustion of coal or any liquid fuel.

The air may be sucked or forced into the evaporating-canal by a special pump, or it may be sucked through the same by the engine-piston during its first upstroke. In the latter case the evaporating-canal is connected with the explosion-chamber through the admission-valve actuated by the engine.

The shape of the furnace and of the evaporating-canal may of course be modified, but always so as to retain a large inner evaporating-surface, and such a width as may be necessary to provide at every cycle of the engine a strong current of air, by which the liquid fuel is perfectly dispersed or evaporated and

mixed with the air to provide an explosive mixture. For the regular speed of the engine it is important that the liquid shall not remain or accumulate in any place of the evaporating-canal. The canal must therefore be swept regularly by the strong current of air. This regularity of speed also requires a suitable proportion between the quantity of air and that of the liquid fuel to be mixed with the air.

In the further description of my invention reference will be made to the accompanying drawings, in which—

Figure 1 is a vertical section of a furnace and a helical evaporating-canal surrounding the same. Fig. 2 is a vertical section along line I I; and Fig. 3 a horizontal section along line II II of a furnace surrounded by a zigzag-shaped evaporating-canal, showing also the explosion-chamber and valve-box of an engine to which the evaporating apparatus forms an accessory.

The evaporating-canal V is preferably formed by a metallic jacket subdivided by metallic partitions, which may be in one piece with the walls of the furnace or lamp. In Fig. 1 the first part of the evaporating-canal is a coil situated inside the furnace. The oil is introduced into the canal through a thin pipe *e*, by means of a small feed-pump adapted to supply small measured quantities of liquid fuel at every cycle of the engine in a similar manner as described in my previous application mentioned above. The air enters the inner coil at the upper end, and after having passed through the same enters the external canal at the bottom, as shown by the arrows. The outlet *b* for the combustible mixture is situated at the upper end of the external canal, as shown. *g* is the fire-grate, and *h* the outlet for the furnace-gases. The inner coil may, however, be omitted, and the air and oil admitted to the external canal at the top, while the outlet for combustible mixture is situated at the bottom of the same.

In the arrangement represented by Figs. 2 and 3, F is the furnace; *g*, the grate; V V, the evaporating-canal; *v*, the air and oil inlet; *w*, the outlet for combustible mixture. V′ is an evaporating-canal surrounding the explosion-chamber A; *v′*, the petroleum and air inlet of the same. S is a water-space underneath the explosion-chamber. C is the valve-chest containing the inlet-valve *a* and exhaust-valve *c*, each valve being opened at every cycle of the engine by mechanism operated from the engine, while the closing is produced by springs. Above the inlet-valve *a* a three-way cock B is arranged in such a manner that communication may be established either between the said valve and the canal V, or between the valve and the canal V′ by turning the said cock, or that both canals may be cut off, for which purpose the said cock is provided with a handle.

In the position represented by Fig. 2 the admission-valve communicates with the canal V′, while in Fig. 3 communication is established between the valve and the canal V.

I am aware that it has been proposed to evaporate petroleum by means of a separate furnace, but the evaporating-canal did not receive small measured quantities of the oil and an air-current sufficient to evaporate the same.

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. In a hydrocarbon-engine, the combination of an independent furnace with a metallic evaporating-jacket surrounding the said furnace and divided by transverse partitions, so as to increase the evaporating-surface, substantially as described, and for the purpose specified.

2. In a hydrocarbon-engine, the combination of the explosion-chamber with an independent furnace, a metallic evaporating-jacket surrounding the said furnace and divided by transverse partitions, so as to increase the evaporating-surface, and a valve adapted to establish and interrupt communication with the explosion-chamber at every cycle of the engine, substantially as described, and for the purpose specified.

3. In a hydrocarbon-engine, the combination of an independent source of heat, with a helical or zigzag shaped evaporating-canal adapted to be heated by the said source and provided with a valve adapted to establish and interrupt communication with the explosion-chamber of the engine at every cycle, an oil feeder or pump adapted to introduce into the said evaporating-canal small exactly-measured quantities of liquid fuel at every cycle of the engine, and a pump, preferably the working-cylinder, for producing in the said canal at every cycle of the engine an air-blast into or toward the explosion-chamber, substantially as described.

4. In a hydrocarbon-engine, the combination of an independent furnace or lamp, with a helical or zigzag shaped evaporating-canal surrounding the said source of heat and provided with a valve adapted to establish and interrupt communication with the explosion-chamber at every cycle of the engine, an oil feeder or pump adapted to introduce into the said evaporating-canal small exactly-measured quantities of liquid fuel at every cycle of the engine, and a pump, preferably the working-cylinder, for producing in the said canal at every cycle of the engine an air-blast into or toward the explosion-chamber, substantially as described.

5. In a hydrocarbon-engine, the combination of the explosion-chamber and valve-chest, with an evaporating-canal surrounding the said explosion-chamber and adapted to be heated by the same, an independent source of heat, an auxiliary evaporating-canal adapt-

ed to be heated by the same, and a cock or valve adapted to establish communication between the explosion-chamber alternately with the first or the second of the said evaporating-canals, substantially as described, and for the purpose specified.

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

MATH. VITAL. SCHILTZ.

Witnesses:
GUSTAVE ALBERT OERICHS,
WM. D. WARNER.