No. 723,956. PATENTED MAR. 31, 1903.

C. W. WEISS.

EXPLOSIVE ENGINE.

APPLICATION FILED NOV. 10, 1898.

NO MODEL.

Fig. 1.

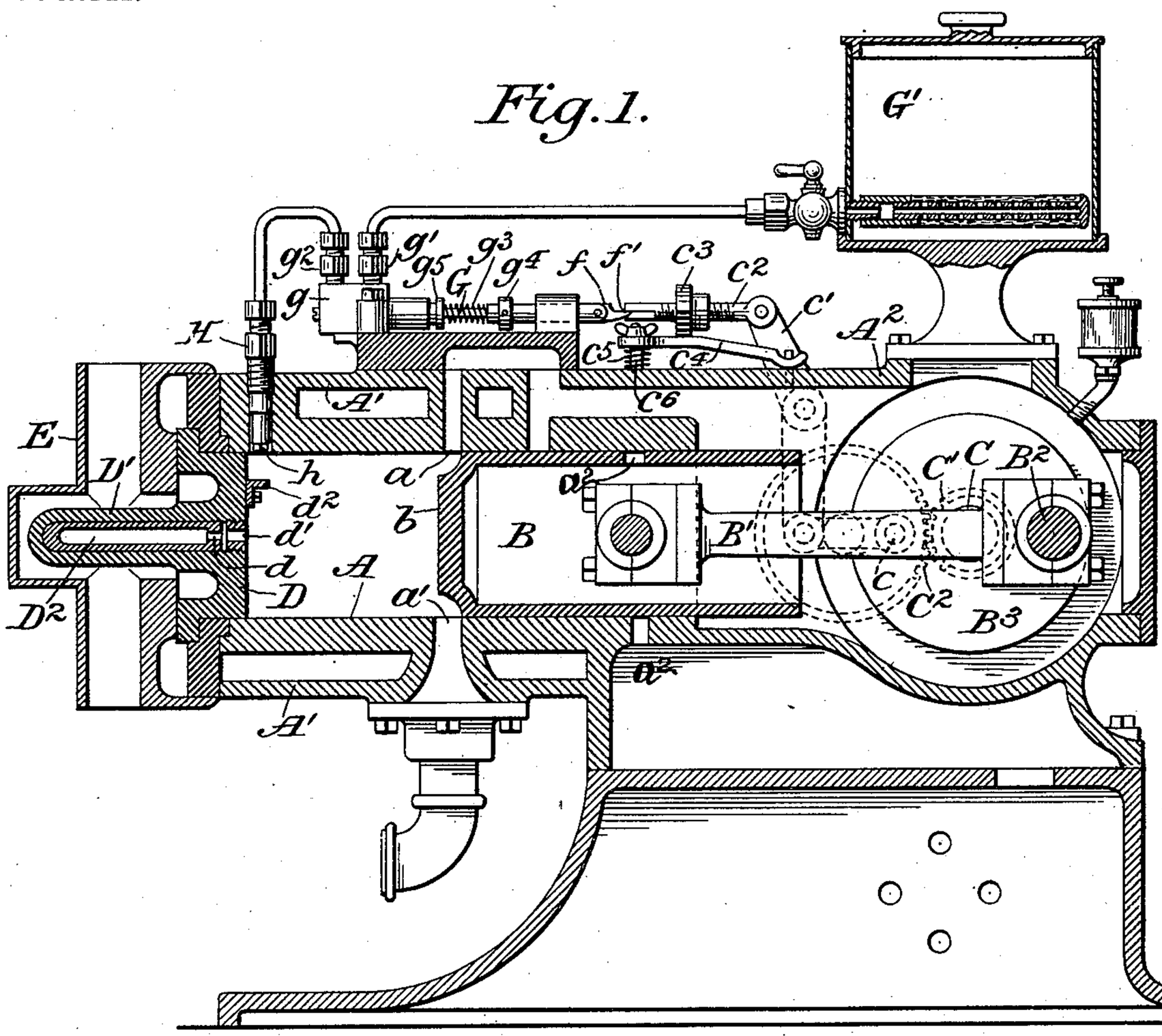


Fig. 2.

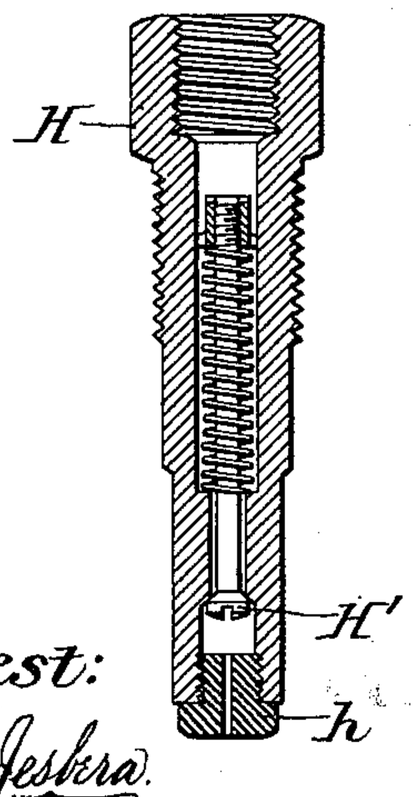
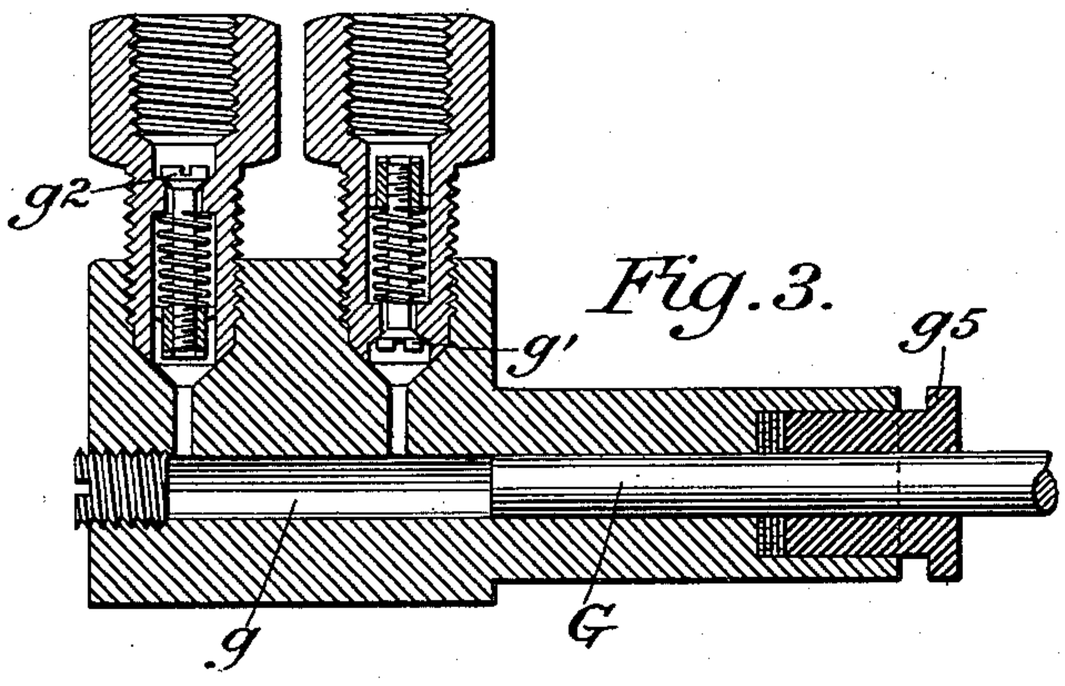


Fig. 3.



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UNITED STATES PATENT OFFICE.

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EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 723,956, dated March 31, 1903.

Application filed November 10, 1898. Serial No. 696,017. (No model.)

To all whom it may concern:

Be it known that I, CARL W. WEISS, a citizen of the United States, residing in the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Explosive-Engines, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to various features of construction, and has for its general object the production of an explosive-engine of exceedingly simple construction, but of great efficiency and capable of very high speed.

One feature of the invention is concerned particularly with the introduction of the oil, which forms the basis of the explosive mixture, the vaporization of the oil, and the mixture of such vapor with air to form the explosive mixture, the special object in view being the certain vaporization of the oil without raising the temperature of the cylinder unduly and the speedy circulation of the vapor throughout the explosion-space in the working cylinder and the consequent reduction of an explosive mixture of uniform quality throughout the explosion-space, whereby the best results as to efficiency and economy are produced.

Other features will be referred to hereinafter.

It will be obvious that some of the features of improvement are capable of application either to a four-cycle engine or to a two-cycle engine. For engines of small size the improvements are preferably embodied in the two-cycle type, but for engines of large size, and especially those using gas as the basis of the explosive mixture rather than oil, they may be embodied to advantage in the four-cycle type. Provision is made when the improvements are applied to engines of the last-mentioned type for the introduction of a scavenging charge of air during the alternate stroke of the piston for the purpose of clearing out from the working cylinder the dead gases remaining from the last previous explosion, thereby rendering the next explosion more effective. The improved engine is thus adapted for very high speeds, although without the complicated valve mechanism of other four-cycle engines.

The various features of the invention will be more fully described hereinafter with reference to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of a four-cycle engine in which the present improvements are embodied. Fig. 2 is a detail view in section of the end of the oil-duct. Fig. 3 is a similar view of the oil-pump.

The cylinder A of the engine may be of ordinary construction, except as may be indicated hereinafter, and may be provided with a water-jacket A′, as usual. The casing A^2 of the cylinder is preferably extended forward to inclose the crank or crank-disks and to receive the bearings of the crank-shaft. The trunk-piston B may be connected by a pitman B′ to the crank-pin B^2, carried by crank-arms or crank-disks B^3, secured directly to the two parts of the crank-shaft C. The chamber inclosed by the forward part of the casing A^2 constitutes a convenient air-compression chamber in which the air (which is admitted through a suitable port at the lower side of the piston, which is covered by the piston in its forward movement, but opened as the piston reaches the limit of its rearward movement) is compressed at each forward movement of the piston. The said chamber is connected through a suitable duct with the working cylinder A or explosion-chamber, said duct having a port a, which is so arranged as to be closed by the piston during its rearward movement. An exhaust-port a' is also provided and is preferably so arranged as to be covered by the piston except when the latter approaches the limit of its forward movement. Oil-holes a^2 may be provided in the wall of the cylinder and in the wall of the trunk-piston. A deflector b is formed upon or secured to the face of the piston B for the purpose of directing a strong blast of air from the compression-chamber rearwardly into the explosion-chamber and against a dash-plate, hereinafter referred to.

There is not in the engine shown in the

drawings an explosion-chamber separate from or independent of the working cylinder of the engine; but the cylinder-head D presents a substantially plane surface and is nearly approached by the piston at the limit of its rearward movement, a space being left between the two, however, in which the explosive charge is compressed.

The igniter shown in the drawings comprises an outer shell D′ and an inner shell D^2, having a contracted port d and a thimble d' in the end of the outer shell to retain the inner shell in place.

The oil is discharged by means presently to be described directly into the working cylinder and upon or against a dash-plate d^2, which is formed independently of the cylinder-head D and is secured thereto by a bolt or screw, whereby the dash-plate is to some extent insulated from the head, so that the heat of the dash-plate is not as quickly conveyed to the head. The dash-plate while the engine is running is consequently kept at a temperature that will vaporize the oil as it strikes it, and the head is kept relatively cool, so that a higher degree of compression is attained. At the same instant that the vaporization of the oil takes place the blast of air from the port a, directed by the deflector b, strikes the oil-spray and carries it on in its circulation through the working cylinder, and a thorough and uniform mixture of the vapor with the air is effected. The mixture so formed is much more thorough than it would be possible to produce in a chamber separate from the cylinder, and the power developed is correspondingly greater. Furthermore, in the present engine the vapor is first formed, then made to circulate and mix with the air to form the explosive mixture, and finally the explosive mixture is compressed, and so brought into contact with the igniter, whereby the instant of ignition is delayed appreciably, whereas heretofore, as described in Letters Patent of the United States No. 592,034, the spray was blown directly upon the igniter. It will be observed also that as the igniter itself is protected from any blast of air that might cool it it is kept at the proper temperature for ignition, whereby the engine is enabled to run without load continuously. The igniter is protected externally by a supplementary shell E, through which a lamp can be applied to the igniter in starting up the engine. It will be understood that the engine becomes self-igniting after it is once started in operation.

It is highly desirable that the dash-plate be placed above the igniter—that is, between the oil-injector and the igniter—as it is found that when the dash-plate is so placed the igniter does not fill with carbon, as it does when the dash-plate is placed below the mouth of the igniter.

The oil, which forms the basis of the explosive mixture, is injected into the cylinder through a nipple H, which is located in the cylinder-wall near the cylinder-head, so that the oil shall be discharged upon or against the dash-plate d^2, previously referred to. As clearly shown in Fig. 2, there is in the extremity of the nipple a plug h, having a narrow orifice, and back of this plug is a check-valve h'. Any suitable means may be employed for feeding the oil. As shown in the drawings, the nipple H is connected with a cylinder g, in which reciprocates a plunger G, operated from the crank-shaft. The oil is supplied to the cylinder from a reservoir G′ through a port guarded by a valve g', opening toward the cylinder. The end of the supply-pipe within the reservoir may be perforated and wrapped with a filter-cloth, as shown in the drawings. The outlet-port is also provided with a valve g^2, opening from the cylinder. This arrangement insures regularity of feed and the delivery of a uniform quantity of oil at each operation. Suitable means for operating the plunger G are represented in the drawings. A spring g^3, confined between a nut or shoulder g^4 on the plunger and a loose stuffing-box g^5, acts to move the plunger backward after its forward movement and to keep the packing around the plunger at all times under proper pressure. At its rear end the plunger has pivoted thereon a tongue f, with a sharp edge f', disposed in a horizontal plane. The shaft C carries a pinion C′, which meshes with a gear C^2, having twice the number of teeth. A crank-pin c on the gear C^2 is connected by a lever c' with a screw-threaded shaft c^2, which carries a flat-faced nut c^3 to bear upon an incline c^4. The latter consists of a bar pivoted at one end and resting at the other end upon a spring c^5, encircling a stud c^6. A thumb-nut on the stud above the bar serves to compress the spring and to adjust the incline as required. When the engine is running at a normal speed, the notched end of the rod c^2 will strike the tongue f and operate the plunger to feed the proper quantity of oil for the next explosion; but when the engine is running too fast the momentum of the rod and nut as the latter travels up the incline will throw the end of the rod c^2 above the end of the tongue f, and the plunger will therefore be unaffected. It will be observed that through the described gearing the pump-plunger is operated only at every other revolution of the crank-shaft. Consequently the oil is supplied only at every other revolution, and no explosion takes place during the alternate revolution; but the working cylinder is then filled with a scavenging charge of air, which drives out the dead gases remaining from the previous explosion, so that the next charge shall not be diluted and weakened by the admixture of such dead gases therewith.

The mode of operation of the engine described above will be readily understood without further explanation herein. The advan-

tages derived from the employment of the various features of improvement will also be obvious in view of what has been stated already as to the object and mode of operation of the several features.

I claim as my invention—

1. In an explosive-engine, the combination with a cylinder and piston, a cylinder-head having a substantially plane face, a tubular igniter carried by the cylinder-head, a compression-chamber in front of the piston and an air-duct from said compression-chamber having a port opened by the piston at the forward limit of its stroke, said cylinder having an exhaust-port also opened by the piston at the forward limit of its stroke, of an oil-injector located in the wall of the cylinder, a separate dash-plate secured on the cylinder-head within the cylinder against which the oil is discharged by the injector, and means to direct the current of air from the port when opened upon said dash-plate, whereby the dash-plate is maintained at a vaporizing temperature and the vapor is carried away from said dash-plate as formed and made to circulate in the cylinder and is thoroughly mixed with air.

2. In an explosive-engine, the combination with a cylinder and piston, a tubular igniter carried by the cylinder-head, a compression-chamber in front of the piston and an air-duct from said compression-chamber having a port opened by the piston at the forward limit of its stroke, said cylinder having an exhaust-port also opened by the piston at the forward limit of its stroke, of an oil-injector located in the wall of the cylinder, a separate dash-plate secured on the cylinder-head within the cylinder and between the igniter and the injector, and means to direct the current of air from the port when opened upon said dash-plate.

This specification signed and witnessed this 28th day of October, A. D. 1898.

C. W. WEISS.

In presence of—
W. B. GREELEY,
F. M. EGGLESTON.