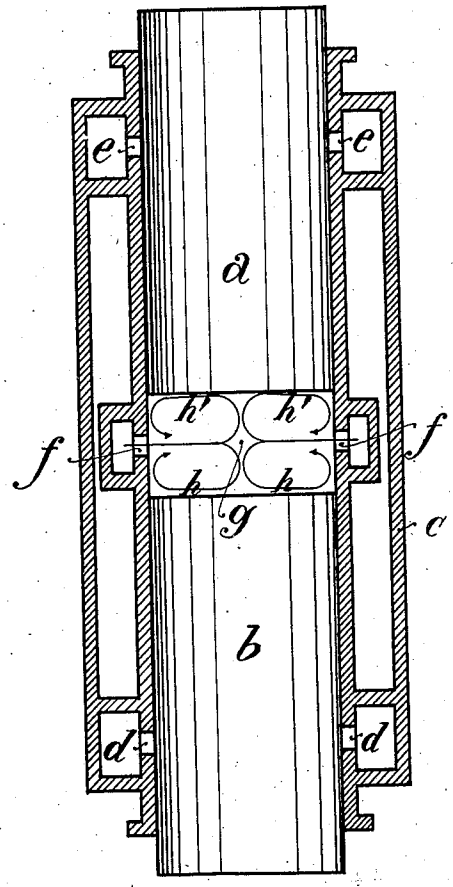
G. SCHIMMING.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED NOV. 8, 1909.

968,695. Patented Aug. 30, 1910.



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UNITED STATES PATENT OFFICE.

GEORG SCHIMMING, OF BERLIN, GERMANY.

INTERNAL-COMBUSTION ENGINE.

968,695. Specification of Letters Patent. Patented Aug. 30, 1910.

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To all whom it may concern:

Be it known that I, GEORG SCHIMMING, subject of the German Emperor, residing at Berlin, in the Empire of Germany, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

Internal combustion engines with pistons working in opposite directions are known, in which the introduction of the combustible takes place at the inner deadpoint followed by the expansion of the ignited combustible. In these internal combustion engines liquid combustibles are employed and the sprayed and ignited oil is injected between the pistons from one point of the cylinder wall, so that the burning jet is conveyed against the opposite cylinder wall, there diverted to both sides and thrown back approximately to the place at which it is injected. This method can be carried out with liquid combustibles, because, from the jet of finely sprayed oil, which is burning through the entire mass of the jet, burning oil is separated immediately on the wall the jet impinges on and burned there by reason of the very high temperature of the impinging jet, and thus no substantial "after burning" takes place (provided the oil be completely combustible without the compression space becoming heated.) In carrying out the same method in internal combustion engines, which are fed with gaseous fuel, very considerable disadvantages result, because as soon as a gas flame is cooled below the temperature of ignition, rapid re-ignition and complete combustion is extremely difficult, as is sufficiently well known with boiler furnaces. In the gas flame jet there is no protective covering formed over the cylinder walls, which, in the case of oil injection, is formed by the very thin burning oil layer. More particularly in the short time of the injection available for complete combustion, the re-ignition of the portion of the gas flame jet which has been cooled below the temperature of ignition, is also no longer possible. In the just mentioned injection of gas an after burning therefore takes place during the expansion and in some cases even during the exhaust.

Now internal combustion engines with one piston which are operated with oil injection are also known (*Zeitschrift des Vereins Deutscher Ingenieure*, Vol. 51, Page IIII), in which the introduction of the combustible takes place from the inner deadpoint, and in which the injected sprayed jets are conducted in such a way against one another, that they meet in the middle of the cylinder and the resultant flame is deflected firstly against the piston and secondly against the cylinder cover. This last deflection is, however, very deleterious even for the combustion of oil spray. The portion of the flame which is thrown against the piston is, as experience has shown, but little cooled, so that in all machines, which work like the Diesel motor for instance, the oil jet is injected directly against the piston. On the other hand, even in the case of oil spray, in which a perfectly complete mixture between air and combustible may be produced within a very short time, the combustion is so impaired by the cylinder cover that it is necessary to coat the cover in the interior of the combustion chamber with sheet metal or the covers must be directly heated externally. In gas jets this action is still more unfavorable; here by the presence of the cylinder cover cooling beneath the ignition point takes place, and thereby "after burning" takes place during the expansion, and, in some cases, the exhaust stroke. The action of the cooled cylinder cover in gas injections is so great, that even if the gas jet be first directed against the piston, and consequently only encounters the cover in the second or third place, "after burning" cannot be avoided.

In order to avoid "after burning" by the cooling of the gas flame jets in internal combustion engines operated by gas, which work with injection of the gas or gaseous mixture from the inner deadpoint, recourse is had in this invention to a combination of an engine with pistons working in opposite directions and the injection of gas jets placed opposite one another. The following advantages are thereby obtained:—

1. The gas jets encountering one another in the middle of the cylinder are deflected against the pistons, that is to say, against surfaces which, as experience has shown, produce the least cooling, and the surest maintenance of the combustion.

2. The longer the injection operation proceeds, the more the two pistons move away from the center of the flames, and therefore even the small cooling action of the pistons

is further diminished, while with single pistons and lateral injection at places facing one another, the flame remains constantly in direct proximity to the cooling cylinder cover.

A machine which works according to this method is shown in the accompanying drawings; *a* and *b* are the two pistons moving in opposite directions in the cylinder *c*. The gas or gaseous mixture is injected through the apertures *f* from the inner deadpoint (commencement of the working stroke). The flames meet one another in the flame center *g* and are then deflected against the two laterally separating pistons in eddies *h* and *h'*. On the conclusion of the injection period the expansion takes place, at the conclusion of which the expanded gases of combustion escape through the apertures *d* and are scavenged by the air entering at *e*.

Instead of causing the machine to work in a two-stroke cycle, it may also work in four-stroke, thus instead of having the apertures *d* and *e*, inlet and outlet valves could be provided in the cylinder and in the plane of the gas injection apertures *f*.

I declare that what I claim is:—

1. A gas operated internal combustion engine, comprising a cylinder with pistons working in opposite directions, and gas inlet ports at the inner dead point of the cylinder so arranged that the ignited fuel forms flames striking against each other and the separating pistons.

2. In a gas operated internal combustion engine, means for preventing after burning of the ignited charge comprising gas inlet ports at the inner dead point of the cylinder so arranged that the ignited fuel forms flames striking against each other and the separating pistons.

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

GEORG SCHIMMING.

Witnesses:

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