No. 886,846. PATENTED MAY 5, 1908.

K. NICOLL.

EXPLOSIVE ENGINE.

APPLICATION FILED MAY 31, 1906.

2 SHEETS—SHEET 1.

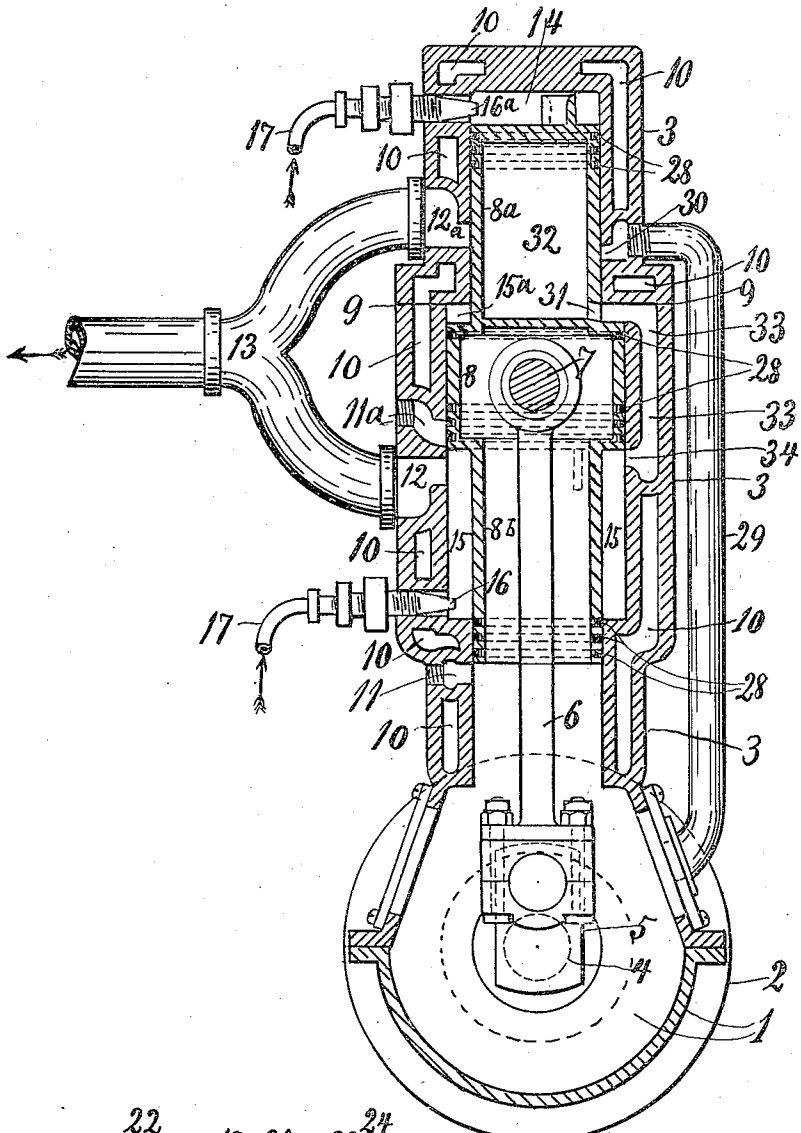


FIG. 1.

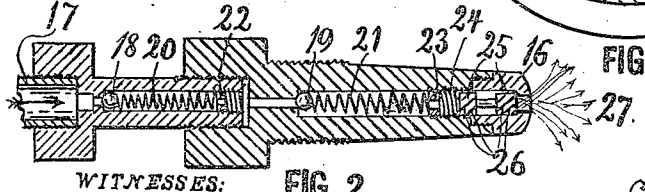


FIG. 2.

WITNESSES:

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C. C. Carlsen.

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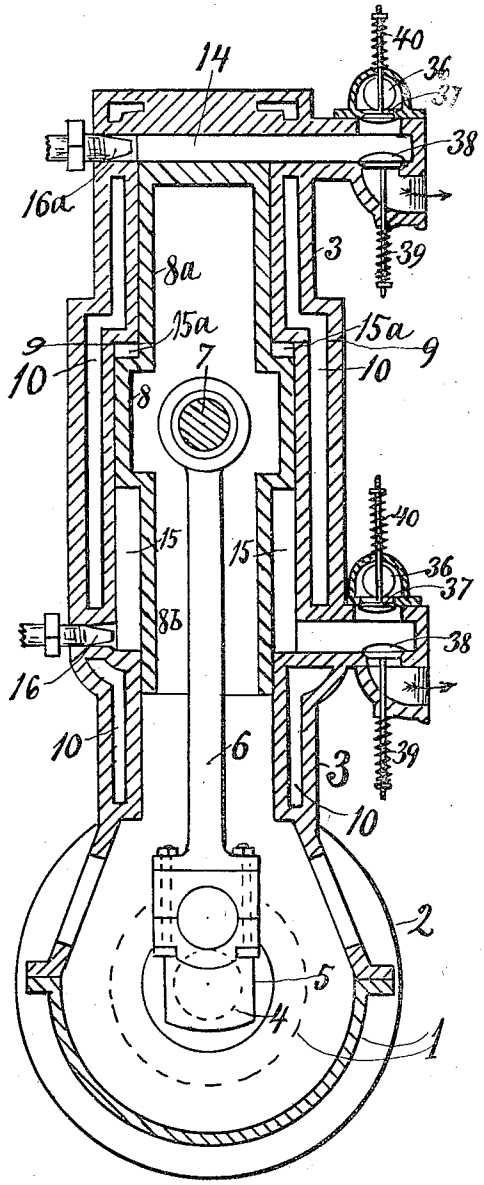


FIG. 3.

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UNITED STATES PATENT OFFICE.

KONRAD NICOLL, OF MENOMONIE, WISCONSIN.

EXPLOSIVE-ENGINE.

No. 886,846. Specification of Letters Patent. Patented May 5, 1908.

Application filed May 31, 1906. Serial No. 319,415.

To all whom it may concern:

Be it known that I, KONRAD NICOLL, a subject of the King of Norway, residing at Menomonie, in the county of Dunn and State of Wisconsin, have invented certain new and useful Improvements in Explosive-Engines; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to explosive engines; and the object is to provide an explosive engine with double-acting pistons, and several advantages, which will be fully understood from the below specification and claims, reference being had to the accompanying drawing in which—

Figure 1 is a vertical substantially central sectional view of my invention looking in longitudinal direction of the crank shaft. Fig. 2 is a longitudinal central section of one of the inlet valves or nozzles which admit the explosive fluid into the cylinder. Fig. 3 is a modification of Fig. 1 with some parts added.

The type of engine shown is especially adapted for use on motor cycles and automobiles, but it is not my desire or intention to confine the invention to such use only; and while in the drawing only one cylinder, pitman and crank is used to illustrate the new features and characteristics of my engine, it should be understood that I do not only reserve the right to use a multiple crank shaft and several cylinders, but the last mentioned well known features belong to the most effective type of my engine.

Referring to the drawing by reference numerals, the crank chamber 1 may be considered as the frame of the engine. Upon said frame is mounted the cylinder 3 of the engine; and in the frame is journaled the crank-shaft 4, whose crank 5 and fly wheel 2 are turned by the pitman 6 pivoted at 7 in the enlarged middle portion 8 of the cylindrical piston 8, 8^a, 8^b.

The cylinder may be made in one piece and integral with the frame 1, but it may preferably be separable at the line 9 or any other suitable point whereby the manufacturing is facilitated.

10 represents space for the circulation of water to keep the cylinder cool.

In Fig. 1, 11 and 11^a are inlet ports for fresh air, while 12 and 12^a are exhaust ports for the foul gas after explosion to pass out and escape through the pipe 13 when driven by air pressure, as will presently be fully described. The gasolene or other explosive used is introduced into the chambers 14 and 15 of the cylinder through the nozzles 16 and 16^a from pipes 17, which are connected with a suitable pump (not shown) operated from the crank shaft 4 in any suitable manner. Said nozzles 16 and 16^a being of the same construction the view Fig. 2 illustrates either or both of them. In said view it will be seen that two ball-valves 18 and 19 are held by the springs 20 and 21, which are supported by internal collars 22, 23, against their respective valve seats, and thus close in two places the inlet of the oil. The inlet is further closed by the end 24 of the elongated cylindrical valve 25, shown in side view in Fig. 2, where it will be seen that it is provided upon its cylindrical surface with spiral grooves 26, which cause the gasolene or other oil to spray or almost atomize, as indicated by the arrows 27, and thus to mix with the air and turn into inflammable gas the moment it gets into the cylinder. As the explosion takes place the valve 25 is forced by the pressure of the explosion against the collar 23, whose central opening is thereby closed, said closing, together with that of the ball valves, cut off effectively the fire from entering the pump and oil supply. As soon as the explosion is over the usual suction in the cylinder, or the force of the pump already referred to, or both the pump and the suction, cause the valves 18, 19 and 25 to open and let in the next charge of explosive.

Turning again to Fig. 1 it will be seen that the piston is much in the shape of a hollow plunger having packing rings 28 near its ends and also in the enlarged middle portion 8, and that the latter moves up and down in the enlarged middle portion of the cylinder, where it performs several functions, as will appear from the following description of the operation. The piston having ascended to the upper position shown in Fig. 1, compressing gas above it and drawing the crank chamber 1 full of fresh air through port 11, an electric spark (produced by means not

shown, as they are common in explosive engines) is applied to the compressed gas, and the explosion drives the piston downward, shutting port 11 and compressing the air in the crank chamber, when the compressed air rushes out of the upper end of the pipe 29 and through the ports 30 and 12ª, carrying with it the foul gas from the chamber 14 and driving it out through the pipe 13. 31 is a deflector on the top of the piston to cause the air current to spread and take with it the gas. While the piston is in this lower position fresh air rushes in through the port 11ª and fills the space 15ª. An explosion in the chamber 15 now drives the piston upward, thereby closing the port 11ª and forcing air from the chamber 15ª through the port 31, compressing it into the chamber 32 in the upper end of the piston until the piston reaches its upper position, when the compressed air in the chamber or room 32 escapes through port 31, duct 33, ports 34 and 12, carrying with it the dead gas from the cylinder portion 15 into the exhaust pipe 13; the compressed gas in chamber 14 is now exploded again, and so on as long as the engine is in motion.

From the above description it will be seen that my engine has its piston actuated in both directions by explosions, whereby, especially when two or more cylinders and cranks are used, the shaft will be turned by so constant pressure that a heavy fly-wheel need not be carried, and the engine is practically self-starting.

In Fig. 3 is illustrated one of the numerous forms of explosive engines for which my invention is equally well adapted. Such forms being too many to here illustrate I have shown this one as an example by which the others may be understood. In this view the nozzles 16, 16ª which are only partly shown, may be used, but they may also be dispensed with by letting in the explosive through the ports 36 and suction valves 37. In this type of engine 38 represent exhaust valves normally held closed by springs 39, which are stiffer than the springs 40 on the suction valves. The exhaust valves are at proper times opened by a suitable mechanism, usually consisting of a revolving shaft with a cam acting directly or indirectly on the end of the valve-stem; and gear wheels meshed together and secured one on the cam shaft and the other on the shaft of the engine; the gears being of the required difference in diameter to make the cam open the valve or valves alternately at every stroke, every other stroke, &c., as may be desired for two cycle, four cycle or six cycle, &c., types of the engines.

From the above it will be understood that the principal features of my engine are equally as well applicable to all forms of explosive engines. And that the explosives used, and the means of igniting the same, may be of any suitable kind, now known or hereafter to become known; including all explosive gases, such as natural gas, coal gas or any other explosive gas, or liquid or vapor which, mixed with air or not, will produce a gas capable of explosion and ignition by an electric spark. And I may ignite the gas by electric spark, hot tube, hot ball and any other suitable means:

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is:—

1. In an explosion engine, the combination of a piston cylinder, and a piston open at one end and having a laterally projecting shoulder portion forming with the cylinder an explosion chamber intermediate such shoulder and the open end of the piston, said piston being hollow and open from its open end inward to a point beyond the end of said explosion chamber.

2. In an explosion engine, the combination of a piston cylinder, a piston open at one end and having a projecting peripheral shoulder portion forming with the cylinder an explosion chamber intermediate such shoulder and the open end of the piston, said piston being hollow and open from its open end inward to a point past the end of said explosion chamber, and a pitman connected with the piston and extending out through the open end thereof.

3. In an explosion engine, the combination of a casing provided with a piston cylinder portion, a crank-shaft mounted in the casing, a piston mounted in the cylinder and provided with a hollow open end portion in the direction of the shaft and forming with the casing a compression chamber into which the shaft extends, a peripheral projecting shoulder portion or enlargement upon and intermediate the ends of the piston forming an explosion chamber between such shoulder and the open end of the piston and encircling a portion of the peripheral surface of the piston, and a pitman extending into a portion of the piston which is encircled by said explosion chamber and into the compression chamber portion of the casing and connected with the shaft and piston.

4. In an explosion engine, the combination of a piston cylinder, and a piston having an open end and a laterally projecting shoulder portion forming with the cylinder an explosion chamber which encircles a portion of the piston, the piston being hollow throughout that portion which is encircled by said explosion chamber and having an end wall which with the cylinder forms an explosion chamber at the opposite end of the piston, all of said elements being so constructed and arranged as to enable the piston to be actuated in opposite directions by the expansion of fluid in said explosion chambers alternately.

and a pitman pivotally connected with the piston and having a laterally reciprocating portion extending through the open end thereof.

5. In an explosion engine, the combination of a casing forming a compression chamber and piston cylinder, a hollow piston mounted in the cylinder and having an open end and a closed end, the closed end forming with the cylinder an explosion chamber adapted to enable the piston to be actuated in one direction; said piston having a laterally projecting enlarged or shoulder portion forming with the cylinder an explosion chamber which encircles a portion of the piston between said shoulder and the open end of the piston, a shaft extending into the compression chamber formed by the casing and the open hollow portion of the piston, and a pitman mounted in the compression chamber and extending into the hollow portion of the piston and connected with the piston and shaft respectively.

6. In an explosion engine, the combination of a casing provided with a compression chamber and forming a piston cylinder having relatively large central and small end chamber portions, a piston mounted in the cylinder and having an open end and a closed end, and an inner wall forming a chamber in one end of the piston having an opening for admitting and discharging air, said piston also having a projecting peripheral or shoulder portion forming with the cylinder an explosion chamber which is adapted to communicate with the air chamber in the closed end of the piston when said piston is in one position and to communicate with the explosion chamber near the open end of the piston when said piston is in a different position, the casing being provided with a passage leading from the compression chamber adjacent to the open end of the piston to the explosion chamber at the opposite end of the piston and with outlet passages leading from said explosion chambers, all of said passages being adapted to be opened and closed as required by the piston, and a pitman connected with the piston and adapted to be operated thereby.

7. In an explosion engine, the combination of a cylinder, and a piston mounted in the cylinder and forming in connection therewith a plurality of explosion chambers and a plurality of compression chambers having passages adapted to connect each explosion chamber with a compression chamber, the piston being adapted to open and close each of such passages and provide and prevent communication between the respective chambers without the use of valves.

8. In an explosion engine, the combination of a piston cylinder, and a hollow piston open at one end and having a laterally projecting enlarged or shoulder portion forming with the cylinder an explosion chamber which encircles a peripheral portion of the piston between said shoulder and the open end of the piston, and connecting rod mechanism extending through the open end of the piston and through and inward beyond the portion of the piston which is encircled by said explosion chamber and pivotally connected with the piston.

9. In an explosion engine, the combination of a casing provided with a compression chamber having an air inlet, said casing also forming a piston cylinder, a piston mounted in the cylinder and forming with the cylinder an explosion chamber having an air passage communicating with the compression chamber, said piston having an open end and hollow axial portion or chamber communicating with the compression chamber, and connecting rod mechanism mounted in the compression chamber and extending into the hollow axial portion of and pivotally connected with the piston.

10. In an explosion engine, the combination of a casing forming a piston cylinder, and a piston having an open end and an axial opening and forming in connection with the cylinder a plurality of explosion chambers adapted to enable the piston to be actuated in opposite directions by the explosion or expansion of actuating fluid in said explosion chambers alternately, and a pitman pivotally connected with the piston on the inside of its axial opening and extending out through the open end of the piston in position to admit air into the portion of the piston with which the pitman rod is connected for cooling the parts.

11. In an explosion engine, the combination of a cylinder forming a piston chamber having relatively large central and small end portions, a hollow piston having an open and a closed end and a relatively large central portion fitting in a transverse direction the enlarged central portion of the piston chamber or cylinder, the closed end of the piston forming in connection with the cylinder an explosion chamber for actuating the piston in one direction and the enlarged central portion of the piston forming with the cylinder a peripheral explosion chamber for actuating the piston in the opposite direction, means for introducing and igniting an explosive substance in said chambers alternately, and a connecting rod extending through the open end of and pivotally connected with the piston.

12. In an explosion engine, the combination of a casing provided with a cylinder portion forming a piston chamber having relatively large central and small end portions, said casing having a hollow end portion forming a compression chamber, a hollow piston having an open end and a closed end and a relatively large central peripheral portion

or shoulder fitting in a transverse direction the enlarged central portion of the piston chamber, the closed end of the piston forming in connection with the cylinder an explosion chamber for actuating the piston in one direction, and the enlarged peripheral portion forming with the cylinder a peripheral explosion chamber for actuating the piston in the opposite direction, said enlarged peripheral portion of the piston also forming in connection with the cylinder a peripheral compression chamber adapted to communicate with a hollow compression chamber portion inside of the piston and with the peripheral explosion chamber respectively, an inner partition wall forming a partition between the open and closed end portions of the piston, and the casing being provided with a passage adapted to connect the compression chamber at the open end of the piston with the explosion chamber at the closed end of the piston, the compression chambers having air inlet passages, and the explosion chambers having outlet passages, and the piston being adapted to open and close each of said passages as required.

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

KONRAD NICOLL.

Witnesses:
W. S. SWENSON,
JENNIE M. BRACKETT.