No. 809,841. PATENTED JAN. 9, 1906.

G. PETZEL.

EXPLOSION ENGINE.

APPLICATION FILED APR. 18, 1904.

3 SHEETS—SHEET 1.

Fig. 1.

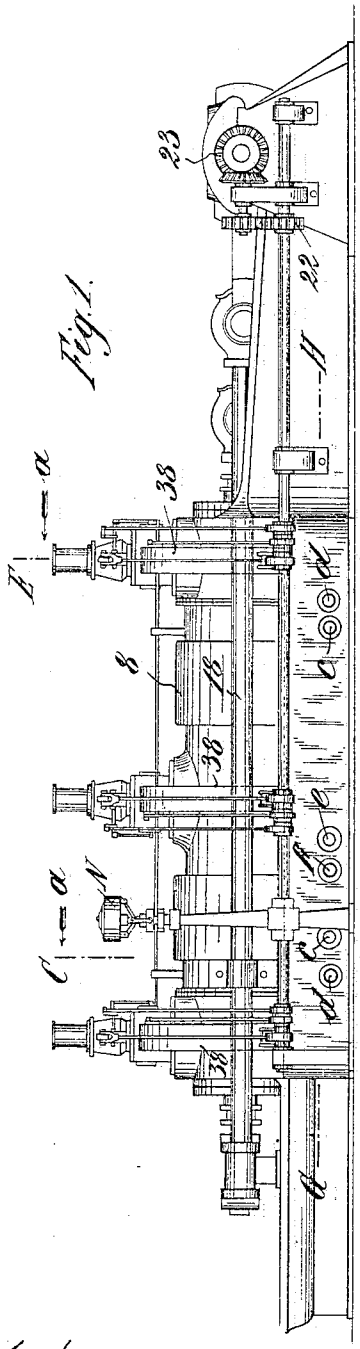
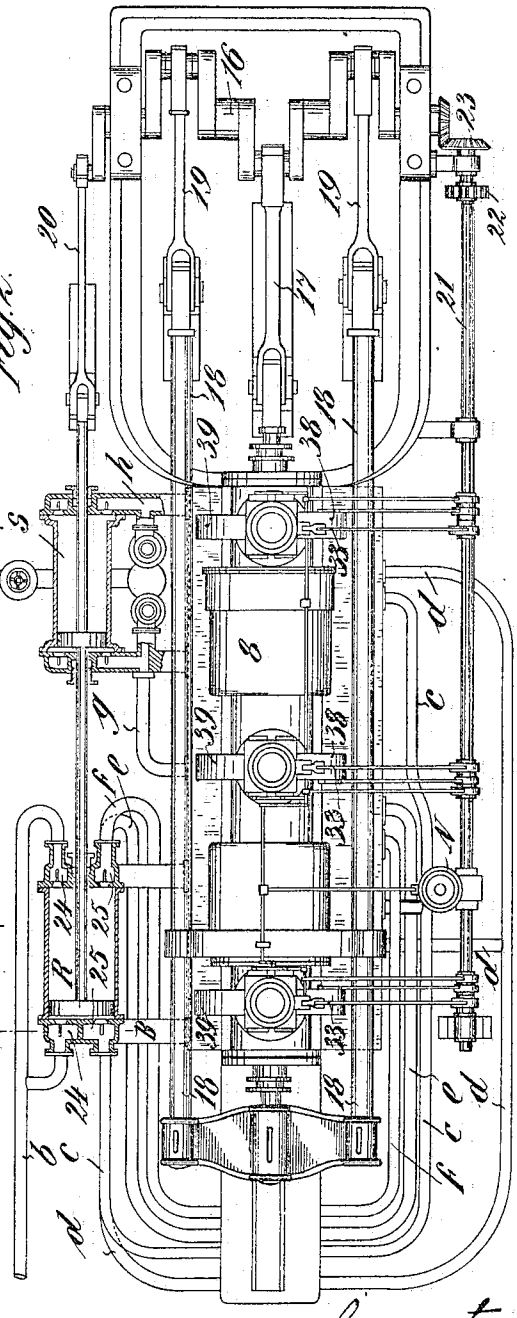


Fig. 2.



Witnesses.

C. Knight, Jr.

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Gustav Petzel

By Knight Bros. Attys.

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3 SHEETS—SHEET 2.

Fig. 3.

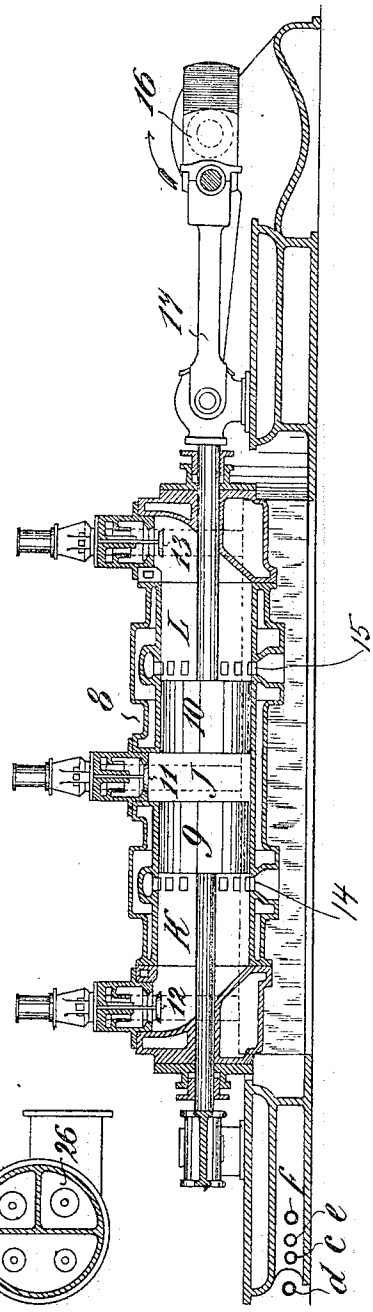


Fig. 4.

Witnesses.

C. Knight, Jr.

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EXPLOSION ENGINE.

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3 SHEETS—SHEET 3.

Fig. 5

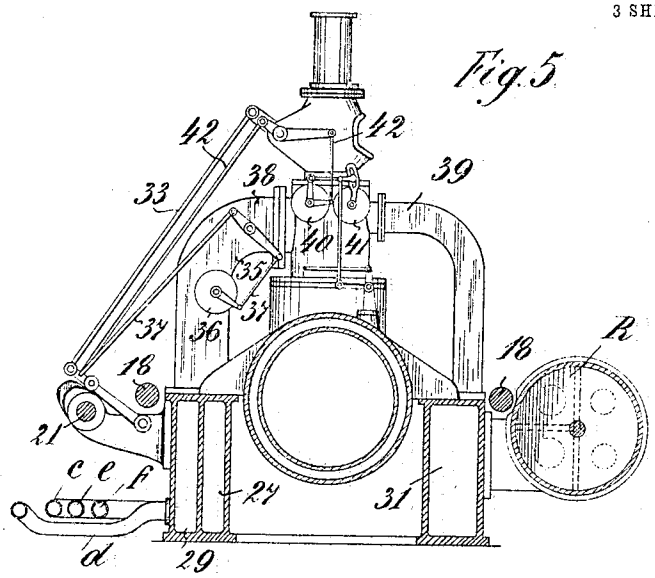


Fig. 6.

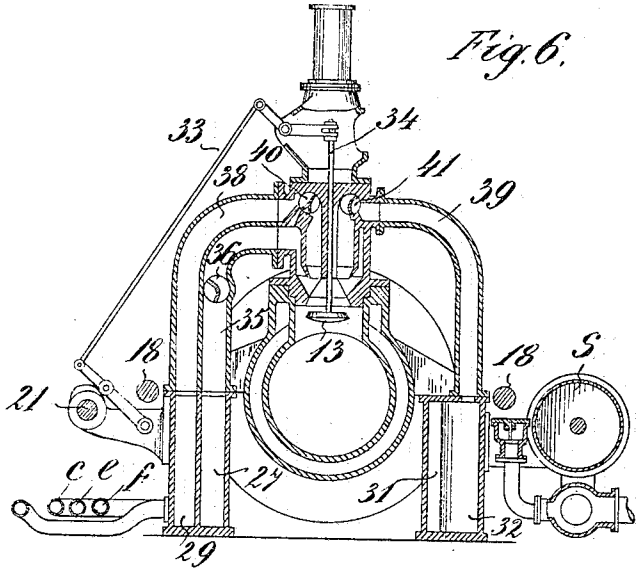
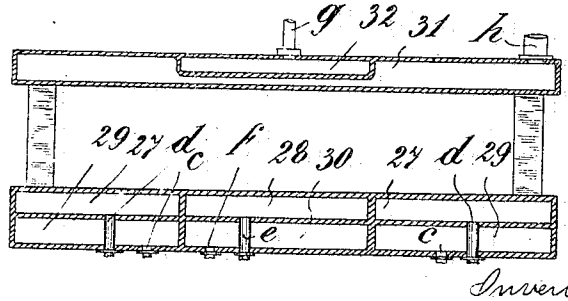


Fig. 7.



Witnesses.

O. Knight Jr.

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UNITED STATES PATENT OFFICE.

GUSTAV PETZEL, OF TEGEL, GERMANY.

EXPLOSION-ENGINE.

No. 809,841. Specification of Letters Patent. Patented Jan. 9, 1906.

Application filed April 18, 1904. Serial No. 203,673.

To all whom it may concern:

Be it known that I, GUSTAV PETZEL, engineer, a subject of the German Emperor, residing at No. 12ª Schönebergerstrasse, Tegel, near Berlin, in the Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Explosion-Engines, of which the following is a specification.

This invention relates to improvements in two-cycle explosion-engines having a plurality of pistons working in opposite directions. In the engines of this kind hitherto known one of the pistons moves the explosive mixture to the place of ignition. When working at high rates of speed, this movement produces a too fine distribution of the gas mixture in the cylinder, and this has the disadvantage of rendering the mixture difficult to ignite. This disadvantage is removed by the present invention, according to which the supply of the scavenging air and the gas mixture does not take place at one end of the cylinder-space between the pistons, but at the center of the said space, so that the said air and the gas are equally distributed toward both sides, and the cylinder-space is effectually scavenged, the gas being compressed again toward the center and ignited at the place of supply, where it is richest. The exhaust-ports are so arranged that if the engine has two pistons working in opposite directions and is double-acting both the central chamber and the end chambers are utilized.

One form of the invention is illustrated as an example in the annexed drawings, in which—

Figure 1 is a side view; Fig. 2, a plan view, partly in section; Fig. 3, a longitudinal section, and Fig. 4 a cross-section on the line A B of Fig. 2 on an enlarged scale. Figs. 5 and 6 are enlarged cross-sections on the lines C D and E F, respectively, of Fig. 1 seen in the direction of the arrows *a*. Fig. 7 is a horizontal section on the line G H of Fig. 1.

As shown in Fig. 3, the cylinder 8 contains two pistons 9 and 10, so that three working chambers J, K, and L are produced. The supply of scavenging air and mixture takes place through the valves 11, 12, and 13. The exhaust-ports 14 and 15 are arranged between the chambers J and K and J and L, respectively, so that the gases of combustion from the chamber K are exhausted through the port 14, those from the chamber L through the port 15, and those from the chamber J through both the said ports. The piston 10 is connected to the crank-shaft 16 by means of the connecting-rod 17, and the piston 9 is connected to said shaft by means of the rods 18 18 and 19 19.

The supply of air for scavenging and for the mixture is effected by means of the pump R, which has at each end three valve-boxes 24, 25, and 26, as shown in Figs. 2 and 4. The valve-boxes 24 communicate with the supply-pipe *b* and the valve-boxes 25 and 26 with the separate pipes *c*, *d*, *e*, and *f*. At the side of the cylinder air and gas chambers are provided, scavenging air being supplied through the pipe *d* to the chambers 27 and through the pipe *e* to the central chamber 28, and air for the mixture being supplied through the pipe *c* to the chambers 29 and 30. The gas is supplied by means of a pump S, communicating with the gas-chamber 31 by means of the pipe *h* and with the gas-chamber 32 by means of a pipe *g*. When the exhaust has taken place through the ports 14 and 15 and the pistons are in the position shown in Fig. 3, the valves 12 and 13 are opened by means of the cam-shaft 21 and rods 33 and 34, and the valves 36 in the scavenger-air ducts 35 are opened by means of the said cam-shaft and the rod 37, so that the air inclosed in the chambers 27 enters the cylinder-chambers K and L and scavenges same. When the pistons begin to move outward and during the further rotation of the cam-shaft 21, the valves 36 are closed and the valves 40 and 41 of the ducts 38 and 39 for the air for combustion and gas, respectively, are opened by means of the rods 42, so that air and gas can enter the chambers K and L through the valves 12 and 13. When this has taken place, the valves 12 and 13 are closed and the mixture is compressed by the outward movement of the pistons and ignited when the latter are at their dead-points. When the pistons are in their outermost positions, the gases of combustion in the chamber J are exhausted in both directions through the ports 14 and 15. Thereupon the valve 11 is opened by means of the cam-shaft 21 and a suitable system of rods and allows scavenging air from the central chamber 28 to enter the chamber J and expel the rest of the gases of combustion. Then air for combustion enters the chamber J from the central chamber 30 and gas from the chamber 32, this air and gas being compressed when the pistons are moved together by the explosions in the

chambers K and L, while in the latter the above-described action is being repeated. The chamber J communicates with the compressed-air chambers 28 and 30 and the gas-chamber 32 by means of ducts similar to the ducts 35, 38, and 39 and also adapted to be closed by means of valves.

The opening of the gas-valves 41 can be controlled in the known manner by means of a governor N.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

The combination of the oppositely-moving pistons, a cylinder in which the oppositely-moving pistons work, having a working chamber at each end thereof, a working chamber between and common to both the pistons and exhausts, each common to one end working chamber and the middle working chamber and controlled by a piston, means simultaneously admitting an explosive mixture into the end working chambers, and means for admitting an explosive mixture between the pistons.

The foregoing specification signed at Berlin, Germany, this 19th day of March, 1904.

GUSTAV PETZEL.

In presence of—
HENRY HASPER,
WOLDEMAR HAUPT.