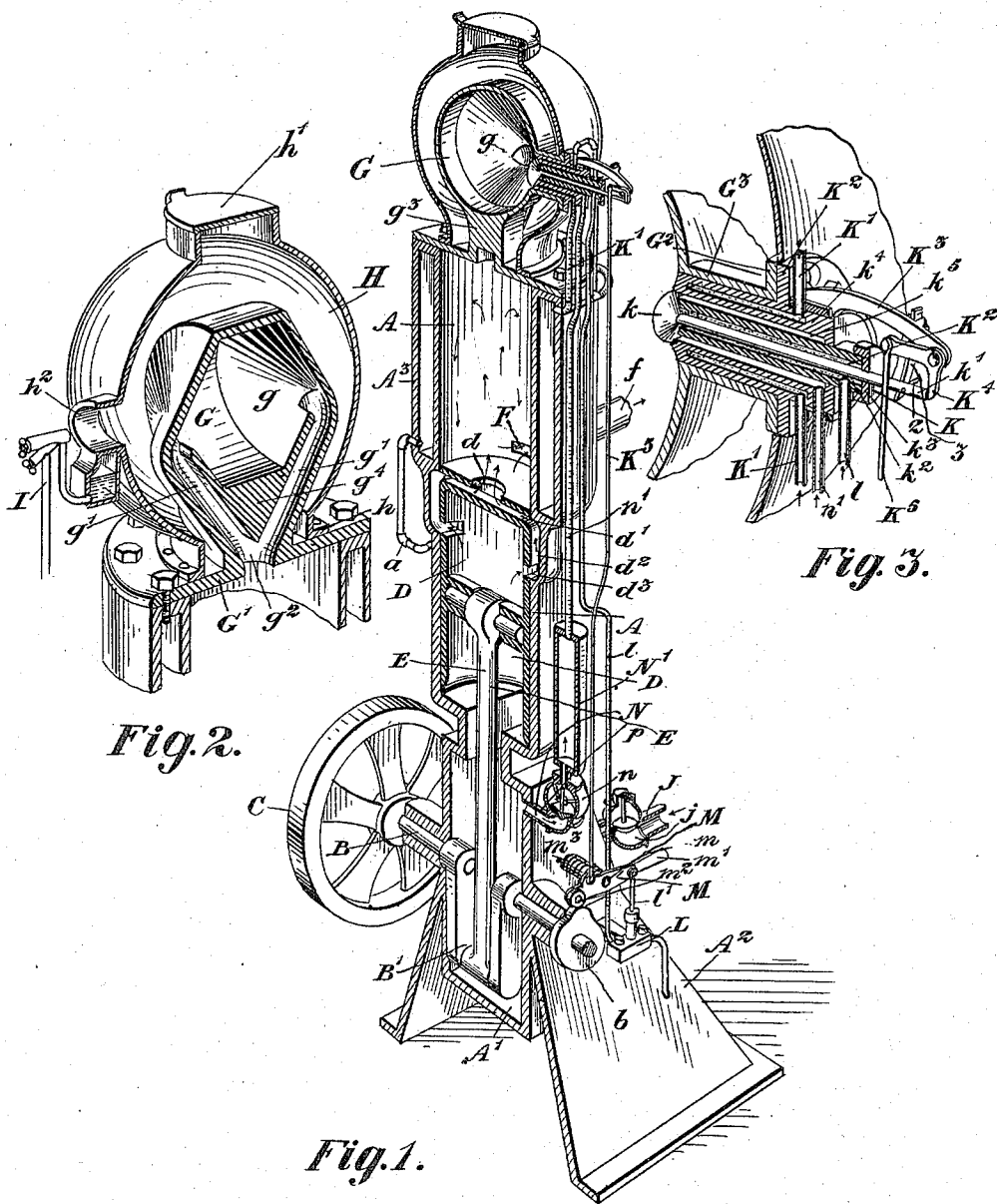


(No Model.)

D. BEST.
PETROLEUM ENGINE.

No. 580,446.

Patented Apr. 13, 1897.



Witnesses
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UNITED STATES PATENT OFFICE.

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PETROLEUM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 580,446, dated April 13, 1897.

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To all whom it may concern:

Be it known that I, DIXON BEST, machinist, of the town of Peterborough, in the county of Peterborough, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Petroleum-Engines, of which the following is the specification.

My invention relates to improvements in petroleum-engines; and the object of the invention is to improve the construction of this class of engine so that ordinary fuel-oil may be used and the explosion will take place rapidly and to the most advantage; and it consists of an exploder of peculiar construction, provided with side passage-ways leading into the top of the cylinder, such exploder being provided with a valve for the introduction of the oil and air and an outer shell to afford protection, the remaining coacting parts of the engine being constructed in the manner hereinafter more particularly explained.

Figure 1 is a sectional perspective view of a petroleum-engine constructed in accordance with my invention. Fig. 2 is an enlarged sectional detail of the exploder, the section being at right angles to that shown in Fig. 1. Fig. 3 is an enlarged detail of the oil and air supply valve for the exploder.

In the drawings like letters and numerals of reference indicate corresponding parts in each figure.

A is the cylinder, which is provided with an air-tight crank-pit A' and base-standard A², preferably forming part of the same.

B is the main shaft of the petroleum-engine, which is provided with a crank B', and C the fly-wheel.

D is a hollow piston, open at the bottom, and E the crank-rod, which is connected to the piston and crank, as shown. The piston D is provided with a central opening *d* and a lateral passage-way *d'* beneath the opening *d*.

*d*² are side passage-ways made in the cylinder, connecting the end of the passage-way *d'* with the ports *d*³ when the piston is down. The ports *d*³ are situated in the piston diametrically opposite each other.

F and *f* are the exhaust port and pipe, respectively, the top of the exhaust-port being slightly above the top of the piston D when the piston is at the end of the downstroke.

A³ is the ordinary water-jacket, which is provided with the supply-pipe *a*.

G is the exploder, the interior of which is cylindrical with conical ends *g*.

g' are passage-ways leading down the sides of the conical ends and joining at the bottom into one passage-way *g*² from each side of the shank *g*³. The tops of the passage-ways *g'* are situated at about the apex of the conical ends, and such passage-ways are separated by a V-shaped partition *g*⁴.

G' is the bottom flange-plate of the exploder, by which it is secured to the top of the cylinder A. To the outside of the exploder I provide a shell H, mostly spherical in form and having at the bottom a flange *h*, by which it is secured to the flange G' of the exploder. The shell H is provided with a hinged cap *h'*, which may be opened to moderate the heat.

In order to provide for the primary heating of the exploder before starting the engine, I provide an oil-burner I of any suitable form, the flame of which passes through the opening *h*² in the shell H.

The air is supplied into the crank-pit and cylinder through a pipe J, provided with a one-way valve *j*. (See Fig. 1.)

K is the oil-and-air valve, which is provided at the inner end with a tapered head *k*, as shown, the major portion of the valve being in the form of a stem *k'*. The stem *k'* fits within a hollow sleeve *k*² of interior diameter greater than the stem and provided with an end cap *k*³. Outside of the sleeve *k*² I provide a cylindrical water-jacket *k*⁴, which has an interior diameter greater than the exterior diameter of the sleeve *k*², so as to form an annular space *k*⁵ around the sleeve.

K² is a flange formed around the water-jacket and designed to form a means for securing it to the flange G², forming part of the hollow cylindrical boss G³, which itself forms a part of the exploder.

The water-jacket *k*⁴ is connected by the pipe K' to the water-jacket A³, and both water-jackets are designed to keep the cylinder and valve cool. The oil is supplied to the valve by a pump L, which is connected by the pipe *l* to the annular chamber *k*², formed around the valve rod or stem *k'*.

The valve and pump are connected together so that they will coact in the following man-

ner: b is a cam on the main shaft. M is a lever pivoted on the pin m , provided with a handle m' and pivotally connected to the pump-rod l' . m^2 is a friction-roller at the end of the lever, and m^3 is a spring encircling the pin m and fastened at one end to the base A^2 and having the other end extending over the lever M , so as to hold the friction-roller m^2 in frictional contact with the cam b .

K^3 is an arm extending outwardly from the end of the water-jacket k^4 .

K^4 is a bell-crank which is pivoted on the end of the arm K^3 . The inner end of the bell-crank is connected by a rod K^5 to the lever, as shown. The other end of the bell-crank normally abuts the end of the valve-stem k' .

2 is a pin which extends laterally from the valve-rod k' , and 3 is a flat spring which is secured on the arm K^3 . The normal tendency of the spring 3 is to press against the pin 2 and thereby force the valve k to its seat.

A small quantity of air is introduced with the oil, so as to atomize it and form a vapor by means of the pipe N , provided with a one-way valve n , cylinder N' , and pipe n' , leading to the chamber k^5 .

The operation of my engine is as follows:

To start the engine, the exploder G is externally heated by means of the oil-burner I . In Fig. 1 the piston is shown at the bottom of the stroke. The cylinder A above the piston is charged with air and the exploder with the oil-vapor, the air being supplied to the cylinder through the pipe J , crank-pit A' , hollow piston and ports d^3 , passage-ways $d^2 d'$, and central opening d . The fly-wheel is started, so as to throw the piston E upwardly, and in its ascent the ports F and d^3 are closed. As the piston ascends it compresses the air in the cylinder and forces it up into the exploder through the ports g' , penetrating the oil-vapor from both sides and thoroughly mixing the vapor with air, thereby forming an explosive mixture. When the piston reaches the end of the upward stroke, the explosion occurs. The firing of the oil-vapor at the proper moment, that is, when the piston is at the end of the compression stroke, is regulated by the form and capacity of the exploder. As the crank is crossing the lower outward center a charge of oil is forced into the exploder by means of the oil-pump L and atomized by means of the compressed air stored in the air-tank N' . During the downward movement of the piston it will of course be seen that the air in the cylinder below the piston and the air in the crank-pit would be forced up through the pipe N and valve n into the air-cylinder, where it remains under pressure and is utilized, as hereinbefore described. During the ascent of the piston it will of course be understood that the fresh supply of air is drawn into the crank-pit through the pipe J . The momentum of the fly-wheel causes the piston to ascend and compresses the fresh air supplied, as herein-

before stated, and the vapor mixture in the exploder is again fired automatically by the heat contained in the exploder, and consequently the reciprocating movement will be imparted to the piston.

It will of course be understood that continuous explosions keep up the necessary heat in the exploder, so that the oil-burner may be turned out after starting the engine. During the downward movement of the piston it will of course be understood that the burned gases will be discharged through the exhaust-port F ; but there will, however, be left a slight layer or cushion of burned gas below the bottom of the exhaust-pipe and above the piston E , which I find in practice as a non-conductor of heat has the effect of preventing the head of the piston from being corroded.

It will be seen from this description that the cycle of the engine is complete in one revolution. It will also be understood, although the oil-vapor or atomized oil when delivered in the heated exploder will not explode, that immediately the mixture of air and vapor is supplemented by the compressed fresh air from the cylinder such explosion will take place.

What I claim as my invention is—

1. The combination with a cylinder and piston, the piston rod and shaft and means for supplying the cylinder with fresh air above the piston, of an exploder secured to the head of the cylinder and provided with passage-ways leading into the top of the cylinder and an oil-supply valve located in the exploder, means for operating such valve and an annular chamber around the valve-stem connected to the interior of the exploder and an air-supply for such chamber connected to the interior of the cylinder as and for the purpose specified.

2. The combination with a cylinder and piston, of an exploder connected to the head thereof, the divided passage-way leading from the head of the piston into the exploder and a regulated oil-vapor valve for such exploder as and for the purpose specified.

3. The combination with a cylinder, of an exploder circular in interior cross-section provided with conical ends and having a lower flange by which it is secured to the end of the cylinder and a divided passage-way leading from the conical ends into the center of the head of the cylinder as and for the purpose specified.

4. In combination the crank-pit, the cylinder in communication therewith, side passages in the body of said cylinder, and the piston having a central opening in the head thereof and ports on the head in communication therewith leading to the exterior of said piston, and ports in the sides of said piston below the head thereof, the said side ports and head-ports being adapted to be simultaneously brought into communication with the opposite sides of the side passages in the cylinder, substantially as described.

5. The combination with the cylinder and piston, the piston rod and shaft, and means for supplying the cylinder with fresh air above the piston, of an exploder secured to the head of the cylinder and communicating therewith, a valve secured to the inner end of the valve-casing and having a stem extending through the casing, a pipe leading from such casing to a pump, a spring-operated lever connected to the rod of such pump, a cam on the main shaft coacting with such lever, an operating-rod connected to the lever and stem, and an annular chamber formed around the valve-casing, and a pipe connecting it to an air-cylinder, which is connected by pipe and valve to the crank-pit as and for the purpose specified.

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