A. A. JAHNKE.

EXPLOSIVE DRIVEN ENGINE.

APPLICATION FILED AUG. 25, 1908.

961,966. Patented June 21, 1910.

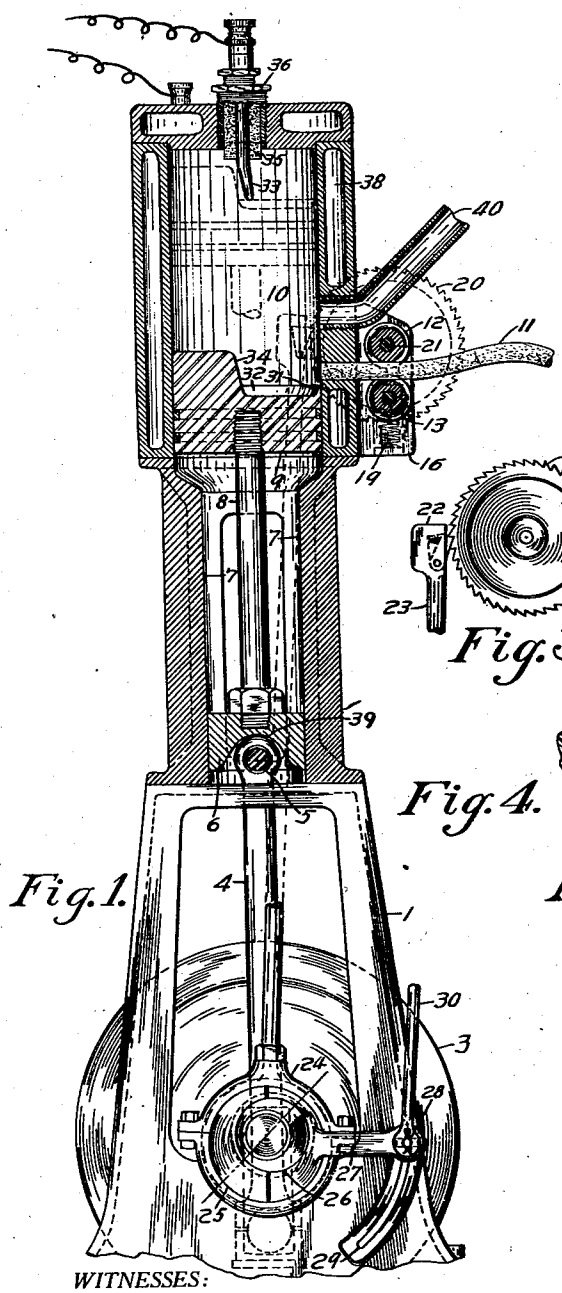

Fig. 1.

Fig. 3.

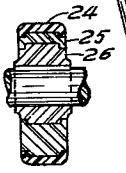

Fig. 4.

Fig. 2.

WITNESSES:

Earl S. Replogle.

Nellie R. Keating

INVENTOR.

A. A. Jahnke

BY

F. M. Wright

ATTORNEY.

UNITED STATES PATENT OFFICE.

ALBERT A. JAHNKE, OF OAKLAND, CALIFORNIA.

EXPLOSIVE-DRIVEN ENGINE.

961,966. Specification of Letters Patent. Patented June 21, 1910.

Application filed August 25, 1908. Serial No. 450,134.

To all whom it may concern:

Be it known that I, ALBERT A. JAHNKE, a citizen of the United States, residing at Oakland, in the county of Alameda and State of California, have invented new and useful Improvements in Explosive-Driven Engines, of which the following is a specification.

The present invention relates to explosive engines, the object of the invention being to provide an engine, the propulsive force of which is derived from re-actions of a self-contained explosive.

A further object of the invention is to provide an engine of this character which shall be comparatively cheap and simple in construction, dispensing with the use of valves, of great power in proportion to its size and weight and easy to regulate so as to develop more or less power as may be desired.

In the accompanying drawing, Figure 1 is a side view of my improved engine, the upper part being shown in vertical section; Fig. 2 is a side view at right angles to that shown in Fig. 1; Fig. 3 is a detail side view of the pawl and ratchet wheel; Fig. 4 is a sectional view through the eccentrics.

Referring to the drawing, 1 indicates a suitable base, in which are mounted the bearings of a crank shaft 2, upon which is secured a fly wheel 3. To said crank shaft is journaled a pitman 4, the upper end of which is connected by a cross pin 5 to a slide block 6 which slides in a guideway 7. Into said slide block is screwed the lower end of a piston rod 8, the upper end of which is screwed into a piston 9 which reciprocates in a working cylinder 10. Into the interior of said cylinder, there lead but two openings, one being provided for feeding explosive material, which, as shown, is fed in the form of a cord 11, although it may also be fed in the form of a thin tape, or sheet, or as a powder, or as a paste. The apparatus for feeding the explosive will suit the form in which the material is fed. When fed in the form of a cord, said cord is advanced by means of upper and lower rollers 12, 13, which may be roughened, if desired, said rollers being concaved at the center to provide bearing surfaces adapted to clamp or engage the cord 11 of explosive material and advance the same. In order to firmly clamp said cord between said rollers the lower roller has bearings 14, which can slide vertically in guideways 15 formed upon brackets 16 cast upon the casing of the cylinder 10, said bearings 14 being normally pressed upward by springs 19, so that the lower roller 13 is constantly pressed upward toward the upper roller and tends to clamp between said roller the cord or tape of explosive material, so that the latter is properly fed into the working cylinder. The lower roller is rotated only by friction with the cord as it is advanced, but the upper roller is positively rotated intermittently by means of a ratchet wheel 20 mounted upon the shaft 21 of the upper roller, which ratchet wheel is advanced intermittently by a spring-pressed pawl 22 carried upon the upper end of a rod 23 attached to an eccentric strap 24 and reciprocated by an eccentric 25 rotating with the crank shaft. Said eccentric 25 is not mounted directly upon the crank shaft, but upon an inner eccentric 26, which is itself fixedly secured upon the crank shaft, so as to rotate therewith. The object of this arrangement is to vary the amplitude of movement of the spring actuated pawl 22, and therefore also the amount of advance of the ratchet wheel. This is done by turning the outer eccentric 25 upon the inner eccentric 26, which turning movement is effected by means of an arm 27 attached to the outer eccentric and having a lug 28, sliding in a curved slot 29, said arm having a handle 30 by which it can be moved to any position. The outer and inner eccentrics thus form a compound eccentric, with variable eccentricity.

The parts are so arranged that the ratchet wheel is moved to advance the cord of explosive material into the cylinder, after the piston has been moved to its outermost position, and before it again returns. When the proper quantity of the cord of explosive material has been thus advanced into the cylinder, the part so advanced is cut off from the remainder by the sharp edge 31 of the piston, and the part thus severed is carried upward with the piston in a shallow bowl or recess 32 formed in the upper or advancing face thereof. When the piston arrives at the extreme upper end of its movement, the explosive material is exploded by an electric spark, which passes from a terminal 33 to a shoulder 34 formed on the face of the piston, said spark being generated by a suitable

timer, not shown. Said shoulder 34 is formed to extend in direction substantially parallel with that of the terminal 33, so that the terminal shall be at a sparking distance from said shoulder even though the piston should not be at the extreme end of its path, thereby insuring the explosion of the explosive even though the time of sparking does not actually correspond with the time at which the piston arrives at the end of its path.

The insulating material 35 which I use in the spark ply 36 and which surrounds the terminal 33 is what is known as artificial lava, much used for making gas tips, since this substance will withstand the exceedingly high pressure generated by the explosion. The terminal may be turned to a greater or less minimum distance from the shoulder 34 by screwing it out or in.

The wall and head of the cylinder are water jacketed as shown at 38.

The slide block is formed on its under side with a cavity 39 of curvature conforming with the end of the pitman 4 and the cross pin 5 is so arranged that said end abuts against said cavity, so that when pressure is imparted to the piston, this pressure is transmitted to the pitman directly, by the abutment of said block against the end of the pitman, and not through the cross pin.

As the piston is pressed outward by the force of explosion it passes an exhaust opening 40 open to the atmosphere, through which the gases of explosion escape.

With engines constructed prior to my invention, in order that they may operate rapidly it is necessary that the air and gas or vapor should be thoroughly commingled before being admitted to the cylinder. This not only necessitates the use of carbureters and mixing chambers, but also requires either, in the case of four-cycle engines, that part of the time of revolution of the shaft be employed in expelling the gases of combustion, to make room for the air and combustible vapor, or, in the case of two-cycle engines, the expulsion of such gases is imperfect and interferes with the proper combustion of the fuel. My invention is distinguished from prior power engines of this character by the fact that no provision is made for admitting the air for combustion, because no such provision is necessary, since the explosive itself contains all the oxygen necessary for combustion. On this account, the engine can be made of very simple construction, without any valves whatever, as the only openings into the chamber are, one for supplying the explosive material, and a second for permitting the escape of gases of explosion. At the time when explosion takes place, both of these openings are separated from the explosion chamber by the piston itself.

A further important advantage of this invention is that, on account of the very great power developed from the explosion, a very small piston area is required, and therefore, notwithstanding the fact that the walls have to be made comparatively strong to withstand the force of explosion the whole engine can be made compact and light in proportion of the power developed. Again, since it is quite immaterial whether any residual gases remain in the explosion chamber at the time of the explosion, it is therefore not necessary to completely expel these gases, or, consequently, to provide comparatively complex mechanism such as valves and the like for insuring such complete expulsion, and a proper mixture of the explosive gases therein, and therefore the explosions can succeed each other with enormous rapidity. Consequently, very great power is developed, from the engine even though the force of each single explosion is comparatively small, and this, again, enables the engine to be constructed comparatively light and compact in proportion to the power developed.

I claim:—

1. In an apparatus of the class described, the combination of a cylinder, a piston therein, means for feeding into said cylinder regulated quantities of an explosive, means carried by the piston for severing the part of the explosive so fed from the remainder at each stroke of the piston, said cylinder being formed with an exhaust passage arranged to be uncovered by the piston on its outward movement, and means for detonating the explosive within the cylinder, substantially as described.

2. In an apparatus of the class described, the combination of a cylinder, a piston therein, means for feeding into said cylinder regulated quantities of an explosive, said cylinder being formed with an exhaust passage arranged to be uncovered by the piston on its outward movement, and means for detonating the explosive within the cylinder comprising a spark terminal, the piston having a shoulder arranged to approach within a sparking distance from said terminal to form the other terminal, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ALBERT A. JAHNKE.

Witnesses:
FRANCIS M. WRIGHT,
D. B. RICHARDS.