

No. 756,961.

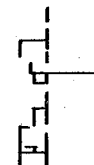
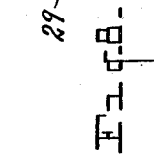
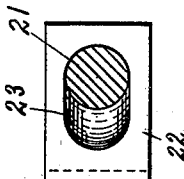
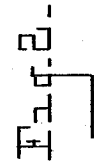
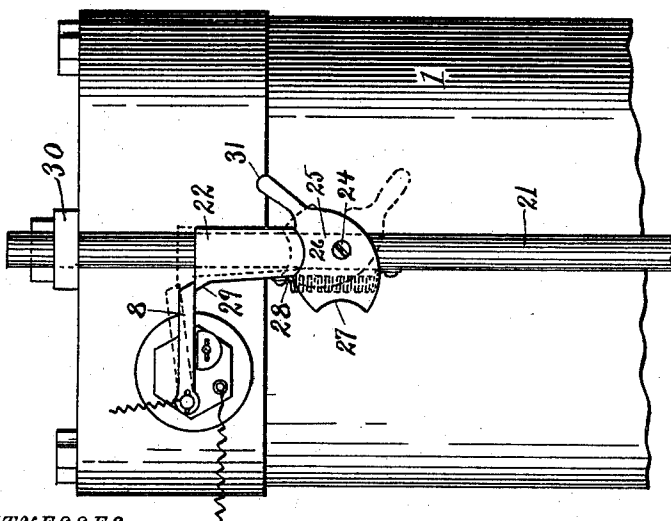
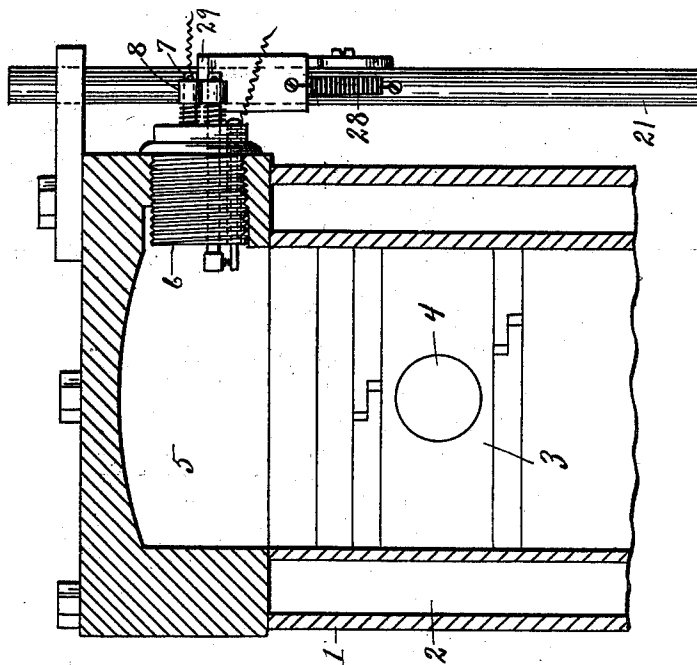
PATENTED APR. 12, 1904.

N. E. HILDRETH.
IGNITER MECHANISM FOR EXPLOSIVE ENGINES.

APPLICATION FILED JUNE 19, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



WITNESSES.

O. B. Baumgarter
M. C. Pooler

INVENTOR.

N. E. Hildreth
By J. B. Waul

Attorneys

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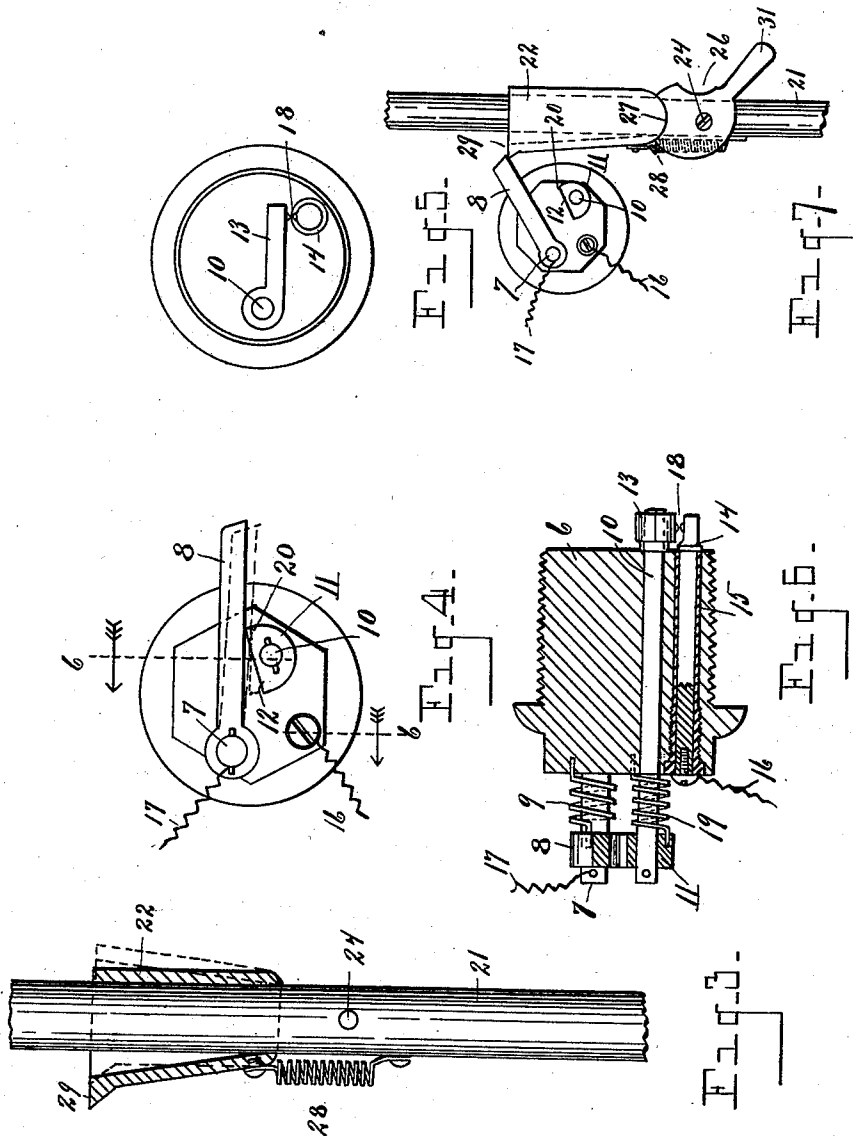
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O. B. Baenziger.
M. C. Poole.

INVENTOR.

N. E. Hildreth.
By R. B. Whelan & Co.

Attorneys.

UNITED STATES PATENT OFFICE.

NED E. HILDRETH, OF LANSING, MICHIGAN.

IGNITER MECHANISM FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 756,961, dated April 12, 1904.

Application filed June 19, 1902. Serial No. 112,279. (No model.)

To all whom it may concern:

Be it known that I, NED E. HILDRETH, a citizen of the United States, residing at Lansing, in the county of Ingham, State of Michigan, have invented certain new and useful Improvements in Igniter Mechanism for 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 figures of reference marked thereon, which form a part of this specification.

This invention relates to an igniter mechanism for explosive-engines; and it consists in the construction and arrangement of parts hereinafter fully set forth, and pointed out particularly in the claims.

The object of the invention is to provide simple and efficient means for exploding a charge in the combustion-chamber of an engine-cylinder of the type using a mixture of air and any of the common ignitable gases, the arrangement being such as to produce a perfect spark and to afford a regulation of the operative parts, so as to time the explosion with respect to the movement of the piston as may be desired.

The above object is attained by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is an elevation of a portion of a cylinder, showing an exterior view of the igniter mechanism and a portion of the reciprocatory rod, through the medium of which said mechanism is actuated. Fig. 2 is a vertical section through the combustion-chamber and cylinder, showing the igniter mechanism in elevation. Fig. 3 is an enlarged view, partly in section, showing a portion of the reciprocatory rod and a sectional view of the tilting dog mounted thereon adapted to engage an arm of the igniter mechanism. Fig. 4 is an enlarged end elevation of the screw-plug in which the operative parts of the igniter are mounted. Fig. 5 is an inner end elevation thereof. Fig. 6 is a longitudinal section through the plug and operative parts, as on line 6 6 of Fig. 4. Fig. 7 is a detail in elevation of the operative

mechanism, showing the position of parts just previous to the causing of the spark. Fig. 8 is an enlarged sectional view through the reciprocatory rod above the dog mounted thereon, showing the oblong opening through said dog.

Referring to the characters of reference, 1 designates the cylinder, a portion of which is broken away and which preferably consists of an inner and an outer shell, between which is formed a water-space 2 for the purpose of keeping down the temperature of the cylinder, as is well understood in the art. Within the cylinder is a piston 3, whose reciprocatory motion is adapted to be imparted in the form of a rotary motion to the crank-shaft by means of the pitman adapted to be connected to the wrist-pin 4 of the piston, said pitman and crank-shaft not being shown, as they are of the common and well-known construction. In the end of the cylinder is the combustion-chamber 5, in which the charges of combustible gases are exploded to impart an impulse to the engine through the piston, upon which said explosions act.

The explosive charges are ignited in the combustion-chamber by means of an electric spark produced at predetermined intervals, according to the speed of the engine. The sparkers comprises a suitable plug 6, which screws through the wall of the cylinder and projects into the combustion-chamber and in the end of which is seated a pin 7, upon which is journaled an oscillatory arm 8, adapted to swing in the arc of a circle upon said pin and having attached to the hub thereof one end of a stiff coiled spring 9, whose opposite end is secured in the plug 6. Passing longitudinally through the plug 6 is a rock-shaft 10, which is journaled in said plug and carries fixed to the outer end thereof a collar 11, having a straight face 12 standing uppermost and in the path of the arm 8. Upon the inner end of the rock-shaft 10 is a movable electrode 13, adapted to describe the arc of a circle concentric with the movement of said shaft. Fixed in the plug 6 and extending there-through is an electrode 14, which is insulated from the plug by a sleeve of suitable insulating material 15, and to the outer end of which

is connected a wire 16, which leads to a battery-generator or other source of electricity. (Not shown.) The other wire 17 from the source of electric energy is connected with the plug 6, as illustrated, or in any suitable manner, so that the current will pass into the rock-shaft 10 and into the electrode 13, mounted upon the inner end thereof. The inner ends of the electrodes 13 and 14 are provided with suitable contact-points 18, which are normally separated. Mounted upon the outer end of the rock-shaft 10 is a coiled spring 19, one end of which is secured to said shaft and the other end to the plug 6. The tension of spring 19 is less than that of spring 9, so that normally the force of spring 9 is exerted to overcome that of spring 19 and to cause the flat face 12 of the collar 11 to lie contiguous to and parallel with the under face of the arm 8, as shown by solid lines in Fig. 1, in which position the electrodes are held apart and their contact-points are separated. When the outer end of the arm 8 is raised, however, so as to release the collar 11, spring 19 will rotate the shaft 10 and actuate electrode 13 to bring its contact-point into engagement with that of electrode 14, as shown in Fig. 6, thereby closing the electric circuit through said electrodes. The free end of the arm 8 is carried upwardly by an arrangement hereinafter described until considerable tension is placed upon its spring 9, when upon the release of said arm it will return and strike the collar 11 a sharp blow upon the corner thereof, as shown in Fig. 4, thereby rotating the rock-shaft 10 against the action of spring 19 and separating the contacts of the electrodes, thereby producing an arc which ignites the charge in the combustion-chamber of the engine. The contact-points of said electrodes are held separated by the force of the spring 9 until the succeeding operation.

To provide for operating the trip-arm 8 in a manner to cause the separation of the contacts of the electrodes, as described, a reciprocatory rod 21 is employed, which is given movement by attachment to any movable part of the engine. (Not shown.) Upon said rod is mounted a tilting dog 22, having an aperture 23 therethrough, through which said rod passes and which is oblong at its upper end, as shown in Fig. 8. Pivoted at 24 to the rod 21 is an eccentric lever 25, having the concave bearing-faces 26 and 27. The lower end of the dog 22 rests upon the eccentric lever and is maintained in place by the coiled-spring 28, the upper end of which is attached to said dog and the lower end to the rod 21. Upon the upper end of the dog 22 is a projecting lip 29, adapted to engage the outer end of the arm 8. Secured to the end of the cylinder is a projecting plate 30, through which the rod 21 passes.

In the operation of this device it will be understood that the charge of explosive vapor is

drawn into the combustion-chamber and compressed therein by the upward movement of the piston or the movement thereof in the direction of the combustion-chamber. The parts are so timed in their operation that the dog 22 on the rod 21 engages the free end of the arm 8 as the piston is traveling back to compress the charge. At the time when the piston has reached the limit of its return stroke the dog 22 will slip past the end of the arm 8, allowing said arm to be returned by the tension of its spring 9 and to strike the collar 11 of the rock-shaft 10, as before described, and rocks said shaft to separate the contacts of the electrodes and produces a spark which explodes the mixture in the combustion-chamber and gives an impulse to the engine.

It is necessary in starting motors or engines of this class, because of the slowness of the movement, to explode the charge at the time when the piston has reached the limit of its "in" travel in order to avoid driving the piston back by the force of the explosion before the crank has passed the "in" center and causing the engine to run backward. After the engine has attained speed, however, it has been found that more power can be developed with a given quantity of explosive mixture if the charge is exploded before the piston reaches the limit of its "in" stroke, so that the full expansive force of the charge may be obtained, the momentum of the fly-wheel of the engine serving to carry the crank past the center.

I control the ignition of the charge with respect to the travel of the piston by means of the eccentric lever 25. When the parts are in position, (shown in Fig. 1,) the dog 22 will trip the arm 8, so as to fire the charge at the time the piston reaches the limit of its in stroke, the position in which said parts are used in starting. After the engine has attained speed the eccentric lever is turned to the position shown by dotted lines in Fig. 1 and by solid lines in Fig. 7 through the medium of its handle 31, when the dog 22 will be raised higher and will sooner engage and release the arm 8 by the same movement of the rod 21, thereby causing the spark in the combustion-chamber before the piston has reached the limit of its return stroke.

The oblong opening 23 in the dog through which the rod passes is to allow the upper end of the dog to recede as said dog is returned by the operation of the rod 21 past the end of the arm 8, said dog being restored to its former position after passing said arm by the tension of the spring 28.

It will now be understood that by means of this device a charge may be fired in the combustion-chamber after the piston has reached the limit of its inward travel when starting the engine and that after the proper speed has been attained by a movement of the cam-lever the charge may be fired before the piston reaches the limit of its inward travel at

such point as may be desired, thereby developing the highest efficiency of the engine.

Having thus fully set forth my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an igniter for explosive-engines, the combination, with the igniting mechanism, of a reciprocatory rod, a dog mounted on said rod adapted to engage and operate said igniting mechanism, said dog being slidable upon said rod and adapted to tilt thereon, and means for returning said dog after the tilting movement, means for sliding the dog longitudinally on said rod and for holding said dog against longitudinal movement only, at two predetermined points.

2. In an igniter for explosive-engines, the combination, with the igniting mechanism, of a reciprocatory rod, a dog having a central longitudinal opening through which said rod passes, the shape of said opening at the lower end of the dog being round and substantially oblong at the upper end to allow a tilting movement of the dog upon the rod, said dog being also movable longitudinally upon said rod and adapted to actuate the igniting mechanism, and a spring attached thereto for restoring it after a tilting movement.

3. In an igniter for explosive-engines, the combination with the igniter mechanism of a reciprocatory rod, the dog mounted upon said

rod to move longitudinally thereon, said dog being adapted to actuate the igniter mechanism, an eccentric lever pivoted to said rod and engaging the lower end of said dog, whereby said dog may be adjusted upon the rod and held from longitudinal movement after adjustment.

4. In an igniter for explosive-engines, the combination with the cylinder, of a rock-shaft extending into the cylinder and carrying a movable electrode, a fixed electrode extending into the cylinder in the path of the movable electrode, a collar upon the end of said rock-shaft, a spring-actuated arm adapted to strike said collar and rotate said shaft to separate the electrodes, a reciprocatory rod, a dog mounted on said rod to slide longitudinally and tilt transversely thereon, said dog being adapted to engage the free end of said arm when moving in one direction and to slip past said arm on the return movement, and means for locking said dog against longitudinal movement only, at two predetermined points on said rod.

In testimony whereof I sign this specification in the presence of two witnesses.

NED E. HILDRETH.

Witnesses:

LUTHER B. McEWING,
WILFRED E. CADY.