A. S. DIACK.

ENGINE STARTER.

APPLICATION FILED APR. 28, 1910.

1,190,522.

Patented July 11, 1916.

2 SHEETS—SHEET 1.

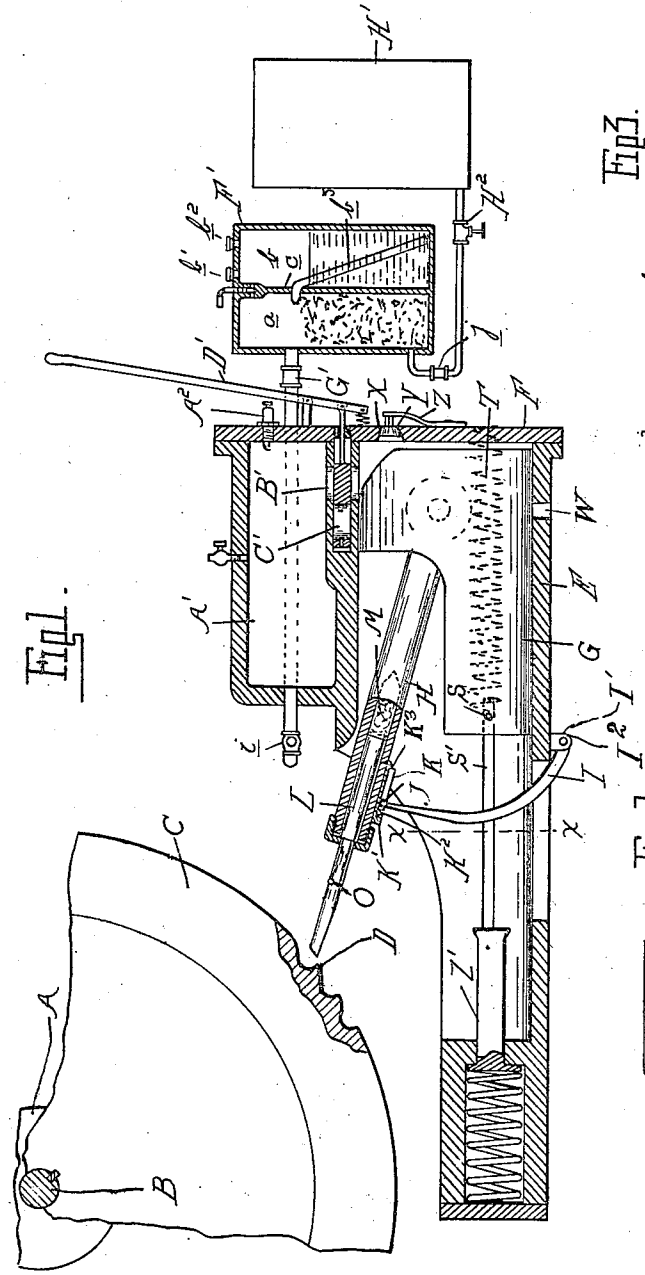


Fig. 1.

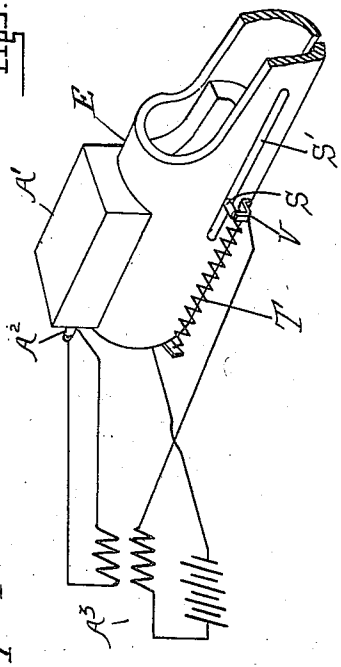


Fig. 3.

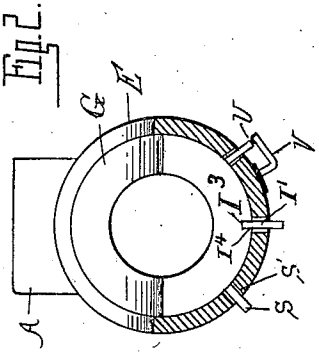


Fig. 2.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 4.

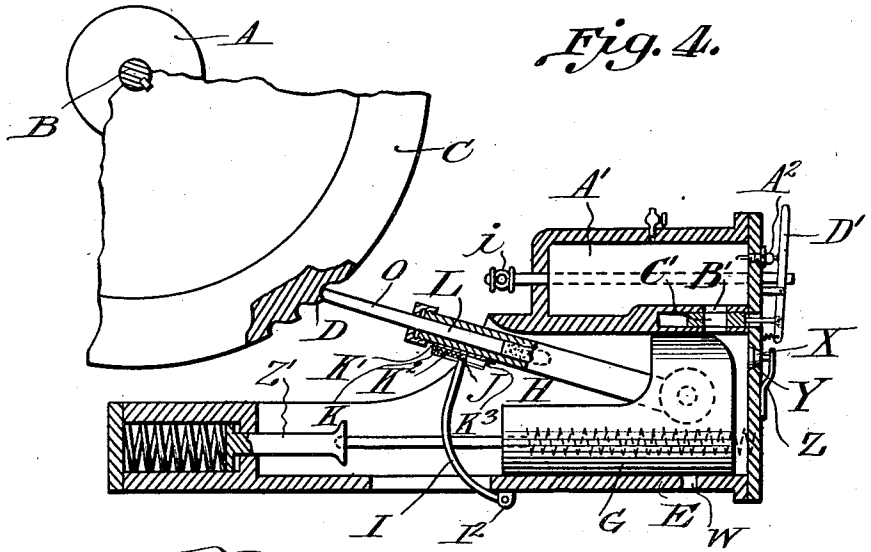


Fig. 5.

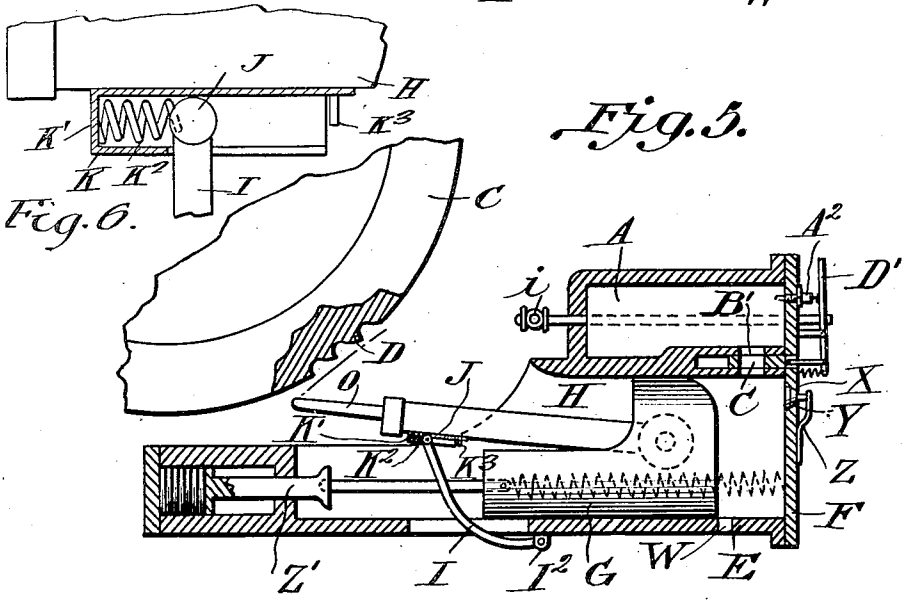


Fig. 6.

Witnesses:

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UNITED STATES PATENT OFFICE.

ALEXANDER S. DIACK, OF DETROIT, MICHIGAN.

ENGINE-STARTER.

1,190,522. Specification of Letters Patent. Patented July 11, 1916.

Application filed April 28, 1910. Serial No. 558,278.

To all whom it may concern:

Be it known that I, ALEXANDER S. DIACK, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Engine-Starters, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to a starting mechanism for explosive engines, designed to impart the initial stroke or strokes to the engine piston without the necessity of cranking, and it consists in the construction of the mechanism, in the peculiar arrangement and combination of parts, and in various details of construction, as will be more fully hereinafter set forth and claimed.

In the drawings,—Figure 1 is a vertical central section through an embodiment of my invention; Fig. 2 is a cross section on line x—x of Fig. 1; Fig. 3 is a sectional perspective view; Figs. 4 and 5 are views similar to Fig. 1, showing the parts in different relations; Fig. 6 is an enlarged detail view of a portion of my invention.

For the purpose of illustration, I have shown and will describe the invention as embodied in a mechanism especially designed for use in connection with automobiles, the starter being adapted to act upon the fly wheel of the engine. It will be understood, however, that this is the preferred form, and that the invention is susceptible of various modifications and other uses.

The reference-letter A represents an explosive engine of any approved type, B its shaft, and C the fly wheel having formed preferably on its face an annular series of teeth, as D.

A cylinder E auxiliary to the engine cylinder is mounted in proximity to the fly wheel, the end F distant from the wheel being closed and the adjoining end open, as shown in Fig. 1.

G is a piston working within the cylinder, and H its rod pivoted to the head and supported by a pivoted link I in a position for engagement at its free end with the fly wheel. The link described is formed preferably wih an enlarged rounded head, as J, at its upper or free end, which is designed to have a limited sliding movement within a guide K upon the piston rod, this sliding movement being limited by the stops K′ and K^3 at opposite ends of the guide. Preferably interposed between the head and a stop, as K′, is a spring K^2 having one end secured to the stop K′ and the opposite end to the head.

I′ is a lug upon the cylinder E having a portion I^2 projecting below the cylinder to which the link I is pivoted and provided with an extension I^3 arranged within the cylinder. The extension I^3 is adapted to engage a longitudinal slot I^4 in the piston G and forms a guide to prevent turning of the piston.

A wheel engaging member, as L, is provided for the piston rod in the form of a shaft or rod located within a bore in the end of the rod proper, and interposed between the bore end and the adjoining end of the rod described is resilient material M, forming a yielding abutment to absorb the shock occasioned by the contact of the rod with the fly wheel; also, I preferably provide a hinged tip, as O, for the member L. This construction allows the engaging end of the rod to be folded rearwardly in the event of the reversal of the fly wheel due to back firing, thus preventing any possibility of breakage of the starter.

For returning the piston to its initial position after operation, I provide studs, as S, one upon each side of the piston, that travel within slots S′ in the cylinder, and springs T connected to the studs. Upon one of these studs is arranged one of the terminals U of the igniting circuit, and upon a bracket V upon the cylinder is the complementary terminal, the terminals being adapted to contact after a slight initial travel of the plunger or piston.

W is an exhaust port within the cylinder for the gases in the forward part of the cylinder, and X is a similar port in the end F, permitting the return movement of the piston. This latter port is controlled by a valve Y, held normally away from its seat by a spring Z.

Z′ is a spring abutment upon the cylinder casting, limiting the forward sliding movement of the plunger.

Upon the auxiliary cylinder is mounted preferably a casting, the interior of which forms a storage chamber A′ for the explosive mixture. The spark plug A^2 is preferably located in the storage chamber.

A^3 represents the igniting circuit, in which the plug and contacts previously described are included.

B′ is a port between the storage chamber and cylinder leading to the rear of the piston, and C′ is a slide valve controlling this port operated in this instance by a spring-pressed lever D′.

F′ represents a carbureter, and G′ a conduit connecting it with the storage chamber.

H′ is a source of compressed air supply, and H^2 is a valve-controlled connection leading from the same to the carbureter. The interior of the carbureter referred to is divided into complementary compartments *a* and *b* by a suitable partition *c*. Within the compartment *a* is arranged preferably a quantity of metal gauze, and within the chamber *b* hydrocarbon oil.

b' b^2 are inlet and vent ports for the chamber *b*, and b^3 is a conduit leading from the lower portion of this compartment upwardly through the partition into the upper portion of chamber *a*, oil being adapted to be forced through the pipe on to the gauze to properly impregnate the same, so that as the air is subsequently forced through the compartment *a* it will be properly charged to form the explosive mixture.

i represents a check-valve in the conduit G, acting to prevent a return of the mixture to the carbureter from the storage chamber A′. *j* is a similar valve within the conduit H^2 preventing back flow into the tank H′.

In the normal position of the starter the parts are in the position indicated in Fig. 1, the head J then being adjacent the outer end of the guide K, since the lower end of the member I has its rearward movement limited by engaging the bottom of the casing E, as will be readily apparent upon reference to Fig. 1. In this position the spring K^2 is in neutral position, or where it exerts no tension and the free end of the plunger or piston rod clears the series of teeth in the fly-wheel. Upon operation of the controlling lever the contents of the storage chamber pass into the auxiliary cylinder, the pressure exerted driving the piston forward a slight distance. During this initial travel, because of the sudden impulse the head J moves longitudinally of the guide, and when the end of the plunger engages the teeth on the fly-wheel, the parts will be in the relation shown in Fig. 4 of the drawing. During further forward travel of the piston the outer end of the piston rod travels an arc controlled by its engagement with the fly-wheel, until it reaches a point where the member I resting against the stop K^3 will act to withdraw the piston rod out of engagement with the teeth. After the piston rod is disengaged from the fly-wheel, the parts assume the relation shown in Fig. 5, the head J being adjacent the outer end of the guide and the spring K^2 being in neutral position. Upon backward movement of the piston G the spring K^2 will remain in neutral position. This will cause the outer end of the piston rod to travel a different arc from the path which said end travels when in engagement with the fly-wheel, for in the forward movement of the plunger the head J is toward the rear of the guide, while on the return movement the head J is adjacent the forward end of the guide. The distance between the head J and the outer end of the piston rod therefore, is shortened upon the return movement of the piston. As the initial movement of the plunger is completed, the sparking is automatically effected, the outward movement of the plunger caused by the explosion being of sufficient force to revolve the fly-wheel one or more times. In this manner the initial stroke of the engine piston is effected, the engine thereafter operating in the usual way.

Upon the operation of the controlling valve and the consequent discharge of the storage chamber contents, the oil from the chamber *a* of the carbureter is forced by the difference in pressure into the complementary compartment upon the wire gauze therein, the latter being in this manner properly impregnated to charge the air passing through that compartment during the next cycle of operation.

What I claim as my invention is,—

1. In starting mechanism for explosive engines, the combination with the engine shaft of a toothed member thereon, a cylinder auxiliary to the engine cylinder provided with a piston having a member positioned to impinge against the toothed member, means for charging the cylinder with an explosive mixture under pressure to initially operate the piston, and mechanism for automatically exploding the charge after the initial operation of the piston has been effected.

2. In starting mechanism for explosive engines, the combination with the engine shaft, of a fly wheel thereon provided with a toothed surface, an auxiliary cylinder and its piston, a rod pivoted to the piston and adapted to impinge against the fly wheel, a pivoted supporting member for and having a limited sliding engagement with the rod, means for charging the auxiliary cylinder with an explosive mixture under pressure, and means for subsequently and automatically exploding the charge.

3. In starting mechanism for explosive engines, the combination with the engine shaft carrying a fixed member, of a cylinder auxiliary to the engine cylinder, a piston therein, a piston rod positioned to impinge against the shaft member, and automatic means for causing the rod to traverse different paths during and outward and

return movements thereof, for the purpose of impinging against the fixed member in one direction of movement and clearing the same in the opposite direction.

4. In starting mechanism for explosive engines, the combination with the engine shaft, of a fly wheel thereon, an auxiliary cylinder and its piston, and a piston rod positioned to impinge against the wheel on outward movement and automatic means for causing said piston rod to clear said wheel upon its return travel.

5. In a starting mechanism for explosive engines, the combination with an engine shaft carrying a fixed member, of a cylinder auxiliary to the engine cylinder, a piston therein adapted to travel to the cylinder head, a piston rod positioned to impinge against the shaft member, and automatic means for causing the rod to traverse different paths during each outward and return movement thereof, to clear said shaft member in one direction of movement.

6. In starting mechanism for explosive engines, the combination with the engine shaft, of a toothed member thereon, a cylinder auxiliary to the engine cylinder, a piston in the auxiliary cylinder, a rod carried by said piston positioned to impinge against the toothed member, means for charging the cylinder with an explosive mixture under pressure to initially operate the piston to move said rod in engagement with the toothed member, and mechanism automatically operated by the initial movement of the piston for exploding the charge.

7. In starting mechanism for explosive engines, the combination with the engine shaft, of a toothed member thereon, a cylinder auxiliary to the engine cylinder, a piston in the auxiliary cylinder, a rod carried by said piston having a hinged outer end positioned to impinge against the toothed member, means for charging the cylinder with an explosive mixture under pressure to initially operate the piston to move the extension in engagement with the toothed member, and mechanism automatically operated after the initial movement of the piston for exploding the charge.

8. In starting mechanism for explosive engines, the combination with the engine shaft, of a toothed member thereon, a cylinder auxiliary to the engine cylinder, a piston in the auxiliary cylinder, a rod carried by said piston having an extension positioned to engage the toothed member, a yieldable connection between said rod and its connection, means for charging the cylinder with an explosive mixture under pressure to initially operate the piston to move said extension in engagement with the toothed member, and mechanism automatically operated after the initial movement of the piston for exploding the charge.

9. In starting mechanism for explosive engines, the combination with the engine shaft, of a member secured to the shaft to actuate the same, a stationary cylinder auxiliary to the engine cylinder, a piston in the auxiliary cylinder, a rod carried by said piston positioned to engage and actuate said member, means for charging the cylinder with an explosive mixture under pressure to initially operate the piston to move said rod in engagement with said actuating member and mechanism automatically operated after the initial movement of the piston for exploding the charge.

10. In starting mechanism for explosive engines, the combination with the engine shaft of a toothed fly-wheel thereon, a cylinder provided with a piston, a rod carried by said piston positioned to impinge against said toothed fly-wheel, means for charging the cylinder with an explosive mixture under pressure to initially operate the piston to move said rod in engagement with the toothed fly-wheel, mechanism automatically operated after the initial movement of the piston for exploding the charge, and means for causing said rod to clear the wheel on its return travel.

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

ALEXANDER S. DIACK.

Witnesses:
JAMES P. BARRY,
W. J. BELKNAP.