J. O. HOBBS.

STARTING DEVICE FOR EXPLOSIVE ENGINES.

APPLICATION FILED DEC. 27, 1911.

1,076,120.

Patented Oct. 21, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

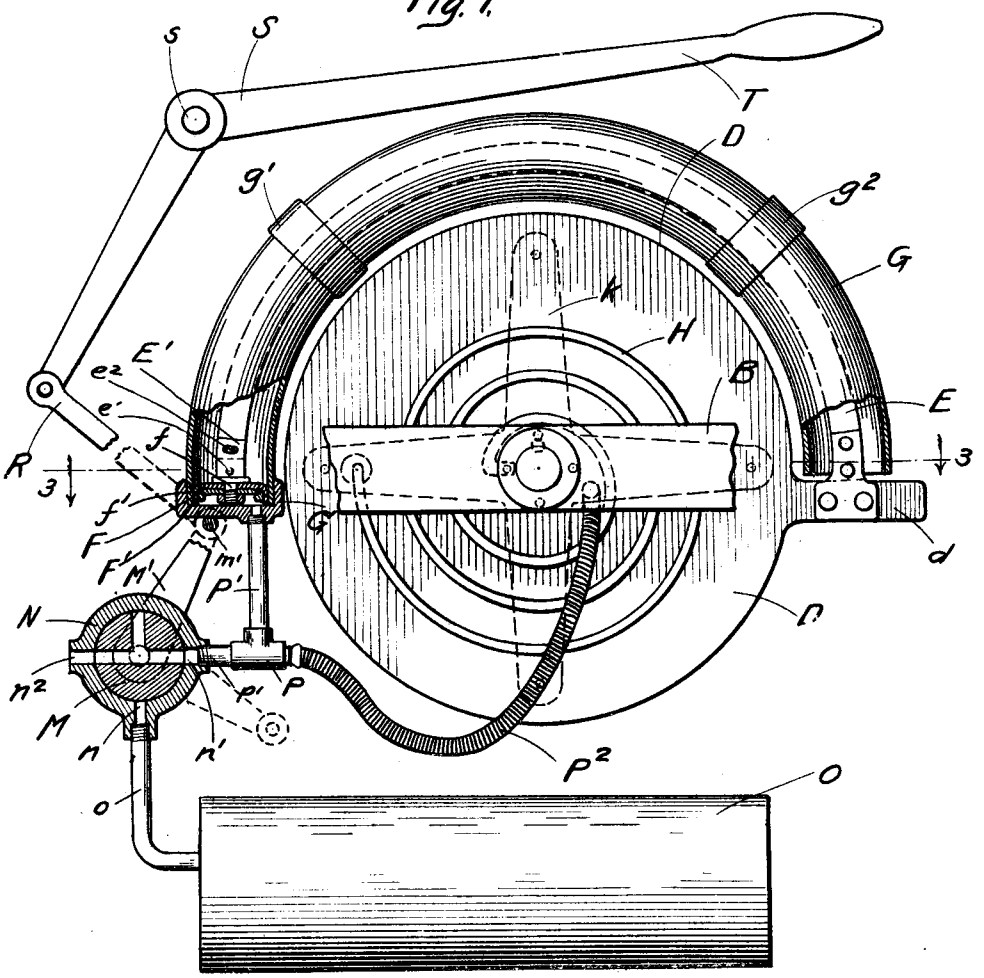
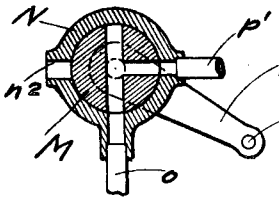


Fig. 2



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Fig. 4

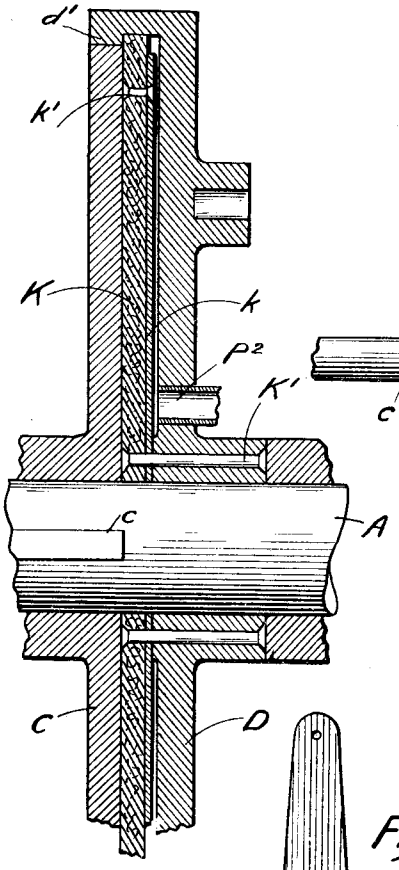


Fig. 3

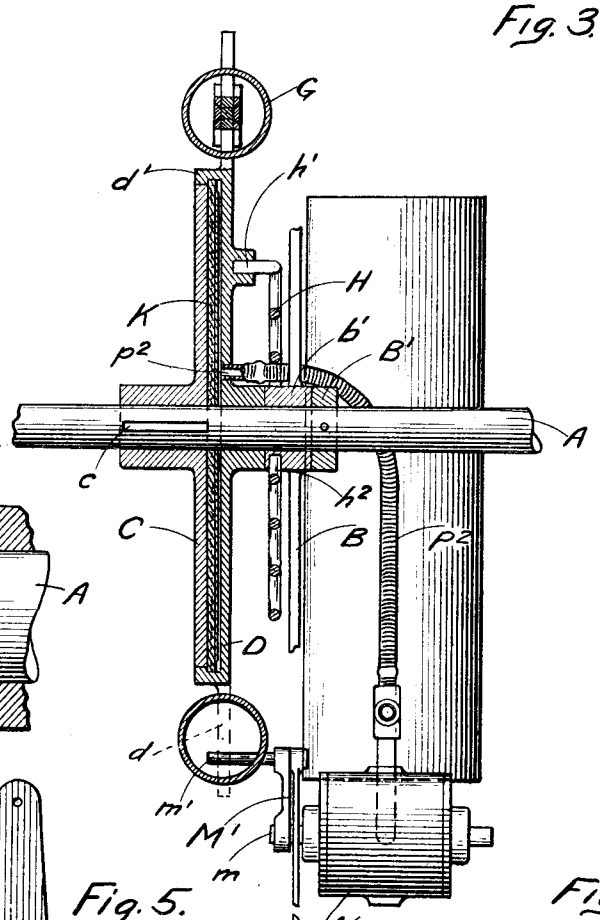


Fig. 5.

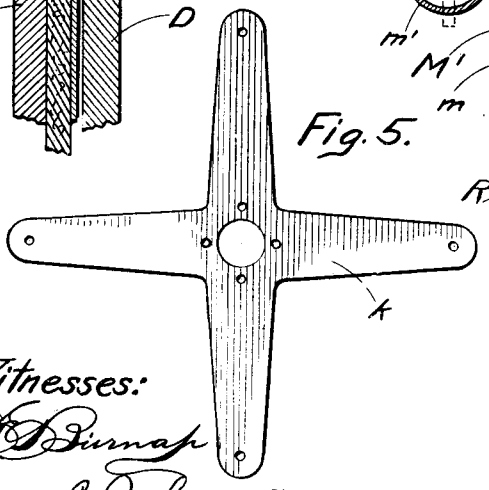
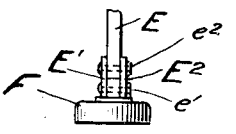


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOHN O. HOBBS, OF CHICAGO, ILLINOIS.

STARTING DEVICE FOR EXPLOSIVE-ENGINES.

1,076,120. Specification of Letters Patent. Patented Oct. 21, 1913.

Application filed December 27, 1911. Serial No. 668,114.

To all whom it may concern:

Be it known that I, JOHN O. HOBBS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Starting Devices for Explosive-Engines, of which the following is a specification.

My invention relates in general to explosive engines, and more particularly to means for initially starting the explosions in the engine cylinders of automobiles.

In order to start an explosive engine, it is necessary to rotate the crank shaft sufficiently to compress and then ignite a charge of explosive mixture in the cylinder. This is usually done manually by means of a crank on the end of the crank shaft of the engine which necessitates the operator leaving his seat and requires considerable physical effort.

The object of my invention is to provide a fluid pressure operated starting device for imparting to the crank shaft of an explosive engine the preliminary rotation requisite to initiate the explosions in the engine cylinders, and in which the pressure will be applied directly to the end of a radial crank throughout a circular movement of the radial crank sufficient to start the explosions in the cylinders.

A further object of my invention is to provide a fluid pressure operated starting device for explosive engines which will be comparatively simple in construction, efficient in use, and convenient in operation.

My invention will be more fully described hereinafter with reference to the accompanying drawings, in which the same is illustrated as embodied in a convenient and practical form, and in which—

Figure 1 is an elevational view looking in the direction of the arrow in Fig. 3; Fig. 2, a sectional view of the controlling valve in position to clutch the crank upon the engine crank shaft; Fig. 3, a sectional plan view on line 3 3, Fig. 1; Fig. 4, an enlarged vertical section through the pneumatic clutch, parts being broken away; Fig. 5, a detail elevational view of the resilient spider for separating the clutch members; and Fig. 6, a detail view of the plunger.

Similar reference characters are used to designate similar parts in the several figures of the drawings.

Reference character A indicates the starting shaft of an explosive engine, such shaft ordinarily consisting of an extension of the crank shaft of the engine.

B indicates a supporting bar through which the shaft A rotatably extends and which is rigidly secured to any suitable fixed support so as to be immovable relatively to the shaft.

B′ indicates a collar fixed to the shaft A adjacent the portion *b′* of the fixed member B which surrounds the shaft.

C indicates a disk non-rotatably mounted upon the shaft A, as by means of a key *c*, interposed between the shaft and the hub of the disk C.

D designates a disk located adjacent the disk C and loosely mounted upon the shaft A. The outer periphery of the disk D is provided with a circular flange having an inwardly projecting lip *d′* which surrounds the periphery of the fixed disk C. Rigidly secured to a radial projection *d* on the disk D is a rod E extending concentrically around the shaft A and provided with a plunger F at its free end. The disk D, the rod E, and plunger F constitute a crank loosely mounted upon the shaft A and adapted to impart rotary motion thereto in a manner subsequently to be described.

G indicates a circular tube located concentrically around the rod E and plunger F, and also concentrically supported relatively to the shaft A by any suitable means, such as brackets *g′* and *g²*, rigidly secured to any stationary support. In order that the plunger F may closely fit within the tube G, a cup-shaped packing F′ forms part of the plunger F and is secured to the end of the rod E by means of a flanged disk *f′* which engages a screw threaded stud *f* on the end of the rod E. To avoid any danger of the plunger sticking in the surrounding tube should the inner surface of the tube be slightly uneven or should the tube occupy a position slightly eccentric to the starting shaft, the plunger F is shown as connected to the end of the rod E in a manner to permit a slight radial movement of the plunger relatively to the adjacent end of the rod E. The connection between the plunger and the adjacent end of the rod E is shown in detail in Figs. 1 and 6. Two flat plates E′ and E² overlie the opposite flat surfaces of the stud *f* and adjacent end of the rod E, the plates being rigidly secured as by means of a rivet or bolt *e′* to the stud and connect-

ed by a rivet or bolt e^2 with the end of the rod E, the openings in the plates E′ and E² through which the bolt e^2 extends being slightly elongated in a direction radial to the starting shaft. The abutting ends of the stud f' and rod E are in close contact so as to prevent any pivotal action between the plunger and rod while admitting of a slight radial movement of the plunger relatively to the rod to avoid danger of the plunger sticking within the tube G.

One end of the curved tube G is closed by a circular cap G′ having a flange surrounding and in screw threaded engagement with the end of the tube G.

A spiral spring H surrounds the shaft A and is secured at its inner end h^2 within a recess formed in the hub b' of the fixed support B. The outer end h' of the spiral spring H is secured within a recess formed within the adjacent surface of the crank disk D. The tension of the spring H is such as to oscillate the crank disk D and rod E rigidly secured thereto to the position shown in Fig. 1, in which the plunger F engages the cap G′ of the tube G.

Interposed between the fixed disk C and loose disk D is a clutch disk K preferably made of flexible material, such as sole leather, and rigidly secured adjacent its center by pins K′ to the hub of the disk D. A leaf spring k preferably comprising radial arms, as shown in Fig. 5, surrounds the shaft A and is rigidly secured to the disk D and clutch member K by means of the pins K′ passing therethrough, as clearly shown in Fig. 4. The outer ends of the radial arms of the spring k are secured to the clutch member K adjacent its outer periphery by means of rivets k'. The tension of the spring k is such as to normally separate the clutch member K from contact with the adjacent surface of the fixed disk C.

M designates a three-way valve surrounded by a valve casing N and provided with passages controlling ports through the casing. The valve casing N is fixed upon any suitable support so as to occupy a fixed relation with respect to the tube G.

o designates a conduit communicating with a port n extending through the valve casing N and leading from any suitable source of fluid pressure, as for instance a compressed air reservoir O. A short conduit p' communicates with a port n' through the valve casing and is connected with a T-coupling P from one opening in which a conduit P′ extends to the cap G′ of the tube G and communicates through an opening in said cap with the interior of the tube G. A flexible conduit P² extends from the other opening in the coupling P to a port p^2 through the crank disk D, as shown in Fig. 3.

n^2 indicates an exhaust port leading from the valve casing N.

The passages in the valve M, when the valve is in the position shown in Fig. 1, connect the conduit p' with the exhaust port n^2, while the passages when the valve is in the position shown in Fig. 2 connect the conduit p' with the conduit o leading from the source of fluid pressure.

A stud m projects concentrically from one end of the valve M through the adjacent end of the valve casing, as shown in Fig. 3. A crank arm M′ is fixed to the stud m at one end and from its other end a rod m' projects into the path of the radial extension d of the crank disk D.

In order that the valve may be conveniently turned into position to connect the source of fluid pressure with the tube G and clutch, a link R is pivotally connected to the pin m' and to the end of a bell crank lever S which is fulcrumed at s upon any suitable support. One end of the bell crank lever is provided with a handle T. Any other suitable means may, of course, be provided for manually turning the valve to a position to permit fluid pressure to flow therethrough to the tube and clutch.

The operation of my improved starting device is as follows: When it is desired to impart to the shaft A an initial movement sufficient to start the explosions in the engine cylinders, the valve M is rotated to the position shown in Fig. 2, in which fluid under pressure passes to the tube G and coincidentally through the crank disk D. The flexible clutch member K is instantly forced into close frictional contact with the fixed disk C, thereby locking the crank disk D to the starting shaft A, while at the same time the fluid pressure moves the plunger F within the tube G, thereby rotating the shaft A through the medium of the curved rod E and disk D. The rotation of the disk D carries the projection d thereon into contact with the pin m', the latter being in the position shown in dotted lines in Fig. 1, thereby moving the pin into the position shown in full lines in Fig. 1, and oscillating the valve into position to connect both the tube and the clutch with the exhaust port n^2. The spring H, which has been placed under tension by the oscillation of the disk D relatively to the hub b' of the fixed member B, immediately upon the release of the fluid from the clutch, rotates the crank disk D and the rod and plunger forming part thereof back to the normal position shown in Fig. 1. Instantly upon the release of the fluid pressure through the conduit P² from the flexible clutch member K, the latter is drawn away from contact with the fixed disk C by means of the leaf spring k, thereby permitting the shaft to continue its rotation while the crank disk D rotates thereon, in a reverse direction, to its normal position by reason of the tension of the spring H.

It will be observed that the outer periphery of the flexible clutch member K overlaps the outer periphery of the fixed disk C and inner surface of the circular flange *d'* on the crank disk D, thereby preventing any escape of fluid pressure between the fixed disk C and crank disk D.

From the foregoing description it will be observed that I have invented an improved fluid pressure operated starting device for explosive engines, in which a starting crank is directly moved through a sufficient arc to impart to the shaft A the necessary rotation to start the explosions in the engine cylinders, and that the radius of the starting crank, consisting of the disk D, rod E, and plunger F, is such as to afford sufficient leverage to permit a comparatively low pressure of fluid to exert the requisite power to rotate the shaft A. It will be further observed that in my improved starting device, the starting crank is instantly clutched to the shaft when fluid pressure is exerted upon the plunger so that the entire movement of the plunger in the tube G will be imparted to the engine shaft A, and that immediately upon the completion of the throw of the plunger in the tube G the pressure is released from the clutch so as to instantly disconnect the starting crank from the engine shaft.

While I have described more or less in detail the specific form in which I have illustrated my invention as embodied, yet I do not wish to be understood as limiting myself thereto, as I contemplate changes in form, proportion of parts, and substitution of equivalents, as circumstances may require, or as may be deemed expedient.

I claim:

1. In a starting device for explosive engines, the combination with a starting shaft, of a crank loosely mounted upon said shaft, means for applying fluid pressure to said crank, a fluid pressure operated clutch for locking said crank to said shaft, valve mechanism for controlling the application of fluid pressure to said crank and to said clutch, means for manually operating said valve mechanism to apply fluid pressure to said crank and to said clutch, and means automatically actuated by said crank for releasing fluid pressure therefrom and from said clutch.

2. In a starting device for explosive engines, the combination with a starting shaft, of a crank loosely mounted upon said shaft comprising a curved portion extending from the outer end thereof and concentrically around said shaft, a plunger on the end of said curved portion of said crank, a curved tube supported concentrically around said shaft within which said plunger reciprocates, a clutch for locking said crank to said shaft, and means for supplying fluid pressure to said tube and simultaneously operating said clutch to lock the crank to said shaft and for releasing fluid pressure from said tube and simultaneously operating said clutch to unlock the crank from said shaft.

3. In a starting device for explosive engines, the combination with a starting shaft, of a crank loosely mounted upon said shaft comprising a curved portion extending from the outer end thereof concentrically around said shaft, a plunger on the end of said curved portion of said crank, a curved tube supported concentrically around said shaft within which said plunger reciprocates, a fluid pressure operated clutch for locking said crank to said shaft, and means for supplying fluid pressure to said tube and simultaneously to said clutch and for releasing fluid pressure from said tube and simultaneously from said clutch.

4. In a starting device for explosive engines, the combination with a starting shaft, of a disk fixed upon said shaft, a disk loose upon said shaft located adjacent said fixed disk, a flexible clutch member rigidly secured to said loose disk and adapted to frictionally engage said fixed disk, means for applying power to said loose disk and simultaneously admitting fluid pressure to the space between said loose disk and said flexible clutch member and automatic means for discontinuing the application of power to said loose disk and simultaneously releasing the fluid pressure from the space between said flexible clutch member and said loose disk.

5. In a starting device for explosive engines, the combination with a starting shaft, of a crank loosely mounted on said shaft, a stop, a spring tending constantly to rotate the crank in one direction against said stop, means for applying power to said crank to rotate it in the opposite direction, means for clutching said crank to said shaft simultaneously with the application of power thereto, and means actuated by said crank after it has moved a certain angular distance from the stop for disengaging said crank from said shaft and simultaneously thereto discontinuing the application of power to said crank.

6. In a starting device for explosive engines, the combination with a starting shaft, of a crank loosely mounted on said shaft, a spring adapted to rotate said crank in one direction, a source of power adapted to rotate the crank in the opposite direction, a clutch to connect the said crank to the said shaft, means to apply the source of power to the crank and to engage the clutch simultaneously, and automatic means actuated by the crank to remove the source of power from the crank and disengage the clutch simultaneously.

7. In a starting device for explosive engines, the combination with a starting shaft, of a disk fixed upon said shaft, a disk loosely mounted upon said shaft adjacent said fixed disk, a flexible clutch member rigidly secured to said loose disk and adapted to frictionally engage said fixed disk, a curved rod rigidly secured to said loose disk and extending concentrically relatively to said starting shaft, a plunger on the end of said curved rod, a curved tube rigidly supported concentrically relatively to said starting shaft and within which said plunger reciprocates, and means for simultaneously supplying fluid pressure to said tube and to the space between said clutch member and said loose disk, and for releasing fluid pressure from said tube and simultaneously from the space between said flexible clutch member and said loose disk.

8. In a starting device for explosive engines, the combination with a starting shaft, of a disk fixed upon said shaft, a disk loosely mounted upon said shaft adjacent said fixed disk, a flexible clutch member rigidly secured to said loose disk and adapted to frictionally engage said fixed disk, a curved rod rigidly secured to said loose disk and extending concentrically relatively to said starting shaft, a plunger on the end of said curved rod, a curved tube rigidly supported concentrically relatively to said starting shaft and within which said plunger reciprocates, valve mechanism controlling the supply and exhaust of fluid pressure to and from said tube and simultaneously to and from the space between said clutch member and said loose disk, means for manually operating said valve mechanism to supply fluid pressure to said tube and clutch member, and means automatically actuated by a predetermined rotation of said loose disk for releasing fluid pressure from said tube and simultaneously from said clutch member.

In testimony whereof, I have subscribed my name.

JOHN O. HOBBS.

Witnesses:
GEO. L. WILKINSON,
HENRY A. PARKS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."