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L. W. TURNBULL.

SPARK CONTROLLER FOR EXPLOSIVE ENGINES.

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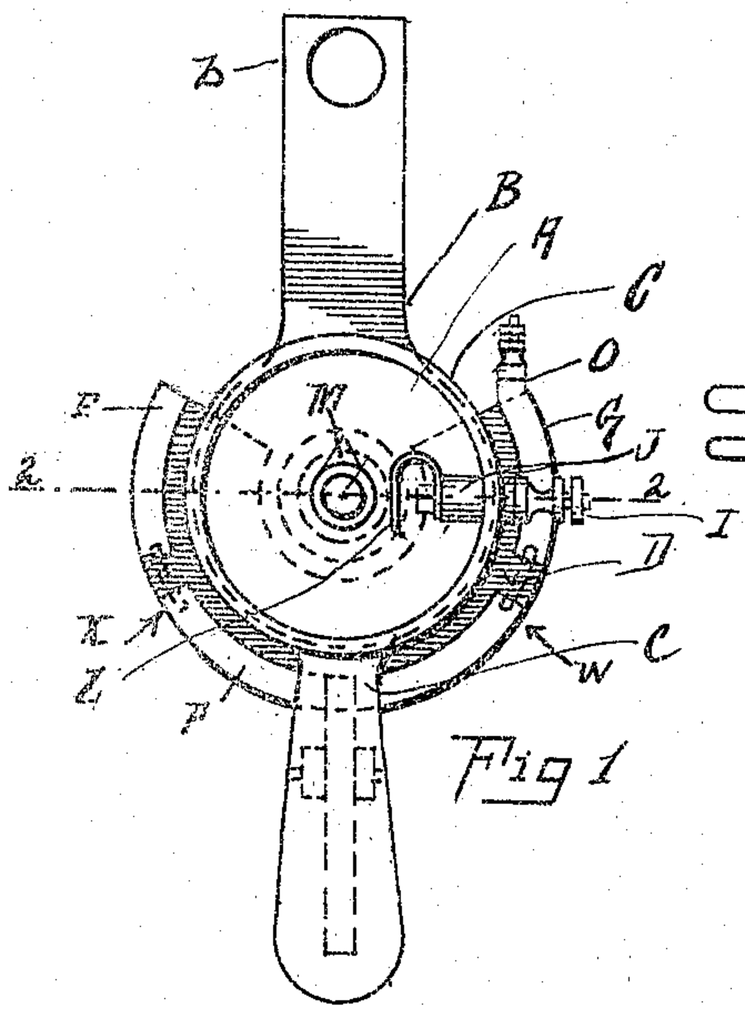

Fig 1

Fig. 2

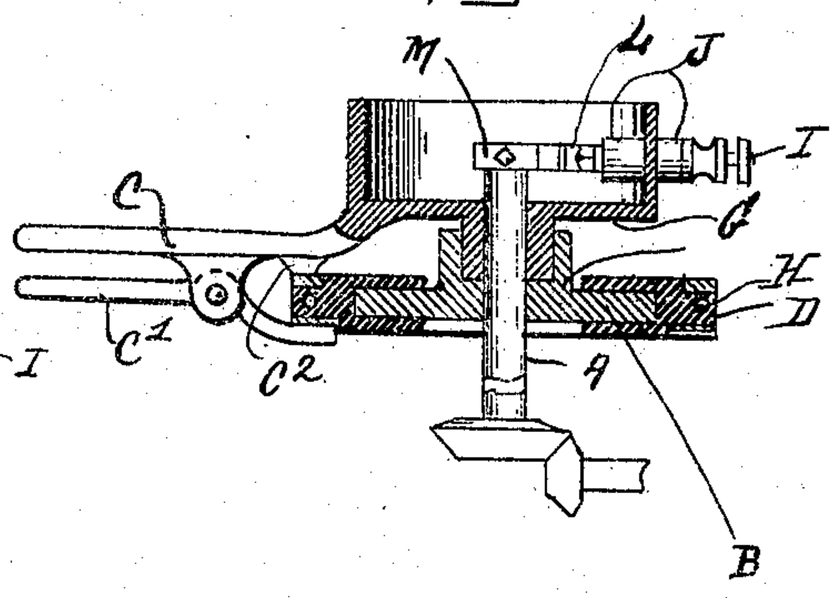

Fig. 3

Witnesses
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SPARK-CONTROLLER FOR EXPLOSIVE-ENGINES.

No. 848,072. Specification of Letters Patent. Patented March 26, 1907.

Application filed November 25, 1905. Serial No. 289,134.

To all whom it may concern:

Be it known that I, LUKE W. TURNBULL, a citizen of the United States, and a resident of the city of Port Huron, county of St. Clair, and State of Michigan, have invented certain new and useful Improvements in Spark-Controllers for Explosive-Engines, of which the following is a full, clear, and exact specification.

This invention relates to spark-controllers for explosive-engines, and especially to means for advancing or retarding the spark, which is of the "jump" type, so that it may occur at any desired moment in relation to the instant of greatest compression in the engine-cylinder.

One feature of the device is the fact that the operator can reverse the engine by the movement of a single switch-handle, and desirable eliminations of wearing parts and joints are also obtained through its use.

The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a view in side elevation of a spark-controller embodying the principal features of the invention as applied to a single or unit cylinder of a two-cycle explosive-engine. Its use with a four-cycle engine occasions reversing valve-gear, which is not in itself a part of the invention, and consequently such type of engine is not herein illustrated. Fig. 2 is a view in partial section on line 2 2 of Fig. 1 with the switch-lever turned at right angles to its position in Fig. 1. Fig. 3 is a diagrammatic view of an engine-cylinder and its electrical connections through the controller.

Referring to the drawings, A represents a vertical cam-shaft, whose upper end is conveniently journaled in a bracket-bearing B, whose inner end *e* may be secured to the engine frame or cylinder, said shaft being driven by any positive connection with the engine working parts, so as to rotate in synchronism with the engine-cycle. Said bearing-bracket B is counterbored to afford a bearing for a horizontal flanged disk C, concentric with the shaft and provided with a latchet-handle *c*. The bracket is also horizontally flanged to afford support for an insulating-plate D, of suitable material—metal, lined, preferably, on its under side to afford ratchets for the handle-latch *c'*. The upper margin of the insulating-plate is provided with three segmental plates E, F, and G, which are electrically connected, as by wires H passing through the insulating-plate, and are in sliding contact with a lug c^2 on the handle C.

A terminal binding-post I is secured in the flange of the disk C by insulating-bushings J, the inner end of the post affording support for a suitably-disposed spring-arm L, which is swept by the point of a horizontal cam M, secured on the cam-shaft A. A second terminal binding-post O at one end of the interconnected segments E, F, and G is also provided.

In operating the device the terminal J is connected to one of the poles Q of the primary coils of an induction-coil. The other terminal O is likewise connected, as through the lead P, to the other primary pole R. This lead may also serve to connect the secondary pole S of the coil to the binding-post O or a separate lead may be used. It is evident that this connection grounds this limb of the circuit with the engine in the usual manner. The other terminal U of the secondary coil is connected by the lead V to the engine-plug Z, it being understood that the sparking-plug is of the jump type.

The cam, cam-shaft terminals, and disk are so disposed that when the engine is running in one direction the turning of the latchet-handle to the point indicated by the arrow W causes the spark to occur, through the contacting of the spring-arm and cam-point, at the moment of greatest compression or at the moment of greatest efficiency. When the lever-handle is turned beyond this point, the spark occurs before the greatest compression and before the piston has reached the end of its stroke, so that it causes a retarding of the engine. At full speed this would probably fracture the cylinder. Accordingly a gap is made in the segments, so that by advancing the lever-latchet past the middle segment to this gap the current is shut off, the spark arrested, and the engine allowed to slow down. When it reaches a reasonably safe speed, the lever is pushed over onto segment G, thereby causing an explosion before the engine has passed its dead-center, thus stopping and reversing the

engine at this point. The latchet is then quickly thrown back to the arrow-point X, which is the point of greatest efficiency for the reverse rotation of the engine, and held there until it is desired to stop or reverse, when the gap between the segments E and F affords the same means as does the other gap. Obviously shifting the lever back and forth on the central segment F advances or retards the spark in relation to the moment of greatest compression in the usual manner, so as to vary the engine speed, thereby affording perfect control of the engine. The device also cuts in and out the battery-circuit, so that it is in only at instant of use. Of course a mechanical generator may be used, the controller being inserted in the circuit in the usual manner.

The special design and construction shown herein may be changed without departing from the spirit of the invention, and I do not limit myself to any particular form and arrangement of parts except as set forth in certain of the appended claims.

It is further to be observed that whereas the device as herein shown is applicable only to a single cylinder, the insertion of other contact-points at the proper intervals with corresponding arrangement of the segmental terminal enables the operator to control an engine of any number of units coupled in the usual manner.

It is further evident that a proper reversing mechanism for the valve-gear will enable the controller to be used with a four-cycle engine.

I claim as my invention—

1. A spark-controller comprising in combination with a jump-spark plug one terminal of which is connected with the current-generator, and the other terminal of which is grounded on the engine, of a cam grounded on the engine, rotating in synchronism with the engine-cycle, a contact-point insulated from the engine and cam, intermittently contacting with the cam, a shifting-lever carrying the contact-point and insulated therefrom, adapted to shift the time of contact of the cam and point in relation to the moment of greatest compression of the engine, and a terminal connected with the current-generator in the other limb from the spark-plug, having sliding contact with the shifting-lever and cut-out points on which said lever rests when it has passed the positions corresponding to the moment of greatest compression of the engine-cycle.

2. A spark-controller comprising a camshaft rotating in unison with the engine, and grounded therewith, a cam secured on the shaft, a shifting-lever rotatable on the shaft, a contact-point carried by the lever, insulated therefrom, periodically contacting with the cam, a terminal having sliding contact with the shifting-lever, having cut-out points on which the lever rests when it has passed the positions corresponding to the moments of greatest compression of the engine, said sliding terminal being connected with the ground-limb of the generator-circuit, and said contact-point with the other limb.

3. A spark-controller comprising a camshaft rotating in synchronism with the engine, a cam secured near one end thereof, a bearing for the shaft near the cam secured to and grounded with the engine, a shifting-lever rotatable on the shaft and bearing, a spring-contact insulated from and carried by the lever, contacting periodically with the cam, an insulating-disk secured on the bearing, and electrically-connected segmental plates secured on the face of the disk having sliding contact with the shifting-lever, said cam, contact-point, a lever and segments being disposed so that the lever lies between adjacent segments when it has passed the position corresponding to the moment of greatest compression of the engine.

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

LUKE W. TURNBULL.

Witnesses:
E. S. POST,
C. R. STICKNEY.