No. 822,525. PATENTED JUNE 5, 1906.

R. M. KEATING.

SPARK AND VALVE CONTROLLING DEVICE FOR EXPLOSION ENGINES

APPLICATION FILED DEC. 23, 1901.

3 SHEETS—SHEET 1.

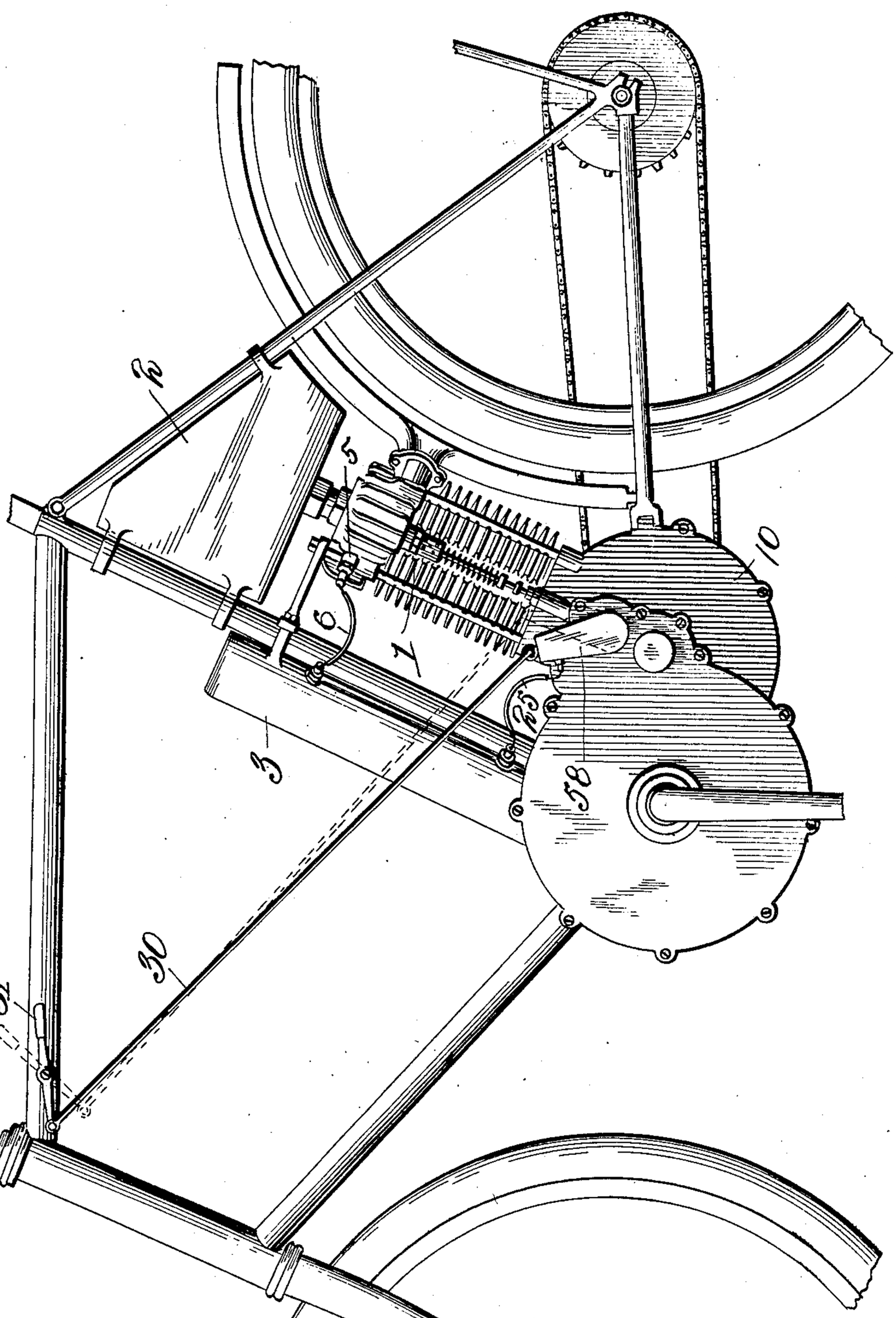


Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 9.

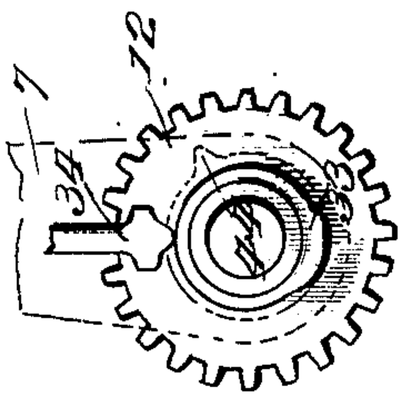


Fig. 10.

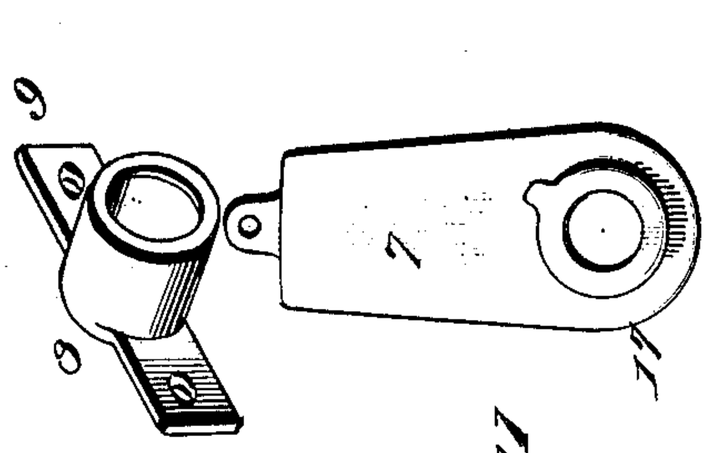


Fig. 12.

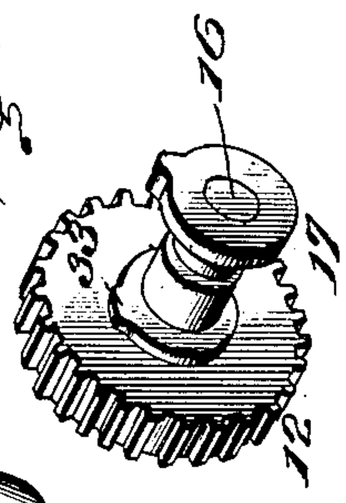


Fig. 11.

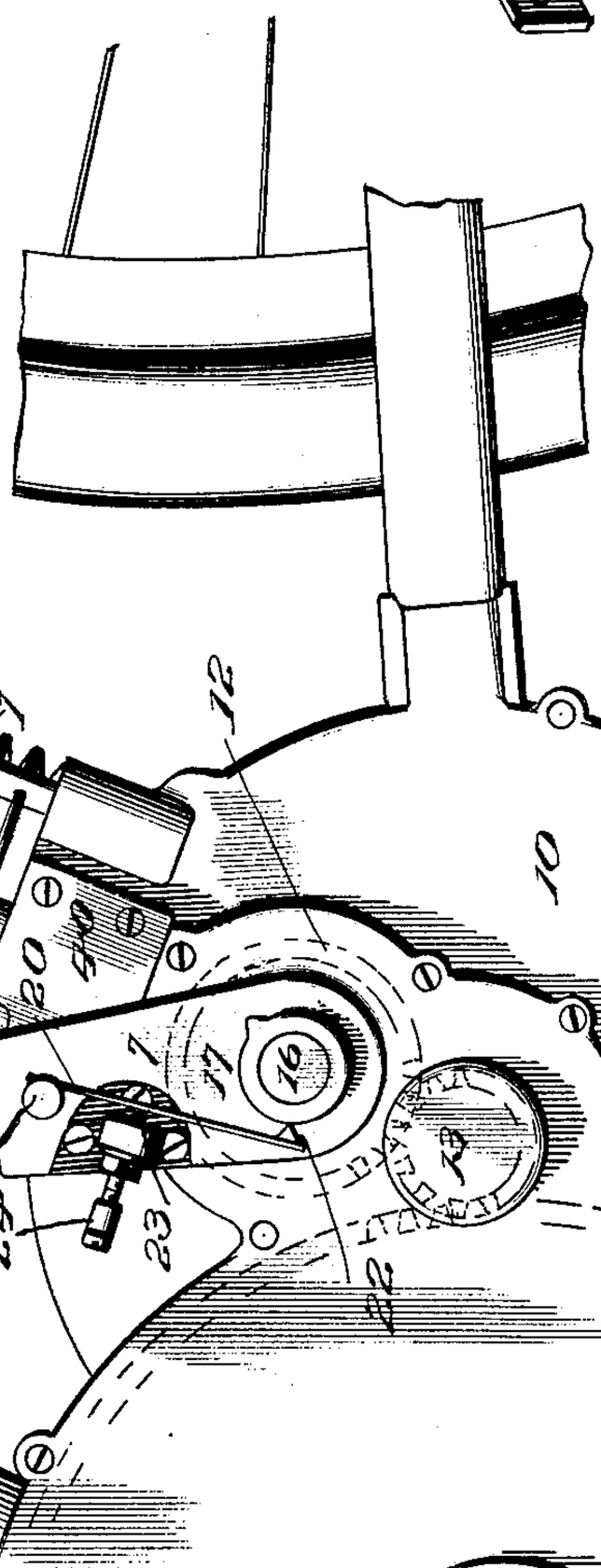

Fig. 2.




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3 SHEETS—SHEET 3.

FIG. 3.

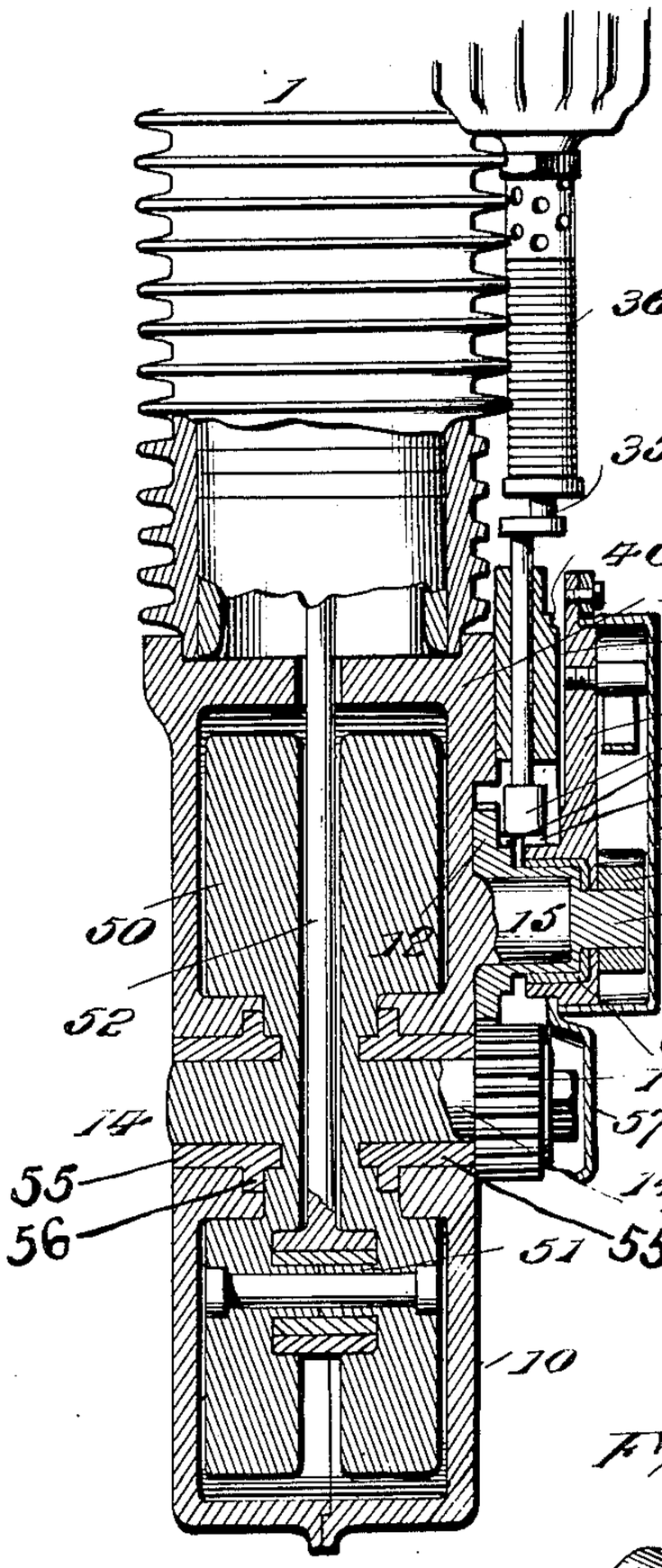



FIG. 4

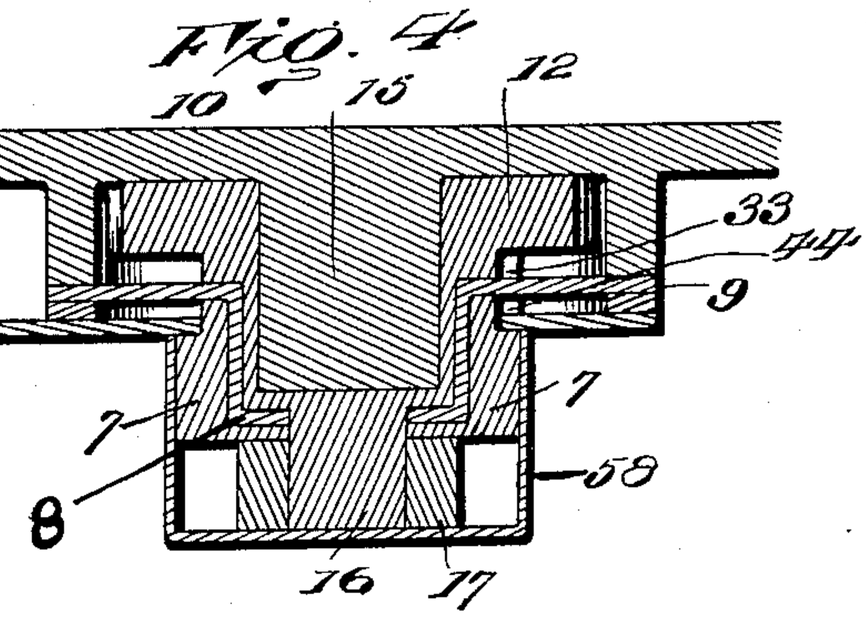



FIG. 5.

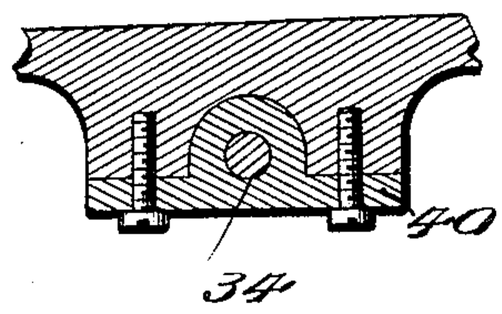



FIG. 6.

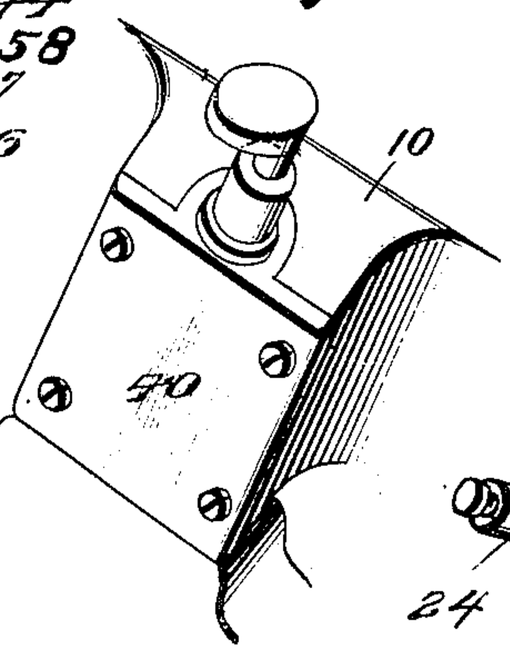



FIG. 7.

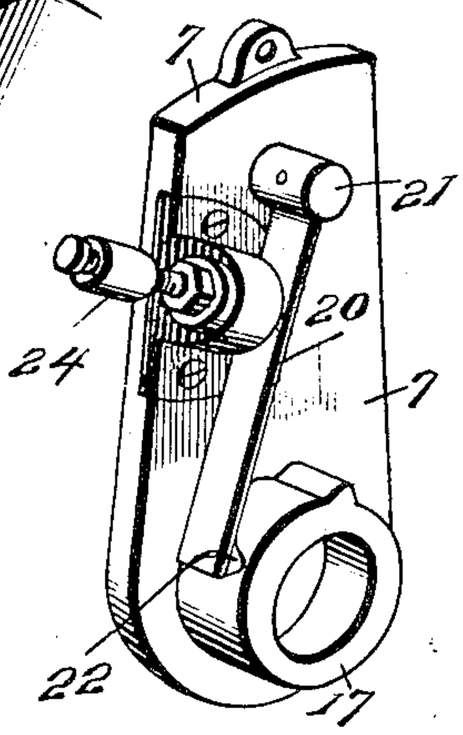
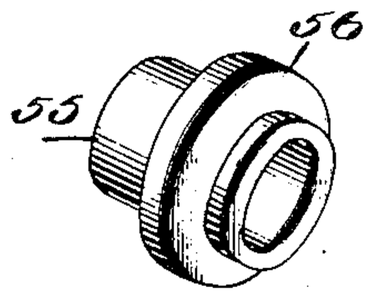



FIG. 8.

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# UNITED STATES PATENT OFFICE

ROBERT M. KEATING, OF MIDDLETOWN, CONNECTICUT, ASSIGNOR TO THE R. M. KEATING MOTOR COMPANY, OF MIDDLETOWN, CONNECTICUT, A CORPORATION.

## SPARK AND VALVE CONTROLLING DEVICE FOR EXPLOSION-ENGINES.

No. 822,525. Specification of Letters Patent. Patented June 5, 1906.

Application filed December 23, 1901. Serial No. 87,005.

*To all whom it may concern:*

Be it known that I, ROBERT M. KEATING, residing at Middletown, in the county of Middlesex and State of Connecticut, have invented certain new and useful Improvements in Spark and Valve Controlling Devices for Explosion-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to gasolene-engines, such as are intended for motor-vehicles.

The object of the invention is to improve gasolene-engines of the class stated and in certain particulars to adapt them specially for motor-bicycles.

To this end the invention consists in certain constructions and combinations of mechanisms, as hereinafter described and particularly claimed.

Figure 1 is a side elevation of so much of a motor-bicycle as is necessary to illustrate my invention and show the general relation of parts. Fig. 2 is an enlarged broken elevation of the more important features of the improvement. Fig. 3 is a vertical section of the lower portion of the engine-cylinder and its gearing, showing parts in elevation. Fig. 4 is an enlarged section of the intermediate gear, its supporting-stud, and connections. Fig. 5 is a cross-section, and Fig. 6 a perspective view, of the lower portion of the exhaust-valve rod, its holding-shoe, and support. Fig. 7 is a perspective view of the interrupter-lever and its immediate attachments. Fig. 8 is a perspective view of bushing or sleeve for the fly-wheel shaft. Fig. 9 is a broken detail elevation of the intermediate gear and exhaust-valve stem. Fig. 10 is a detail perspective of the flanged bushing. Fig. 11 is a front elevation of the interrupter lever and cam, and Fig. 12 is a perspective view of the gear which carries the interrupter-cam and actuates the exhaust-valve.

The engine-cylinder 1 is provided with any usual mechanism for feeding in a supply of explosive mixture from tank 2. The spark-coil 3 is connected to the sparker 5 by wire or other insulated metallic connection 6, and thence through the engine-body metallic circuit is made to the interrupter-lever 7, which lever is pivoted on a sleeve 8, which sleeve has flanges 9 attached to the casing 10 of the engine fly-wheel.

The exhaust-valve gear 12 engages the driving-gear 13 on the fly-wheel shaft 14. The exhaust-valve gear 12 is mounted on a stud 15 on casing 10 and has a spindle 16, which projects through sleeve 8 and bears a cam-wheel 17 on its outer end. Said cam-wheel rotates with the gear 12.

It being understood that the fly-wheel of the engine and its driving-gear 13 rotate in usual manner, the gear 12 and its connected cam will also be compelled to rotate; but as gear 12 is twice the circumference of gear 13 it will rotate only half as fast, and the one-tooth cam-wheel 17 will make one rotation to each two rotations of the engine fly-wheel.

Interrupter-lever 7 bears a movable contact piece or spring 20, supported by stud 21, so that its projection 22 is in the path of rotation of the one-tooth cam 17. An insulated contact-piece 23 is carried by a stud 24 on the interrupter-lever, and this insulated piece 23 is connected by insulated flexible connections 25 to the sparking coil 3.

When the single tooth of cam 17 comes against projection 22 of spring 20, it flexes the spring and presses it into contact with insulated point 23; but as the cam-tooth rides past the projection of the spring in an instant when the cam is moving the spring recoils away from point 23, thus breaking the contact. Now as spring 20 through its metallic supports is all the time in metallic connection with the engine-casing it follows that the contact of spring 20 with point 23 completes electrical connection to the spark-coil, and the sparker becomes operative, and when spring 20 leaves point 23 the circuit is broken and the sparker is inoperative.

The interrupter-lever may be swung on its pivot so as to bring the projection 22 on spring 20 into the path of the cam-tooth at an earlier or later period of the rotation of the cam, thus regulating the time of the spark, and therefore the speed of the engine, since the speed is determined mainly by the instant of the explosion.

Lever 7 is connected by a draw-rod 30 with a hand-lever 31, pivoted to the frame near the bicycle-head. As indicated in Fig.

1, the lever may be swung to various positions and will be held by friction in any adjusted position. This adjustment of lever 31 adjusts lever 7, and thereby the sparking period and the speed of the engine.

The gear 12 has a cam 33, which at each rotation of the gear lifts the sliding stem 34 of the exhaust-valve of the engine. This stem 34 is the lower section of the exhaust-valve stem and is made separate from the upper section 35 of said exhaust-valve stem for convenience of access to the engine. The valve-stem 35 is pressed down by the spring 36 to close the exhaust-valve in usual manner.

The lower section 34 of the valve-stem has sliding bearings in a shoe 40, which is attached to the casing 10 by screws and can be removed, taking the slide-piece 34 with it. The lower end of slide-piece 34 engages the cam of gear 12 behind the sleeve 8, as shown in Fig. 3.

The interrupter-lever 7 has a cam projection 44 on its inner face, which projection 44 is swung under the lower end of valve-stem 34 when lever 7 is swung to extreme position. This lifts said valve-stem and opens the exhaust-valve, permitting the escape of air which might otherwise be pent in the engine-cylinder and enabling the machine to be started by the action of the pedals (as in my Patent No. 675,389 of June 4, 1901) without such resistance in the cylinder. Thus the single lever 31 may determine the speed of the engine and open the exhaust when desirable.

The fly-wheel casing 10 contains fly-wheel 50, which is composed of two disks having studs 51 between them, and these studs form the wrist-pin to which the pitman 52 is connected, said pitman moving between the disks in manner well known.

The projecting hubs 14 form the driving-shaft. These hubs are surrounded by bushings 55, which bushings have collars 56 projecting into corresponding recesses in the inner faces of the fly-wheel casing.

The casing is made in sections, as usual, and these sections are secured together in any usual manner. The bushings 55 are applied from the inside of the casing-sections and can be renewed with little difficulty. The flanges 56 afford broad bearings against the casing and the hub of the fly-wheel, and the bushings extend inside these flanges into recesses in the outer faces of the fly-wheel. (See Fig. 3.) The gear 13 is covered by a sheet-metal cover 57, attached to casing 10. The interrupter-lever is also covered by a sheet-metal cover 58, which incloses the mechanism attached to the said lever.

What I claim is—

1. In a gasolene-engine, an interrupter-lever and mechanism connected thereto by which the sparking period is determined according to the position of said lever, the exhaust-valve having a stem, and means carried by the interrupter-lever to engage said exhaust-valve stem whereby the same may be opened by the interrupter-lever, all combined.

2. In an explosive-engine, the combination with a cylinder, a piston and sparking mechanism including an actuating device having substantially uniform movement in reference to the piston, a movable contact-arm actuated periodically by said device for causing a spark at the electrodes, a shiftable member carrying said arm and adjustable to occupy any one of a plurality of points between two extreme positions for causing the occurrence of the spark at the electrode at two extreme points in the stroke of the piston or at any point intermediate of said two extreme points, and means actuated by said member for opening the exhaust-valve and maintaining the same in open position.

3. In an explosive-engine and in combination, a cylinder, a piston, a crank-casing, a main shaft journaled in the latter and operatively connected to the piston, a stud on the casing, a gear mounted on said stud driven from the main shaft and carrying a make-and-break operating-cam, an exhaust-valve-operating cam, and an interrupter-lever journaled concentric of the axis of the gear, and having means associated therewith for varying the time of the effective operation of the make-and-break operating-cam in reference to the piston and for opening and closing the exhaust-valve and cam 44 mounted on the lever 7 for opening the exhaust-valve when said lever is in one position.

4. In an explosive-engine, the combination with the exhaust-valve, valve-stem and means for actuating the latter periodically including a rotating gear, of sparking mechanism including a lever, relatively movable and stationary contact members carried by the lever, a cam moving in synchronism with the gear for actuating the movable contact member, means for shifting the lever to change the time of the formation of the igniting-spark relative to the engine-piston, and a cam actuated by said lever to open the exhaust-valve.

5. In an explosive-engine, the combination with the exhaust-valve, valve-stem and means for actuating the latter periodically including a rotating gear, of sparking mechanism including a lever, relatively movable and stationary contact members carried by the lever, a cam moving in synchronism with the gear for actuating the movable contact member, means for shifting the lever to change the time of the formation of the igniting-spark relative to the engine-piston, and a cam carried by the lever and movable there-

with for opening the exhaust-valve when the lever reaches substantially the limit of its movement in one direction.

6. In a gasolene-engine, the combination with an exhaust-valve and sparking mechanism including stationary and relatively movable contact members an actuating-shaft, and means interposed between said shaft and the exhaust-valve and movable contact member, respectively, for operating said valve and member from the shaft, of a shiftable lever with means for operating the same for altering the time of formation of the spark and for opening the exhaust-valve.

7. The combination of the engine-casing the exhaust-valve, its divided stem, and a shoe-carrying part of the valve-stem and detachable from the casing, of the interrupter-lever pivoted to the casing and having a cam in position to engage said removable part of the valve-stem, substantially as described.

8. In an explosive-engine, the combination with the crank-shaft, gear operated therefrom, and an inclosing casing, of a stud projecting from the casing, a second gear journaled on the stud intermeshing with the first gear and provided with a shouldered spindle, a collar inclosing a part of the spindle and having a flange embracing the shoulder thereof, a lever mounted on the collar, relatively fixed and movable make-and-break members carried by the lever, a cam mounted on the outer end of the spindle and coacting with the movable make-and-break members, an exhaust-valve, and means comprising a cam 44 mounted on the lever for operating the same.

9. In an explosive-engine, the combination with the cylinder, an exhaust-valve and a casing, of a stud projecting from the casing, a member mounted thereupon having a peripherally-toothed portion at its rear end, a cam-surface in advance of the toothed portion for periodically opening the exhaust-valve, a bearing part in advance of the cam-surface, and a reduced spindle in advance of the bearing-surface with a shoulder interposed between the spindle and bearing-surface, a collar secured to the casing and coacting with the shoulder and bearing-surface, a cam mounted on the reduced spindle, a lever mounted on the collar, relatively movable and stationary contact members associated with the lever with one of which the second cam coöperates, and means for shifting the lever.

10. In an explosive-engine, the combination with the cylinder, an exhaust-valve and a casing, of a stud projecting from the casing, a member mounted thereupon having a peripherally-toothed portion at its rear end, a cam-surface in advance of the toothed portion for periodically opening the exhaust-valve, a bearing part in advance of the cam-surface, and a reduced spindle in advance of the bearing-surface with a shoulder interposed between the spindle and bearing-surface, a collar secured to the casing and coacting with the shoulder and bearing-surface, a cam mounted on the reduced spindle, a lever mounted on the collar, relatively movable and stationary contact members associated with the lever, a movable contact member also associated with the lever and designed to be operated by the cam on the spindle, and means for shifting the lever.

11. In controlling mechanism for explosive-engines, the combination with an exhaust-valve, of a rotary cam for intermittently opening said valve at the proper intervals, an independently-rotatable starting-cam arranged to open and hold open said valve independently of the first-mentioned cam, and means for manually turning said starting-cam, substantially as described.

12. In a gasolene-engine, an interrupter-lever, a mechanism connected thereto by which the sparking period is determined according to the position of said lever, an exhaust-valve, means for opening the same, and means connected to the interrupter-lever for engaging and actuating said opening means, when the lever is in an extreme position.

13. The combination with an exhaust-valve and means for opening the same, of a rotary cam for normally actuating said opening means, an auxiliary device for actuating the opening means, an adjustable commutator-plate, and means for simultaneously operating said plate and auxiliary device, whereby, when the period of ignition is changed for starting, the exhaust-valve is simultaneously opened.

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

ROBERT M. KEATING.

Witnesses:
G. H. NOYES,
JOSEPH P. QUIRK.