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PATENTED AUG. 13, 1907.

B. P. CHURCHILL.
AUTOMATIC SPARK ADVANCER.

APPLICATION FILED JULY 28, 1906.

Fig. 1.

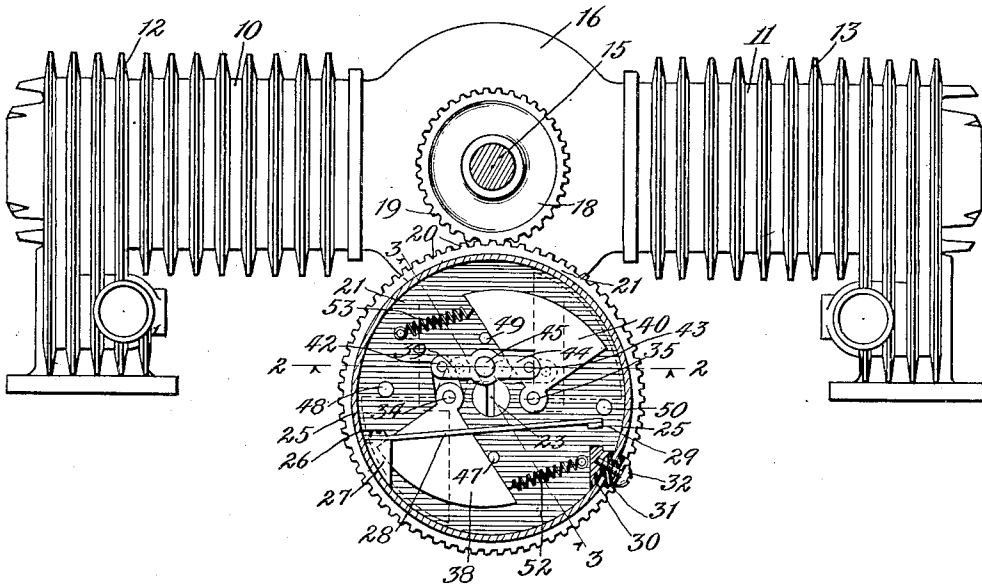


Fig. 2.

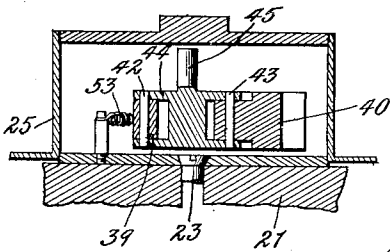


Fig. 3.

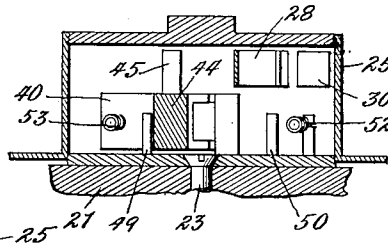
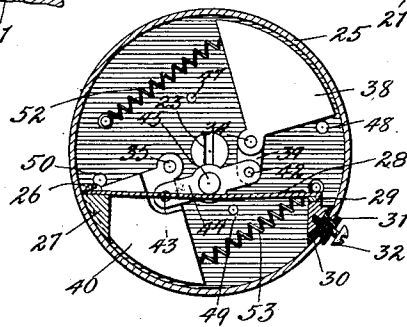


Fig. 4.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC SPARK ADVANCER.

No. 863,151.

Specification of Letters Patent.

Patented Aug. 13, 1907.

Application filed July 28, 1906. Serial No. 328,188.

To all whom it may concern:

Be it known that I, BENN PITMAN CHURCHILL, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Automatic Spark-Advancers, of which the following is a specification.

My invention relates to mechanism for controlling sparking apparatus of gas engines ordinarily used upon automobiles.

As is well known, it is essential to the proper operation of a gas engine that the gas in the working cylinder be fully exploded at the instant the piston begins its working stroke, and as it always takes substantially the same amount of time to explode the gas within the cylinder, it is necessary, where the exploding or sparking is affected by the revolution of a wheel or other corresponding part within the engine mechanism, to cause such revolving mechanism to operate the sparking mechanism at a considerable earlier point in its revolution than is necessary when the engine is running slower. In other words, it is necessary to advance the point of spark.

The object of my invention is to provide automatic mechanism by means of which the point of spark is advanced a proper amount as the speed of the engine increases, and is varied as the speed of the engine varies.

More in detail, my invention consists in the application of a governor mechanism adapted to be moved by the varying speed of the engine to a pin which operates the sparking mechanism, the governing mechanism being so constructed and arranged that this pin is moved backward and forward in a circle about the center of the wheel or shaft which carries it, a sufficient amount so that it operates the sparking mechanism earlier or later as required.

My invention further consists in details of construction which will be hereafter more fully described and claimed.

Figure 1 is a side external view of the two cylinders of a gas engine, and a transverse sectional detail view of the primary and secondary shafts of said engine, and the mechanism of my invention for sparking one of the above cylinders applied thereto, there being a duplicate device for the other cylinder located at some convenient point, usually on the opposite side of the two cylinders. Fig. 2 is a sectional detail view of my preferred mechanism taken on the line 2—2 of Fig. 1; Fig. 3 is a corresponding sectional detail view taken on the line 3—3 of Fig. 1; Fig. 4 is a detail view showing the position of the governing mechanism when the engine is running at full head, and when the parts have traveled from the position of Fig. 1 through approximately 180° to a point in which the engine is in the act of sparking.

While the cylinders of the gas engine form no part of

the invention here in question, I have, in order to show the relation of the mechanism to the gas engine, illustrated two gas engine cylinders 10 and 11, having on their exterior surfaces cooling devices 12, 13 of the ordinary type. These two cylinders are arranged on opposite sides of the primary crank shaft 15 carrying within the casing 16 crank-arms and connecting-arms (not shown) connected with pistons (not shown) within the cylinders.

On the shaft 15 is a gear wheel 18, having on its circumference gear teeth 19 meshing with other gear teeth 20 upon a larger wheel 21 rigidly secured to the secondary shaft 23 of the engine. Mounted about, but independent of this shaft 23 is a stationary casing 25 forming a part of the frame of the engine. On one side of this frame 25 and connected thereto by a screw 26, or other suitable means, is a contact 27 to which is rigidly secured one end of a spring-switch 28. This switch 28 carries upon its opposite end a contact-point 29 adapted to temporarily engage the contact-block 30. This contact-block 30 is insulated from the casing 25 by the insulation 31, or other suitable means, and has connected to it a binding post 32. This binding post 32 is, in a gas engine, always connected to a battery or other source of electrical energy (not here shown), and is thence connected in the ordinary manner through an induction coil to one terminal of the spark-plug within the engine cylinder. The opposite side of the spark-plug is always connected to the frame of the engine, so that electricity can travel from said second side of the spark plug back to the block 27 and switch 28.

The parts thus described constitute ordinary construction, and, in this form no part of my invention.

In order to cause the switch 28 to move from the position of Fig. 1 to that of Fig. 4, and in order to cause the moment of sparking to be advanced, as and for the reasons heretofore stated, I add to the mechanism just described that of my invention, which I will now describe. Upon the wheel 21, heretofore described, and inside the casing 25, adjacent to the switch 28, but clear of said switch, I place two pins 34 and 35, equidistant from the center of the secondary shaft 23. Upon the pin 34 I journal a triangular governor weight 38 having extending from it on the opposite side of the pin 34, a short lever arm 39, with the result that this arm and the governor weight form together a lever of the first class pivoted at 34. Similarly, I journal upon the pin 35 and within the casing 25, another governor weight 40 exactly like the one 38 heretofore described, except that the extension arm is omitted. Upon the arm 39 is a pin 42, a certain distance from the center of the pin 34. Upon the body of the governor weight 40 is a pin 43, a distance from the pin 35 equal to the distance of the pin 42 from the pin 34. Both pins 42 and 43 are, as shown in the drawings, upon the same side

of a center line of the wheel 21, drawn through the pins 34 and 35, so that a connecting link 44 pivotally connected to the pins 42 and 43, is, as shown, to one side of the center of the secondary shaft and the wheel 21. On this connecting link 44 is a contact pin 45 of such a length and location that it will, at one point in the revolution of the wheel 21, strike the switch 28 and move it from the position of Fig. 1 to that of Fig. 4, after passing which point the spring switch 28 moves back to the position of Fig. 1.

Upon the wheel 21 I provide two stops 47 and 48 adapted to limit the motion of the governor weight 38, and in corresponding positions upon the wheel I provide two other stops 49 and 50 adapted to limit the motion of the governor weight 40. Connected to the governor weights 38 and 40 are suitable springs 52 and 53 adapted to hold said weights in the normal position shown in Fig. 1.

In the operation of the mechanism, assume that the parts are as shown in Fig. 1, in which position the engine starts from rest and moves slowly. The contact pin 45 will, during rotation at this speed, be carried around in a circle by the wheel 21, and will, every time it strikes the spring switch 28, move it to the position of Fig. 4, thereby exploding gas within the engine cylinder. As, now, the speed of the engine is accelerated, the governor weights 38 and 39 are, in the well-known manner, moved outward from the position of Fig. 2 toward that of Fig. 4, against the action of springs 52 and 53. This motion of the governor weights tends to move the pin 45 clockwise in the arc of a circle about the center of the wheel 21. Or, in other words, to angularly advance it with reference to a fixed point upon the circumference of the wheel 21, so that as the wheel revolves, it contacts with the spring switch 28 sooner in the revolution of the wheel 21 than it does when the parts are in the position of Fig. 1. When this outward motion of the governor weights has reached its maximum, or the position of Fig. 4, this contact-pin 45 is advanced as much as possible, and as

much as is necessary for the proper operation of the engine. When, now, the engine begins to slow down, the governor weights begin to move backward under the action of the springs 52 and 53, from the position of Fig. 4 to that of Fig. 1, with the result that the contact-pin 45 is withdrawn or retracted from this advanced position a proper amount to give the engine the proper sparking point for the speed at which the engine is then running.

Having thus described my invention, what I claim as new and desire to secure by Letters-Patent is:—

1. In a gas engine, the combination of a rotating member, a switch connected with the sparking mechanism of the engine, a governor weight movable with reference to the rotating member, a link connected to said governor, extending along one side of the center of the rotating member, a contact mounted on the link adapted to engage the switch, means for so guiding said link that as the governor weight moves it moves said contact on the link about the center of the rotating member for the purposes set forth.

2. In a gas engine, the combination of a rotating member, a switch connected with the sparking mechanism of the engine, a governor weight pivoted to the rotating member at one side of its center, a link connected to said governor, extending along one side of the center of the rotating member, a contact mounted on the link adapted to engage the switch, means for so guiding said link that as the governor weight moves it moves said contact on the link in approximately the arc of a circle about the center of the rotating member for the purposes set forth.

3. In a gas engine, the combination of, a rotating member, a stationary switch connected with the sparking mechanism of the engine, two governor weights pivoted to the rotating member on opposite sides of its center, an arm extending from one of said weights, a link connecting said extending arm on one weight and the body of the other weight, spring mechanism holding said weights in normal position, and a contact member mounted on said link adapted to engage said switch, the whole arranged to operate as described, for the purposes set forth.

In witness whereof, I have hereunto subscribed my name in the presence of two witnesses.

BENN PITMAN CHURCHILL.

Witnesses:

HOWARD M. COX,
E. C. ROCKWELL.