C. C. CHARLES.

AUTOMATIC SPARK ADVANCER.

APPLICATION FILED FEB. 27, 1912.

1,040,884.

Patented Oct. 8, 1912.

Fig. 1.

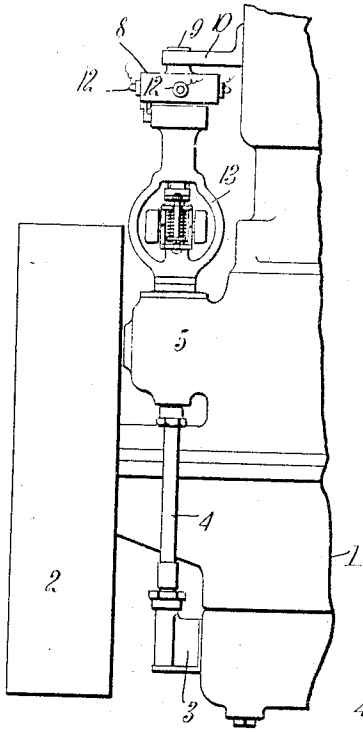


Fig. 2.

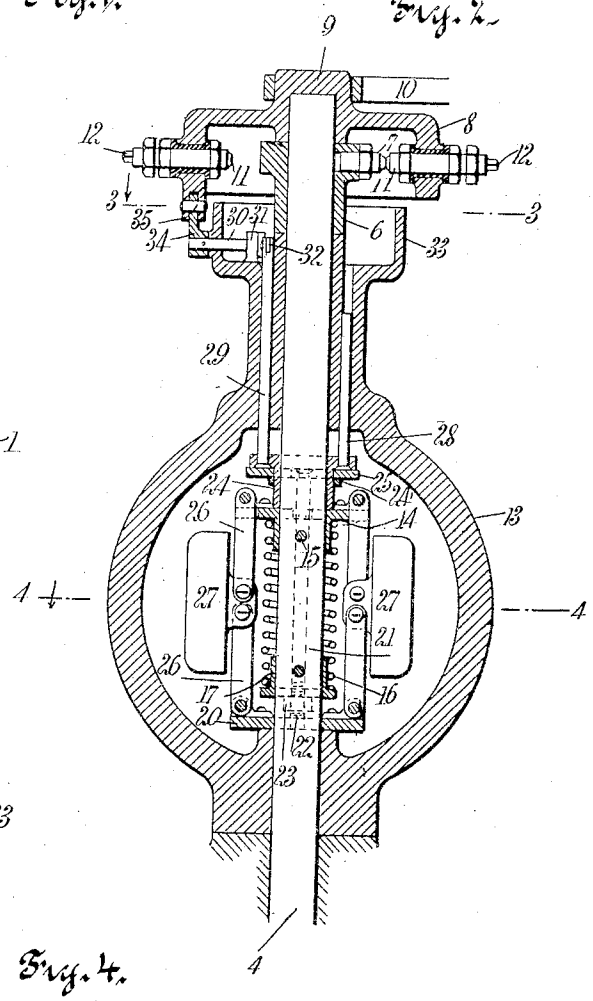


Fig. 3.

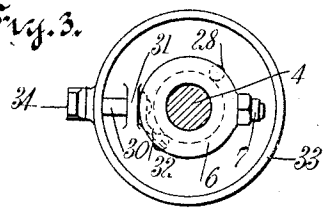
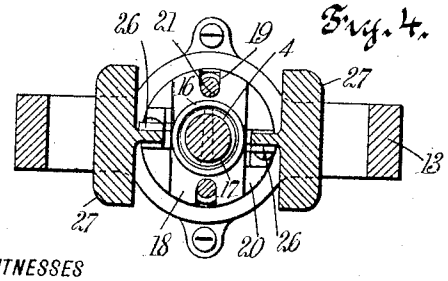


Fig. 4.



WITNESSES

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AUTOMATIC SPARK-ADVANCER.

1,040,884. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed February 27, 1912. Serial No. 680,295.

To all whom it may concern:

Be it known that I, CLYDE C. CHARLES, a citizen of the United States, and a resident of Hoisington, in the county of Barton and State of Kansas, have invented a new and Improved Automatic Spark-Advancer, of which the following is a full, clear, and exact description.

My invention relates to apparatus for automatically controlling the spark by means of which the mixture in the cylinder of an internal combustion engine is ignited, and it comprises suitable apparatus for operating the casing of the timer which closes the circuit supplying current to the igniter, in such a way that when the engine speed increases, the instant at which the circuit is closed to operate the igniter is automatically advanced so as to cause the spark to be produced at the required point before the piston reaches its inner dead center. In this manner the combustion of the mixture is caused to be well under way by the time the piston is ready to start on its out stroke and the full power of the charge is obtained.

Reference is to be had to the accompanying drawings forming a part of this specification, in which the same characters of reference indicate the same parts in all the views.

Figure 1 is a side elevation of my improved automatic spark advancing apparatus, showing the same mounted in position, the portion of the framework of the multi-cylinder engine to which the automatic timing device is applied being included; Fig. 2 is a vertical longitudinal sectional view of my improved spark advancing device; Fig. 3 is a horizontal sectional view on the line 3—3 of Fig. 2; and Fig. 4 is a horizontal sectional view on the line 4—4 of Fig. 2.

Referring particularly to the drawings, the numeral 1 represents the framework of a multi-cylinder engine having the usual fly-wheel 2.

3 represents a bearing for one end of the half-time shaft, and 4 represents a spindle operated from the half-time shaft to transmit motion to the automatic spark advancer which constitutes my invention. This spindle 4 passes through a bearing 5 in the frame of the engine 1, and carries on its upper end a sleeve 6 having a collar provided with a radial aperture in which is mounted the rotating grounded contact 7.

8 represents the timer casing, this casing having a central boss 9 extending from the top and bottom thereof to receive the upper end of the shaft 4; and 10 represents an arm or brace having an aperture through its outer end to receive the boss 9, and being fastened at its opposite end to the frame of the engine 1. This arm 10 serves to steady the timer casing 8, and the upper end of the shaft 4, as will be readily understood. The timer casing 8 is in the form of an inverted cup-shaped body, and mounted to project through the walls thereof are insulated contacts 11, corresponding in number to the number of cylinders of the engine, and terminating at their outer extremities in binding posts 12. This timer is designed to control the ignition circuit, and whenever the rotating contact 7 passes one of the contacts 8, the ignition circuit for each cylinder will be closed in turn, and a spark produced to ignite the mixture therein in the usual way.

13 represents a casting supported upon the bearing 5, and having bores in its opposite ends to permit the passage of the shaft 4. The sides of this casting are bowed out from each other adjacent the lower part thereof, and between the bowed-out sides is located a centrifugally-actuated device which is controlled by the shaft 4, and which is connected to the timer to advance the spark when the engine speed increases. The centrifugally-actuated device in question is preferably in the form of a governor, and it comprises a flanged sleeve 14, secured to the shaft 4 by means of a pin or bolt 15, so as to turn therewith and be prevented from sliding longitudinally thereon, the flange on this sleeve serving as an abutment for the upper end of an actuating spring 16. The lower end of the spring 16 abuts against a sleeve 17, which can slide along the shaft 4, and which has laterally-extending projections 18 at its lower end. These projections extend in opposite directions as shown in Fig. 4. In the outer ends of these projections are formed recesses 19, and below these projections and encircling the shaft 4 loosely is a disk 20. This disk 20 has screw-threaded connection with a pair of rods 21, which

pass through the recesses 19 in the projections 18, the lower ends of these rods being screw-threaded some distance above the disk 20, as shown at 22, and carrying nuts 23. The nuts 23 engage the bottom of the projections 18, and by screwing these nuts up or down, the sleeve 17 is caused to move toward or from the flanged sleeve 14, and thus increase or decrease the compression of the spring 16. The parts 17 and 20 may be keyed on the shaft, if desired.

Above the flanged sleeve 14 and loosely encircling the spindle 4 is a sleeve 24.

26 represents a pair of links pivotally connected to the flange at the upper end of the sleeve 14. Similar links 26 are pivotally connected to the disk 20, and the adjacent ends of the links 26, which are four in number, are pivotally secured to the governor weights 27.

The sleeve 24 terminates in a flange at its upper end which is perforated at diametrically opposite points, and below this flange the sleeve 24 is encircled by means of a ring 25. Through the perforations in the flange carried by the sleeve 24 pass a pair of rods 28 and 29; and the ring 25 will be loosely mounted on the sleeve 24, so that the same can rotate freely around the same, and it will engage the lower ends of the rods 28 and 29 which are headed, as shown, to prevent them from moving down through the flange carried by the sleeve. The ring 25 will be rigidly secured to the upper ends of the rods 22, so that when the governor balls 27 fly outward, the links 26 will lift the disk 20, and through the rods 21 push the ring 25 and the flanged sleeve 24 upward, raising both the rods 28 and 29.

The rods 28 and 29 are received in bores formed in the casting 13, these bores being located in the upper part of this casting and being parallel to the shaft 4. The sleeve 24 can move along the shaft 4 when actuated by the governor, but is held against rotation by means of the rods 28 and 29, as will be readily understood. The rod 28 terminates short of the upper end of the casting 13, but the rod 29 passes through the upper end of this casting and is pivotally connected at its upper extremity to a rock-shaft 30, mounted in a bearing 31 and having an arm 32 which is joined to the rod 29, as plainly shown in Figs. 2 and 3. This rock-shaft 30 passes out through the side of a cup-shaped flange 33 formed on top of the casting 13, and carries on its outer end an arm 34. This arm extends upward and is pivotally connected by means of a pin or the like 35, to the timer casing 8.

The manner of operation of my device will now be described: When the engine is at rest or at slow speed, the spring 16 will hold the governor weights 27 close to the shaft 4, forcing down the sleeve 17 and causing this sleeve to act upon the nuts 23 carried by the rods 22, to depress the disk 20. At the same time the rods 21 will pull down the ring 25 and thus draw down the sleeve 24 with it; and an annular ring 24′ may be secured on the sleeve 24 below the ring 25 for this purpose, so that the ring 25 can not move longitudinally on the sleeve 24, although it can rotate thereon. Hence, the rod 29 will be caused to move the rock shaft 30 and through the same the arm 34 to move the timer casing in such a direction as to make the contact 7 close the circuit through the contacts 11, to produce ignition in each cylinder, after the piston therein has started on its out stroke. In other words, the spark will be retarded in this case and produced at a comparatively late point in the cycle of the operation of the engine. When the engine speeds up, however, the governor balls will fly outward, lifting the disk 20 against the action of the spring 16 and pushing upward on the rods 21. This moves the sleeve 24 upward and pushes the rod 29 upward with it. As a result, the rock shaft 30 is shifted and the timer casing is shifted with it, and in the opposite direction to that in which the contact 7 rotates. As a result, the ignition circuit for each of the cylinders of the engine will be closed at an earlier point in the cycle and the spark will be advanced to the extent required to produce the full power of the engine.

By such a construction it will be seen that the necessity of manipulating the ignition devices to advance or retard the spark is entirely eliminated. The spark is retarded when the engine starts, owing to the action of the spring returning the governor to a position of rest, the connections being such that the timer will be moved to retarded position when the governor weights are at the inner limit of their movement toward the shaft 4; and when the speed increases the spark will be advanced to the extent required, and should the speed decrease, the amount of spark advance will be decreased accordingly.

The principle involved in this invention may be applied to any circuit controller or timer, and that shown on the drawings is merely one construction taken for purposes of example. Obviously, I may connect any timer or circuit-breaking construction to be shifted by means of the arm 34 on the rock-shaft 30, in accordance with the movement of the governor arms 27; and the shaft 30 including the arm 34 and the controlling means which actuates this shaft can be applied alike to a battery timer or circuit breaker, or to a magneto circuit breaker.

I wish to have it understood that the foregoing description and drawings accompanying the same are for purposes of illustration only, and that they disclose but one embodi-

ment of my invention, and that I do not wish to be limited to the details thereof except in so far as is indicated in the accompanying claims.

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

1. Apparatus of the kind described comprising a timer having a casing, a contact carried thereby, a shaft for operating said timer, an arm pivotally connected to said casing, a rock shaft on which said arm is mounted, a second arm mounted upon said rock shaft, and means connected to said second-named arm and actuated in accordance with the speed of the shaft to shift the position of the timer casing.

2. Apparatus of the kind described comprising a timer having a casing, a shaft for operating said timer, an arm pivotally connected to the timer casing, a rock shaft carrying said arm, another arm carried by said rock shaft, a governor comprising a spring mounted upon said shaft, and connections between said governor and said second-named arm to shift the position of the timer, the governor spring serving to move the timer casing to retarded position when the engine stops.

3. Apparatus of the kind described comprising a timer having a casing, a shaft for operating said timer, a governor mounted on said shaft, said governor comprising a sleeve fixed to the shaft and a disk movable on said shaft, a pair of rods connected to said disk, nuts upon said rods, a flanged sleeve movably mounted upon said shaft and engaging said nuts, a spring arranged between said sleeves and serving to force the same apart, a ring surrounding said shaft and secured to the opposite end of said rods, a sleeve rotatably secured to said ring, the nuts on the rods being adjustable to vary the tension of the spring, and means for connecting said last-named sleeve to the timer to shift the position thereof in accordance with the speed of the shaft.

4. Apparatus of the kind described comprising a circuit maker and breaker for closing the ignition circuit to an internal combustion engine to supply ignition sparks therefor, a shaft for operating said circuit maker and breaker, said circuit maker and breaker being mounted upon the upper end of said shaft, a casting surrounding said shaft below said circuit maker and breaker, a governor carried by said shaft inside of said casting, means connecting the governor to the circuit maker and breaker to shift the same in accordance with the speed of the shaft, said circuit maker and breaker having a projection in line with the shaft, and an arm or brace connecting said projection to the frame of the engine.

5. Apparatus of the kind described comprising a timer having a casing, a shaft for operating said timer, a casting surrounding said shaft adjacent the timer casing, an arm pivotally connected to the timer casing, an oscillatable spindle on which said arm is mounted, a second arm carried by said spindle, a sleeve loosely mounted upon the shaft inside of the casting, a rod connecting said sleeve to said second-named arm, and means rotatably connected to said sleeve and actuated in accordance with the speed of the engine to move said sleeve along the shaft to shift the position of the timer.

6. Apparatus of the kind described comprising a timer having a casing, a shaft for operating said timer, an arm pivotally connected to said timer casing, an oscillatable spindle carrying said arm, a second arm mounted upon said spindle, a casting surrounding said shaft adjacent the timer, a sleeve rotatably mounted upon said shaft inside of said casting, a rod connecting said sleeve to said second-named arm and passing through the end of said casting, a second-named rod secured to said sleeve and received by a bore in the end of the casting, the said second-named rod serving to steady the sleeve and coöperating with the first-named rod to prevent rotation thereof, and means rotatably connected to said sleeve and actuated in accordance with the speed of the shaft to move the same along the rod and shift the position of the timer casing.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CLYDE C. CHARLES.

Witnesses:
C. E. JOHNSON,
HARRY E. WAELDIN.