July 24, 1934. M. MALLORY 1,967,445

IGNITION GOVERNOR

Filed May 18, 1931

Fig. 3

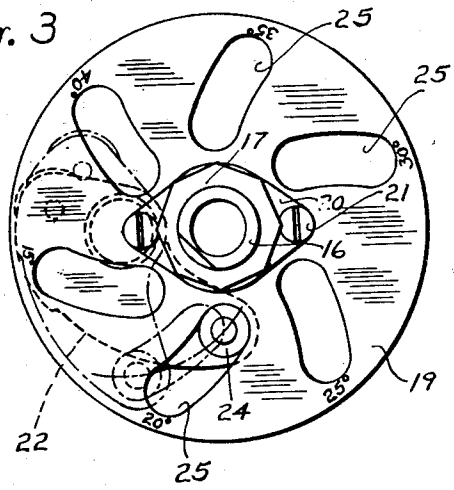
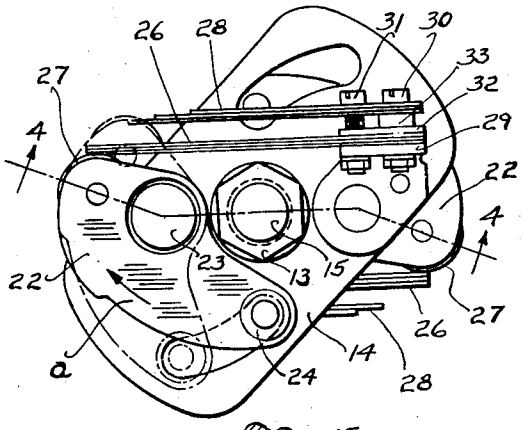


Fig. 2



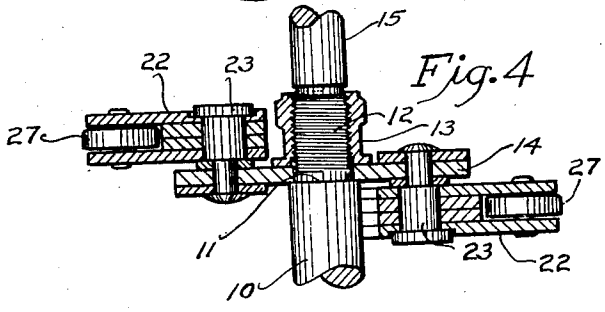
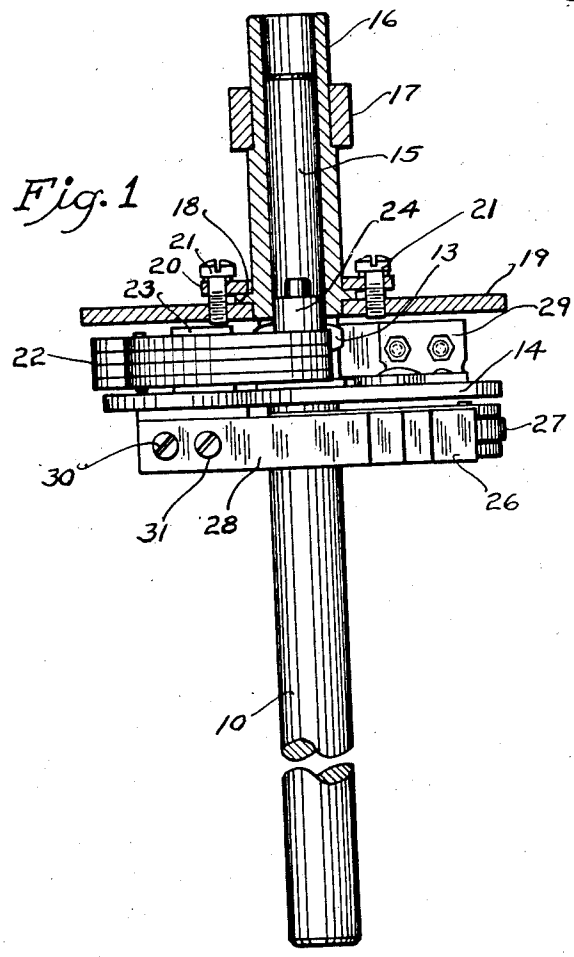


Fig. 4

Fig. 1



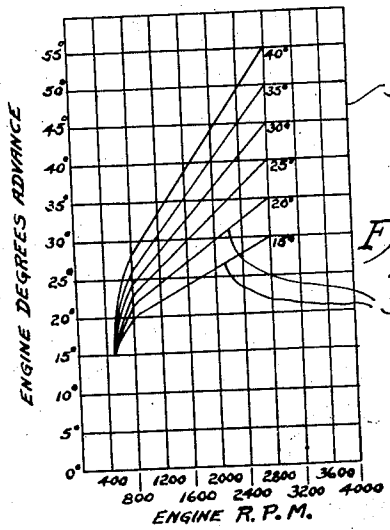


Fig. 5

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UNITED STATES PATENT OFFICE

1,967,445

IGNITION GOVERNOR

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9 Claims. (Cl. 200—31)

This invention relates to an ignition governor capable of controlling the timing of the spark in accordance with the speed of the engine.

In engines of different makes and even in different engines of the same make, in order to obtain the greatest possible efficiency, it has been found necessary to correct or adjust the rate at which the spark is advanced as compared to the increased speed of the engine, and in most cases the advance at the lower speeds, say below 800 R. P. M., requires a different rate than at the higher speeds. Also, in some engines, the maximum advance at high speed should be less than in others.

With the above conditions in mind, it is an object of the present invention to provide a governor which may be adjusted more accurately than those heretofore used, particularly in order to meet these various conditions. As a result of my improved construction a single governor may be adapted for use in connection with different engines which differ greatly in their operation.

The invention, in its preferred form, will be more particularly described in connection with the accompanying drawing, in which—

Figure 1 illustrates the invention partly in elevation and partly in section;

Figure 2 is a plan view of the governor with the cam plate and sleeve removed;

Figure 3 is a plan view of the cam plate and sleeve, illustrating also the position of the governor weight with reference thereto;

Figure 4 is a section taken on the line 4—4 of Fig. 2; and

Figure 5 represents a chart showing advance curves for various adjustments of the cam plate.

In carrying out my invention, the timer shaft 10 is reduced at its upper end to form an annular shoulder 11. Above this shoulder is a threaded portion 12 on which is a nut 13 adapted to clamp a plate 14 against the shoulder 11. The smooth upper portion 15 of the shaft carries a sleeve 16 on which is keyed a circuit breaker cam 17. The lower end of the sleeve 16 is formed with a circumferential flange 18 to which a universal cam plate 19 is clamped by means of a collar 20 and screws 21.

Obviously, the cam plate 19 may be set in any position circumferentially of the sleeve 16 in order to secure a proper initial timing of the spark. Two governor weights 22 are disposed symmetrically with reference to the shaft 10 and are pivotally mounted on pins 23 secured to the plate 14. One of these weights controls the advance of the spark in accordance with the increased speed of the engine while the other acts merely as a counterbalance. Each weight 22 is provided with a pin 24 and the pin on the uppermost weight is adapted to be received in a slot 25 in the cam plate 19.

In order that the maximum possible advance of the spark may be limited in accordance with the operation of any engine to which the governor may be applied, the plate 19 is formed with a number of slots 25 which, in the present instance, respectively represent an advance of 15°, 20°, 25°, 30°, 35° or 40° with reference to the rotation of the timer shaft. In Fig. 3, the pin 24 of the governor weight 22 is represented as engaging the 20° slot, the initial position of the governor weight being represented by a dotted line and the position of the governor weight and the slot at the maximum advance of the spark being represented by dot and dash lines.

The position of the plate 14, with the weights 22, and of the cam plate 19 as represented in the drawings is for a right hand rotation of the timer shaft as indicated by the arrow *a* in Fig. 2. If the governor is applied to a timer shaft having a left hand rotation the cam plate 19 and the plate 14 carrying the weights 22 should be inverted. This change is easily made by removing the screws 21 and the nut 13 respectively.

In order that the advance of the spark may be properly controlled at both lower and higher speeds, the centrifugal action of the weight 22 is resisted first by a primary spring 26 which engages a roller 27 on the governor weight and later by a secondary spring 28 as the speed increases. Each of the springs 26 and 28 may be composed of a number of thin leaves which may be selectively removed or inserted to adjust the timing in accordance with the operation of the engine. Both springs are secured at their rear ends to an upstanding lug 29 on the plate 14 by means of screws 30 and 31, a washer 32 and a spacer 33. By removing some of the leaves of the spring 26 the advance will begin at a lower speed. The rate of advance will become less as the spring 26 engages the spring 28. By tightening the screw 31, drawing the free end of the spring 28 toward the spring 26, the slower rate of advance will begin at a lower speed, By increasing the effective length of the screw 31, or if necessary, by inserting a spacer 33 of greater thickness the slower rate of ad-

vance under the influence of the secondary spring 28 may be caused to take effect only at a higher rate of speed.

In the chart 34 represented in Fig. 5, the lines 35 represent the degrees of spark advance with reference to the speed of the engine for various settings of the cam plate 19, the other settings of the governor remaining the same. In this chart, the abscissas represent the number of revolutions per minute and the ordinates represent the degrees of advance of the spark ahead of dead center position of the piston. The fixed setting represents an advance of 15° and the tension of the spring 26 is such that the governor begins to move outwardly at about 500 R. P. M. while the secondary spring 28 takes effect at about 800 R. P. M. This is a correct setting for many engines requiring a rapid advance of the spark between 500 and 800 R. P. M. and then a slower advance. The governor may be adjusted for engines requiring a substantially straight line advance or, in other words, a uniform spark advance for all speeds, by setting the secondary spring so that its free end substantially touches the primary spring when at rest. By varying the strength of the springs the maximum advance may take place at any speed desired.

From the foregoing description, it will be understood that a speed curve with any desired rate of advance, either at lower or higher speeds may be obtained merely by the proper adjustment. Also, by proper adjustment, the beginning and end of either rate of advance may be caused to take place at any desired engine speed.

While I have shown and described specifically one embodiment of the invention, it will be apparent that the same may be modified in many respects without departing from the scope of the invention as defined in the claims.

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

1. In an ignition timer for internal combustion engines, the combination with means for advancing the timing of the spark as the speed of the engine increases, of means for limiting the angle of maximum advance, means for adjusting such limit, and means for adjusting the control of the speed responsive means, so that the limit of advance will be reached at a higher or a lower speed.

2. In an ignition timer, the combination with a centrifugal governor, of a circuit breaker cam, and a plate having a plurality of radiating slots with different angles of advance, said plate being adjustable with reference to said cam and governor to bring any one of said slots selectively into cooperative relation to the governor.

3. In an ignition timer, the combination with a circuit breaker cam, of a cam plate mounted for rotation therewith and having a plurality of slots with different angles of advance, a centrifugal governor, and means for adjusting the cam plate with reference to the circuit breaker so that the governor selectively cooperates with any one of said slots to advance the spark in accordance with the speed, the selected slot defining the limit of maximum advance.

4. In an ignition timer, the combination of a shaft, a member mounted for circumferential advance with reference to said shaft, a circuit breaker cam keyed to said member, a centrifugal governor mounted on said shaft for controlling the advance of said member, and an intermediate member having a fixed circumferentially adjustable connection with said first-mentioned member and operatively connected to said governor.

5. In an ignition timer, the combination of a shaft, a member mounted for circumferential advance with reference to said shaft, a circuit breaker cam keyed to said member, a cam plate secured to said member and circumferentially adjustable with reference thereto, and a centrifugal governor operatively connected to said cam plate.

6. In an ignition timer, the combination of a shaft, a member mounted for circumferential advance with reference to said shaft a circuit breaker cam keyed to said member, a cam plate secured to said member and circumferentially adjustable with reference thereto, said plate having a plurality of slots of different degrees of advance, and a centrifugal governor which may be operatively engaged with any one of said slots.

7. In an ignition timer for internal combustion engines, the combination with means for advancing the timing of the spark as the speed of the engine increases, of a primary spring constantly resisting such advance, a secondary spring effective to offer further resistance to such advance above a predetermined speed, and adjustable means to cause the secondary spring to become effective at a higher or a lower speed.

8. In an ignition timer for internal combustion engines, the combination with means for advancing the timing of the spark as the speed of the engine increases, of a primary spring constantly resisting such advance, a secondary spring engageable with the primary spring after the latter has yielded to a predetermined extent to oppose further yielding thereof, and means to adjust the secondary spring to vary the position at which the primary spring becomes engaged thereby.

9. In an ignition timer for internal combustion engines, the combination with means for advancing the timing of the spark as the speed of the engine increases, of a primary leaf spring and a secondary leaf spring, both secured at one end, with their free ends normally spaced apart in position to successively resist such advance, and means for adjusting the free end of the secondary spring toward or away from the primary spring.

MARION MALLORY.