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A. A. KENT

IGNITION APPARATUS

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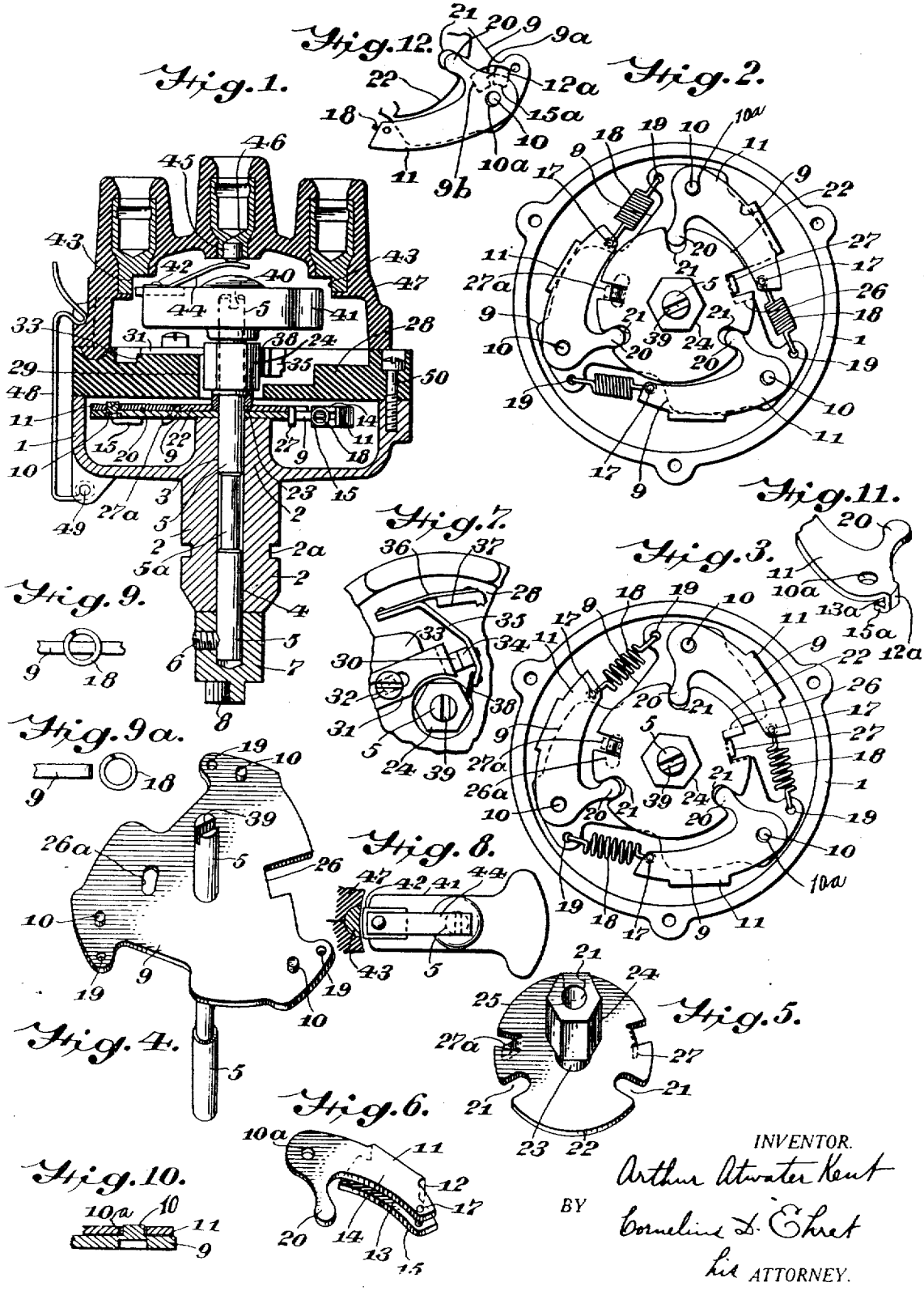

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UNITED STATES PATENT OFFICE.

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IGNITION APPARATUS.

Substitute for or continuation of application serial No. 360,237, filed February 20, 1920. This application filed December 30, 1921. Serial No. 525,936.

To all whom it may concern:

Be it known that I, ARTHUR ATWATER KENT, a citizen of the United States, residing in Ardmore, county of Montgomery, and State of Pennsylvania, have invented certain new and useful Improvements in Ignition Apparatus, of which the following is a specification.

My invention relates to apparatus forming part of or cooperating with the ignition system of an internal combustion engine, and particularly a variable speed engine such as employed upon motor vehicles.

In accordance with my invention, there is provided governor or centrifugal control structure, for automatically advancing or retarding the instants of occurrence of the ignition sparks with changes of engine speed, characterized by high degree of simplicity and compactness, by relatively small weight or mass, and by delicacy, certainty and accuracy of operation.

My invention resides in features of structure and combination of the character hereinafter described and claimed.

This application is a substitute for or continuation of my prior application Serial Number 360,237, filed February 20, 1920.

For an illustration of one of various forms my invention may take, reference is to be had to the accompanying drawing, in which:

Fig. 1 is a vertical sectional view, partly in elevation, through apparatus embodying my invention.

Fig. 2 is a plan view of the governor structure in position corresponding with rest or low speed.

Fig. 3 is a plan view of the governor structure in position corresponding with increased or high speed.

Fig. 4 is a perspective view of the engine driven shaft and the governor plate.

Fig. 5 is a perspective view of the controlled plate and attached cam.

Fig. 6 is a perspective view of one of the governor arms.

Fig. 7 is a fragmentary plan view of the interrupter structure.

Fig. 8 is a fragmentary plan view of distributor structure.

Figs. 9 and 9ª are fragmentary views showing the position of the governor spring with respect to a governor plate.

Fig. 10 is a fragmentary section of a governor plate, pivot and weight.

Figs. 11 and 12 show a modification.

Referring to the drawing, 1 is a casing, preferably of metal, having a central hub 2 secured to or integral therewith. The hub 2 is preferably circular in cross section, preferably machined or turned, to be supported and capable of rotation in a suitable supporting member, not shown, having a screw or the like adapted to enter the groove 2ª, allowing rotation of the hub 2 and the parts supported thereby, and preventing their longitudinal displacement within or from the supporting member. The hub 2 is provided at 3 and 4 with bearings for the shaft 5 driven by and in suitable fixed relation with the engine, the speed of the shaft 5 generally being half that of the crank shaft of the engine when the latter is of the four cycle or four stroke type. In the example illustrated, the shaft 5 has secured thereto in suitable angular position by screw 6 the member 7 having the lug or tongue 8 cooperating with the usual engine driven element or part.

The shaft 5 is cheaply produced from round steel blank, stock or bar, as tool steel, drill rod, or the like, procured upon the market, of suitable diameter requiring no machining for its bearings at 3 and 4, though between these bearing portions, by simple and inexpensive operation, requiring no accuracy or refinement, it may be reduced in diameter, as indicated at 5ª. The only other machining required is that at its upper end, by formation of slot 39, or equivalent, for driving the hereinafter described distributor.

By so constructing the shaft, the cost is materially reduced, since turning or machining to accurate dimensions is dispensed with, the only dimensions requiring accuracy being those of the bearings 3 and 4, and these are predetermined by the stock or blank from which the shaft is made.

Rigidly secured to the shaft 5, as by shrinking it thereon, is the main governor plate 9, of sheet steel or other suitable material, which may be stamped from a sheet of suitable thickness.

Near the periphery of the plate 9, preferably at equal distances from the axis of rotation and preferably equally spaced cir-

cumferentially of the shaft 5, are the pivots 10 upon each of which is pivoted a governor weight or arm 11 which, as indicated in Fig. 6, may be formed of a stamping from sheet metal and bent into U or channel shape, leaving a gap 13 between the upper and lower portions or cheeks 14 and integrally joined by portion 12 which, in the example indicated, does not extend to the pivotal end of cheek 14, the U shaped form embracing the edge of the plate 9, which is received into the slot, gap or channel 13.

The lower or short cheek 15 of the weight 11 serves to prevent the weight 11 rising from the plate 9, and at the same time constitutes a considerable portion of the entire weight of the arm 11. It will be understood that the lengths of the cheek 15 and the part 12 by which it is attached to the arm or weight 11 may be greatly reduced, so that in effect it may be considered merely as a lug which extends to the opposite side of the governor plate 9 for restricting the arm or weight 11 from movement away from the plate 9.

The pivots 10 may be integral with plate 9 as indicated in Fig. 10, and may be formed by partially or incompletely punching them from plate 9. The pivot holes 10^a in the weights 11 are sufficiently larger than pivots 10, as roughly indicated in Figs. 2, 3 and 10, to effect looseness whereby the weights 11 slide upon plate 9 while rotating about pivots 10 under centrifugal force; the pivots 10 do not determine the plane of movement of the weights but serve merely as centers about which they rotate while resting and sliding upon plate 9. Obviously the pivots 10 may be on the weights 11 and the pivot holes 10^a in the plate 9; therefore both dispositions of pivots 10 are included in the appended claims.

At its end remote from its pivot hole 10^a, the arm 11 is provided with the pin 17 to which is attached within the channel 13 one end of a helical spring 18, whose other end is attached to the plate 9 at the hole or other suitable means 19. The plate 9 has recesses 18^a in its edge for accommodating the springs 18. As shown in Figs. 1, 9 and 9^a, the springs 18 are disposed in the plane of plate 9 or plates 9 and 22; or more specifically, the axes of the springs are between the upper side of plate 22 and lower side of plate 9. This disposition of the springs yields compactness of the governor structure which, as regards plates, weights and springs, occupies very small space longitudinally of shaft 5.

To place an arm 11 in operative position upon the plate 9, it is presented thereto in such position that the upper cheek 14, which alone has a pivot hole 10^a, extends more or less radially outward from the pivot 10 without engagement of the lower cheek 15 with the plate 9. In such position the pivot 10 may enter the hole 10^a, then the arm 11 rotated toward the plate 9, whose edge will then enter the channel 13 between the upper and lower cheeks or flanges 14 and 15.

While in the above described structures the weight or arm 11 is formed so as to extend around an outer edge of the plate 9, it will be understood that the weight 11, particularly when the cheek 15 is omitted, may have a lug extending downwardly from the plane of the arm 11 and then parallel with the plane of the arm 11, such lug extending through an aperture in the plate 9. Such structure is indicated in Fig. 11, wherein the aforesaid lug comprises the downwardly extending portion 12^a and the inwardly extending portion 15^a forming between the portion 15^a and the weight 11 a gap, slot or channel 13^a. As shown in Fig. 12, the plate 9 has an aperture 9^a having at its left end 9^b sufficient width in a direction radially from the pivot 10 to allow passage therethrough of the lug member 15^a and having at its right end less radial width sufficient to allow free movement therein of the downwardly extending portion 12^a of the lug. With the weight 11 in the position indicated in Fig. 12, the plate 9 is received in the slot or channel 13^a, and the lug portion 15^a prevents the weight 11 from rising from the plate 9. In this position the weight 11 is in effect locked upon the plate 9. To remove the weight, it is swung counter-clockwise upon its pivot 10 until the lug portion 12^a comes into register with the wide part 9^b of the aperture 9^a, when it may be lifted from the plate 9, the portion 15^a of the lug passing freely through the wide end 9^b of the slot 9^a. When in the position indicated in Fig. 12, however, the lug portion 15^a extends under the plate 9 and prevents rise of the weight 11.

Accordingly, in the structures of Figs. 11 and 12, as well as of the preceding figures, the weight is of channel form. for in both forms of the weight, included in the appended claims, there is formed a channel, these channels being 13 and 13^a, which receives the plate 9; and in both forms the weight embraces an edge of the plate 9, an outer or peripheral edge in the case of Figs. 1, 2 and 3, and an edge of an aperture in the case of Figs. 11 and 12.

Integral with each arm or weight member 11 is an inwardly extending arm or lug 20 whose end projects into a notch or recess 21 in the controlled governor plate 22, to which is rigidly secured the upstanding stub shaft or bushing 23 to which is secured or integral with which is the cam 24, in this example having six faces for actuating the interrupter or timer contacts of the ignition system for a six cylinder engine. Through the cam member 24 ex-

tends a hole 25 through which the engine driven shaft 5 loosely or freely extends to a suitable distance above the cam member 24, as indicated in Fig. 1.

In the plate 9 is formed the notch 26, into which projects the lug 27 integral with and extending downwardly from the controlled or cam plate 22, the circumferential width of the lug 27 being at least that much less than the width of the notch 26 in plate 9 to allow the suitable or desired degree of angular movement of the cam and plate 22 with respect to the plate 9 or shaft 5.

In the plate 9 is formed a second notch or slot 26^a through which extends the lug 27^a struck and extending downwardly from the second or controlled governor plate 22, the lug 27^a after passing through the slot 26^a taking or being bent to such position as to prevent the plate 22 from rising from plate 9, the arcuate length of the slot 26^a and the width of the lug 27^a being preferably such as not to interfere with the limitation of rotation by lug 27 in co-action with slot 26.

It will be understood, however, that lug 27^a in co-action with slot 26^a may not only lock plate 22 against movement away from plate 9, but may serve also, in lieu of lug 27 and slot 26, to determine or limit the rotation of plate 22 and attached cam 24 with respect to plate 9 and shaft 5.

Secured upon the casing 1, as by screws 50, is the plate or base member 28, of any suitable material, in this example of insulating material. At its center the member 28 has a hole or aperture 29, through which extends the cam member 24, and through it, as aforesaid, extends the engine driven shaft 5.

The cam member 24, of any suitable shape and of any suitable number of faces, is adapted to co-act with any suitable type of interrupter or timer mechanism. For example, the ignition apparatus controlled by the cam 24 may be of the so-called open circuit type whereof it is characteristic that the interrupter contacts can never remain in circuit closing position; and of the so-called closed circuit type whose interrupter contacts may, as upon stoppage of the engine in certain position, remain in circuit closing position.

By way of example, a closed circuit type of interrupter mechanism is herein illustrated.

Referring to Figs. 1 and 7, the fixed or stationary interrupter contact 30, of tungsten or other suitable material, is secured upon the metal plate or bar 31, secured by screw 32 to any suitable support, as for example, an upstanding lug 33 upon the base 28.

Co-acting with the contact 30 is the movable interrupter or timer contact 34 carried by the metallic arm 35 supported by spring 36 in turn secured to the bracket member 37 carried by the base plate 28. At its free end the arm 35 is provided with the tip or cam engaging shoe 38, of fibre or other suitable material.

In the upper end of the shaft 5 is provided the offset slot 39 into which projects the rib or lug 40, in a cavity in the distributor arm 41 of molded insulating material or the like. The rib 40 is at the bottom of a recess receiving the upper end of the shaft 5. Accordingly the distributor arm 41 rotates in fixed angular relation with respect to the engine driven shaft 5, and is not affected by the governor control. As shown in Figs. 1 and 8, the distributor arm 41 carries at one end the terminal 42 co-acting with the stationary terminals 43, one for each cylinder of the engine and connected to the spark plug thereof. Connected to the terminal 42 is the contact spring 44 rotating with the arm 41 and engaging the centrally located terminal 45 in contact with the metallic insert 46, with which communicates one terminal of the secondary of the induction coil supplying the high tension ignition energy.

The members 43 and 46 are in the example illustrated inserts molded within the cap 47 of insulating material, preferably molded insulating material, as condensite, bakelite or equivalent.

The cap 47 encloses the interrupter structure and distributor, and is held to the base or plate 28 by springs, one of which is indicated at 48, having hook ends engaging the cap 47 and pivoted at their lower ends at 49 to the casing 1.

The casing 1, member 28 and cap 47 form a unitary structure in which are formed on opposite sides of the member 28 two chambers, one containing the governor mechanism described and the other the interrupter and distributor structure, the shaft 5 extending through the first and into the second chamber. This unitary structure is rotatable about the shaft 5 to different angular positions.

The operation is as follows:

As the shaft 5 is driven or rotated by the engine, in fixed angular relation with respect thereto as determined by the setting of the coupling or member 7 upon shaft 5, the plate 9 is rotated at like speed, and rotates the weights or arms 11, which with increasing speed move outwardly by sliding on plate 9 and swinging on their pivots 10 under the influence of centrifugal force incident to the speed. The outward movement is opposed by the springs 18, which may be of any suitable strength or dimensions. In virtue of the outward movement of the arms 11, from their position indicated in Fig. 2 corresponding with rest or

low speed, their arms 20 rotate the cam plate 22 and cam 24 in clockwise direction, as viewed in Fig. 3, with respect to the shaft 5 and plate 9, thereby advancing the ignition sparks because the cam 24 then engages earlier in the engine stroke the fibre shoe 38, causing movement of the arm 35 to separate the movable interrupter or timer contact 34 from the stationary interrupter or timer contact 30, the moment of separation determining the moment of spark production. In so advancing the plate 22 the lug 27 moves with it, but the extent of movement of the lug 27 and therefore plate 22 is limited by the notch 26 in the plate 9; and plate 22 is locked against movement away from plate 9 and lugs 20 by the lug 27ª.

For all degrees of control movement of the arms 11 upon pivots 10, their upper and lower cheeks 14 and 15 still remain in position embracing the edge of the plate 9, and accordingly for all speeds within the desired or operative range the arms 11 cannot become detached from their pivots 10.

Notwithstanding the movement of the plate 22 and the cam 24, the distributor 41 remains in fixed position with respect to the shaft 5, the angular width of the contact 42 and contacts 43 being such that for all positions of the cam 24 the interrupter contacts 34 and 30 will separate while some part of contact 42 is adjacent or opposite some part of a contact 43.

It is accordingly true of the structure illustrated that the distributor is not shifted or actuated by the spark advancing governor mechanism, but only the interrupter actuating means, as cam 24. That is to say, the cam 24 is operated by the governor mechanism independently of the distributor 41, which remains in fixed relation with respect to the shaft 5 and therefore with respect to the main shaft of the engine. By my structure, therefore, the governor is not called upon to shift the distributor, but is required only to shift the relatively light plate 22 and cam member 24.

It shall be understood, however, that as to some of its aspects my invention is not limited to the extension of the shaft 5 through the cam member or the distributor directly carried by the shaft; but that the shaft may be shorter, and the distributor carried upon an extension upon the cam member 24, whereby distributor and cam are both advanced by the governor.

The structure described, particularly that of the governor mechanism and cam, is of unusually small dimensions and mass, and is none the less certain and accurate in its operation effectively to rotate the cam and so advance the spark with increasing speed.

Should it be desired manually to advance or retard the spark, it is only necessary to rotate the casing 1 and attached parts about the shaft 5, thereby rotating the interrupter arm 35 with respect to the cam 24, which latter, however, for any adjusted position of the casing 1, will nevertheless be controlled by the governor mechanism as above described. For such manual operation there may be secured or clamped to the hub 2 an arm whose actuation about the shaft 5 as a center will effect the manual adjustment described. Certain features herein described and involving characteristics of the engine-driven or governor shaft are not herein claimed, but are claimed in a divisional application.

What I claim is;

1. Ignition timer structure comprising a rotatable governor plate, a weight pivoted to said plate and having channel form embracing an edge of said plate, and a timer cam moved by said weight.

2. Ignition timer structure comprising a rotatable governor member, a weight embracing an edge of said member and movable with respect thereto, and a timer cam moved in response to movement of said weight.

3. Ignition timer structure comprising a rotatable governor plate, a weight sliding on said plate and having channel form embracing the edge of said plate, and a timer cam moved in response to movement of said weight.

4. Ignition timer structure comprising a rotatable governor plate, a weight loosely pivoted to said plate and sliding thereon, said weight having a member embracing an edge of said plate, and a timer cam moved in response to movement of said weight.

5. Ignition timer structure comprising a rotatable governor plate, a pivot on said plate integral therewith, a weight loosely engaging said pivot and sliding upon said plate, and a timer cam moved in response to movement of said weight.

6. Ignition timer structure comprising a rotatable governor plate, a pivot on said plate integral therewith, a weight loosely engaging said pivot and sliding upon said plate, said weight having channel form embracing the edge of said plate, and a timer cam moved in response to movement of said weight.

7. Ignition timer structure comprising a rotatable governor plate, a pivot integral therewith and consisting of metal thereof displaced to one side thereof, and a governor weight loosely mounted upon said pivot and sliding upon said plate.

8. A pivotal weight for a governor of ignition timing structure, comprising cheek members, and a member joining said cheek members at their edges remote from the axis of rotation of the governor.

9. A weight for a governor of ignition timing structure having a portion forming therewith a slot for receiving edgewise a plate of the governor.

10. A weight for a governor of ignition timing structure comprising cheek members joined at their edges, and an actuating arm on one of said cheek members only.

11. A weight for a governor of ignition timing structure comprising cheek members overlying each other, means for pivoting said weight, and an actuating arm on one of said cheek members only and disposed adjacent said pivoting means.

12. A weight for a governor of ignition timing structure comprising cheek members overlying and integral with each other at their edges, and an actuating arm on one of said cheek members only.

13. A weight for a governor of ignition timing structure comprising cheek members spaced from each other to form a channel, an extension on one only of said cheek members having means for pivoting said weight, and an actuating arm on said extension.

14. A weight for a governor of ignition timing structure consisting of an integral sheet metal unit comprising cheek members overlying each other, a member joining said cheek members at their edges, at least one of said cheek members extending beyond said last named member and having means for pivoting said weight, and an actuating arm on said one of said cheek members only.

15. A pivotal weight for a governor of ignition timing structure comprising cheek members overlying each other and joined at their edges, means for pivoting said weight, an arm on one of said cheek members only extending therefrom adjacent said pivotal means, and means for connecting a spring to said weight at a distance from said pivotal means.

16. Ignition timer structure comprising a shaft, a timer cam, governor plates secured, respectively, to said shaft and cam and lying adjacent each other, a weight pivoted to one of said plates and reacting on another of said plates to cause angular movement of said plates, through structure comprising an arm on one of them engaging in a recess in the other of them, said shaft extending freely through said cam and the plate to which said cam is secured, and a distributor carried upon the end of said shaft.

17. Ignition timer structure comprising a shaft and a cam, a governor plate secured to one of them, a circumferentially extending governor weight pivoted to said plate and embracing the edge thereof for effecting relative movement between said cam and said shaft, and a spring secured to said plate and to said weight.

18. Ignition timer structure comprising a shaft and a cam, an axially short governor comprising governor plates lying adjacent each other and secured, respectively, to said shaft and cam, a governor weight pivoted to one of said plates and movable with respect thereto for effecting adjustment of said cam with respect to said shaft, means holding the plate secured to said cam against movement longitudinally of said shaft, said shaft extending through said cam and the plate secured thereto, and a distributor carried by said shaft rotating in fixed angular position with respect thereto.

19. Ignition timer structure comprising an axially short governor comprising governor plates disposed parallel and closely adjacent to each other, a shaft secured to one of said plates, a timer cam secured to another of said plates, and weight structure for effecting relative angular movement of said plates comprising a weight member pivoted to one of said plates and comprising parallel cheek members joined to each other at their edges, and an actuating arm on one of said cheek members only engaging another of said governor plates.

20. Ignition timer structure comprising a rotatable governor plate, a governor weight comprising cheek members disposed on opposite sides of said plate, an extension on one of said cheek members pivoted to said plate, and a timer cam moved by said weight in response to change in speed, said weight being detachable from said pivot only upon movement of said weight to position where the other cheek thereof is free of said plate.

21. Ignition timer structure comprising a rotatable governor plate, a governor weight pivoted to said plate, a second plate lying adjacent said first plate, an engaging connection between said weight and said second plate for effecting angular adjustment between said plates, a timer cam secured to one of said plates, a notch in the edge of one of said plates, and means on the other projecting into said notch for limiting relative movement of said plates.

22. Ignition timer structure comprising a shaft and a timer cam, governor plates lying adjacent each other and secured, respectively, to said shaft and cam, a governor weight pivoted to one of said plates, an engaging connection between said weight and the other of said plates for effecting adjustment of said cam with respect to said shaft in response to change in speed, means positively limiting relative movement of said plates in a direction longitudinally of the axis of rotation, and a distributor terminal rotating in fixed angular relation with said shaft.

23. Ignition timer structure comprising a rotatable governor plate, a weight pivoted to said plate, a spring attached to said weight and to said plate, said weight having a portion between its pivot and spring attachment embracing said plate, and a timer

cam moved in response to movement of said weight.

24. Ignition timer structure comprising a rotatable governor plate, a weight comprising long and short cheeks joined to each other and embracing said plate, a pivotal connection between the long cheek and said plate, and a timer cam moved in response to movement of said weight.

25. Ignition timer structure comprising a rotatable governor plate, a weight carried thereby and movable with change of speed, a second plate moved by said weight, a member fixed to one of said plates and directly engaging the other permitting relative angular movement and preventing separation in a direction longitudinally of their axis of rotation.

26. The combination with ignition timing structure, as a cam, of a governor therefor comprising a rotatable governor plate, a pivoted weight, and a spring extending substantially parallel to said plate for controlling said weight, said plate having a form effecting free space adjacent its edge for said spring.

27. The combination with ignition timing structure, as a cam, of a governor therefor comprising a rotatable governor plate having a recess in its edge, a pivoted weight extending toward said recess, and a spring disposed in said recess in the plane of said plate and attached to said weight.

28. The combination with ignition timing structure, as a cam, of a governor therefor comprising a rotatable governor plate having a recess in its edge and having a hole adjacent said recess, a weight pivoted to said governor plate and extending toward said recess, and a spring disposed in said recess attached to said weight and engaging in said hole in said plate.

29. Ignition timer structure comprising a rotatable governor plate, a weight carried thereby and movable in response to change of speed, a second plate upon which said weight reacts, a timer cam secured to one of said plates, one of said plates having a member projecting through a slot in the other for locking said plates with respect to each other in predetermined position longitudinally of their axis of rotation.

30. Ignition timer structure comprising a rotatable governor plate, a weight carried thereby and movable in response to change of speed, a second plate upon which said weight reacts, a timer cam secured to one of said plates, one of said plates having a member projecting through a slot in the other for locking said plates with respect to each other in predetermined position longitudinally of their axis of rotation, and a projection on one of said plates engaging in an opening in the other for limiting the relative angular movement of said plates, said opening having greater angular width than said slot.

31. Ignition timer structure comprising rotatable governor plates lying adjacent each other, a weight having pivotal connection with one of them and movable in response to change of speed to move another of said plates, a cam moved by said other plate, and means for limiting relative angular movement of said plates comprising a member independent of said pivotal connection, said member attached to one of said plates and engaging in a notch in the edge of the other.

32. Ignition timer structure comprising a shaft and a timer cam, sheet metal governor plates lying adjacent each other and secured, respectively, to said shaft and cam, a plurality of weights pivoted to one of said plates and each having a channel section embracing the edge of one of said plates, resilient means opposing movement of said weights, the other of said plates having a plurality of notches, and lugs integral with said weights engaging in said notches for effecting relative rotation of said plates.

33. Ignition timer structure comprising a rotatable governor plate, a sheet metal weight pivoted to said plate extending around the edge of said plate, and a timer cam moved by said weight.

34. Ignition timer structure comprising a rotatable governor plate, a sheet metal weight pivoted thereto and embracing the edge thereof, a second plate of sheet metal having a notch, a lug integral with said weight engaging in said notch for effecting angular adjustment of said plates, and a timer cam secured to one of said plates.

35. Ignition timer structure comprising a shaft and a cam, sheet metal governor plates secured, respectively, to said shaft and said cam, a weight pivoted to one of said plates for shifting said plates with respect to each other, and a spring secured at its one end to said one of said plates and at its other end to said weight at its end remote from its pivotal connection to said one of said plates.

36. Ignition timer structure comprising a rotatable governor plate, a weight movable under the influence of centrifugal force, a timer cam moved in response to movement of said weight, and a spring controlling said weight disposed substantially in the plane of said governor plate.

37. Ignition timer structure comprising a rotatable governor plate, a weight movable under the influence of centrifugal force, a timer cam moved in response to movement of said weight, and a helical spring controlling said weight and having its axis substantially in the plane of said plate.

38. Ignition timer structure comprising a rotatable governor plate, a weight mov-

able under the influence of centrifugal force, a timer cam moved in response to movement of said weight, and a helical spring controlling said weight and disposed beside and extending substantially parallel with the edge of said plate.

39. Ignition timer structure comprising superposed governor plates, a weight carried by one of said plates, a timer cam moved in response to movement of said weight, and a control spring disposed beside and extending substantially parallel with the edges of said plates.

40. Ignition timer structure comprising a shaft and a timer cam, governor plates lying closely adjacent each other and secured, respectively, to said shaft and said cam, a movable weight in the form of a plate on the same side of one of said plates with the other of said governor plates in substantially the same plane with said other of said governor plates, said weight loosely pivoted to said one of said plates and sliding thereon, means on said weight engaging said other of said governor plates for effecting angular adjustment of said cam with respect to said shaft, and a spring attached to said weight and to one of said plates.

41. Ignition timer structure comprising a shaft and a timer cam, governor plates lying closely adjacent each other and secured, respectively, to said shaft and said cam, a movable weight in the form of a plate on the same side of one of said plates with the other of said governor plates in substantially the same plane with said other of said governor plates, means on said weight engaging said other of said governor plates for effecting angular adjustment of said cam with respect to said shaft, and a weight-controlling spring disposed substantially in the plane of said plates.

In testimony whereof I have hereunto affixed my signature this 28th day of December, 1921.

ARTHUR ATWATER KENT.