E. MOORE.

GOVERNING DEVICE FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED FEB. 18, 1918.

1,388,743.

Patented Aug. 23, 1921.

2 SHEETS—SHEET 1.

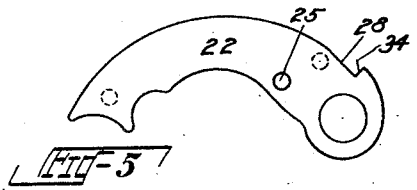


FIG-5

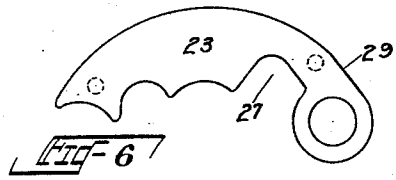


FIG-6

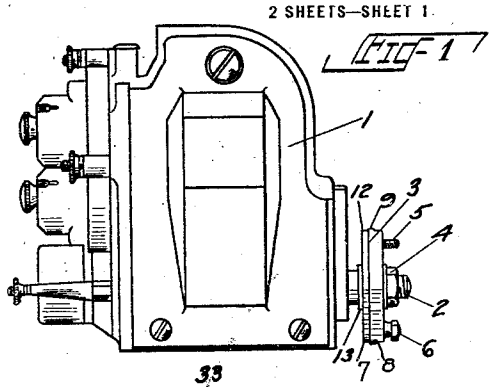


FIG-1



FIG-7

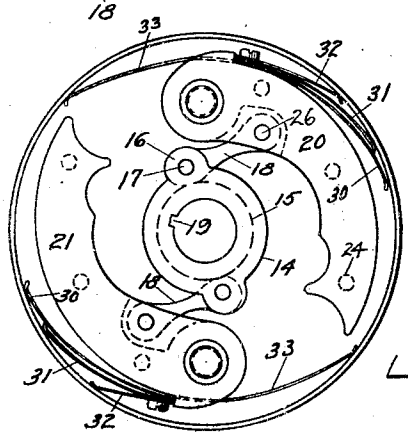


FIG-3

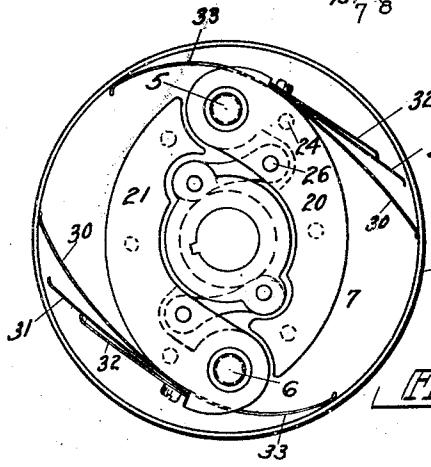


FIG-2

FIG-4

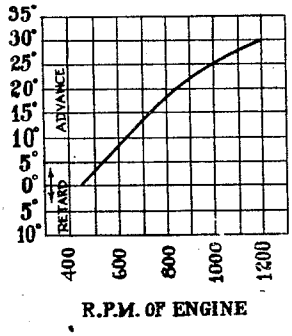


FIG-8

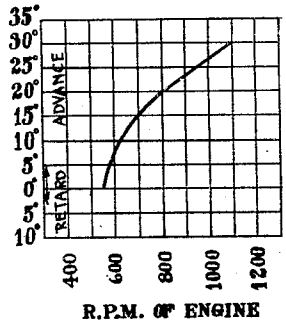
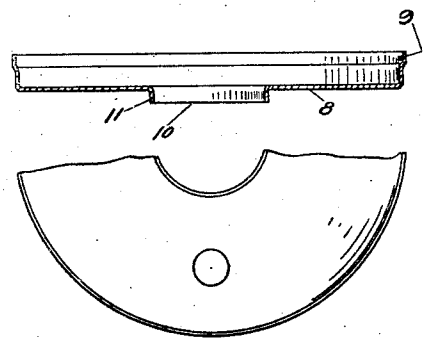


FIG-9



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GOVERNING DEVICE FOR INTERNAL COMBUSTION ENGINES.

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1,388,748.

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2 SHEETS—SHEET 2

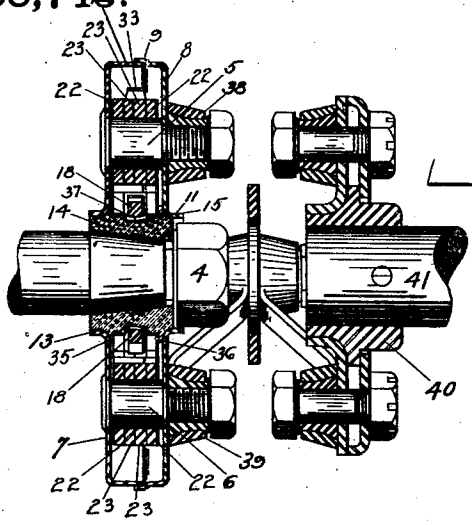


FIG 11

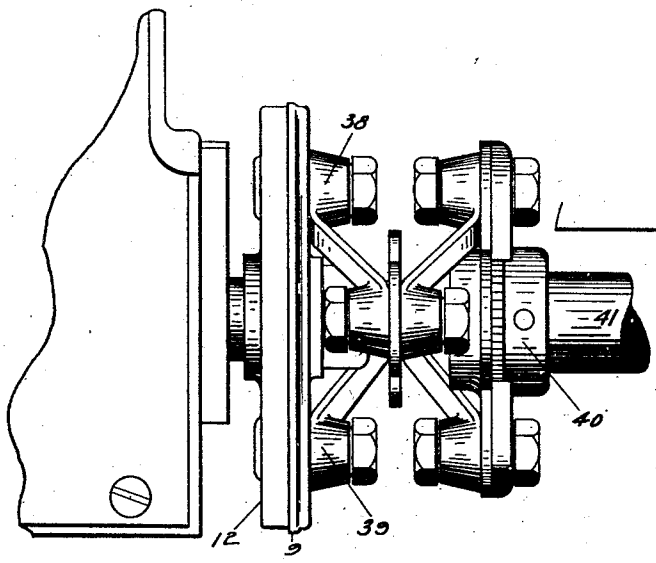


FIG 10

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GOVERNING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

1,388,743. Specification of Letters Patent. Patented Aug. 23, 1921.

Application filed February 18, 1918. Serial No. 217,862.

To all whom it may concern:

Be it known that I, EDWARD MOORE, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in a Governing Device for Internal-Combustion Engines, of which the following is a specification.

My invention relates to means for automatically governing the time of ignition of an internal combustion engine. In order to get the highest efficiency from such an engine it is essential that the spark be advanced in accordance with the increased speed of the engine. Where manual control is used the best sparking point is hard to find by the ordinary driver and it is the primary object of my invention to provide a governing device which will automatically give the proper sparking point without regard to any manual control. My invention is particularly applicable for use on automotive trucks which are more difficult of operation than so-called pleasure vehicles and consequently any work that can be taken off the driver is desirable.

It is another object of my invention to provide a device which is very simple, compact, light in weight and cheap to manufacture, yet efficient in operation.

Other and further objects will be apparent after a study of the specification and drawings which form a part thereof.

In the drawings, Figure 1 illustrates a high tension magneto having my governing device mounted on one end thereof.

Fig. 2 is a plan view of the interior mechanism of the governing device with one of the driving parts removed.

Fig. 3 is a similar view to Fig. 2 except the parts are in another position of operation.

Fig. 4 is a part sectional view of one part of the driving member which incloses the parts shown in Figs. 2 and 3.

Fig. 5 is a plan view of one of the members of the weighted arms shown in Figs. 2 and 3.

Fig. 6 is a plan view of another one of the members constituting the weighted arm.

Fig. 7 is a plan view of the link member connecting the arms to the driven member.

Fig. 8 is a curve taken from one of my governing devices showing its performance under certain conditions.

Fig. 9 is a curve taken from one of my governing devices under another state of operating conditions.

Fig. 10 is a view similar to Fig. 1 but showing only a portion of the magneto and the driving shaft with a coupling attached to the governing device.

Fig. 11 is a vertical section in the plane of the drawing of Fig. 10.

Referring now to the details wherein like numbers refer to corresponding parts in the various views, 1 is a magneto having a shaft 2 upon which my governing device 3 is adapted to be mounted in a manner which will be hereinafter explained, the said governing device being held on the shaft by the usual nut 4. Extending from the governing device are studs 5 and 6 to which is adapted to be fastened by arms 38 and 39 to any suitable coupling 40 that is operatively connected to some driving shaft 41 of the engine. The construction of the coupling shown in Figs. 10 and 11 constitutes no part of my present invention and hence need not be further described herein. The governing device in my preferred form is made up of two punched parts 7 and 8. The part 8 has a shouldered flange 9 at its outer periphery and a central opening 10 formed by a short hub 11. The part 7 of the driving member has a smooth flange 12 that is adapted to fit snugly within the shouldered flange 9 so as to produce substantially a water and dust proof joint. The part 7 has a hub 13 corresponding to hub 11 of the part 8 and a central opening corresponding to opening 10. Positioned within the openings and hubs 11 and 13 is a driven member 14 having said flanges 35 and 36 and a centrally arranged groove 37, the bottom of which is shown at 15 in Fig. 7. Arranged on either side of said groove and adjacent to said flanges 35 and 36 are ears 16 having holes 17 therein. The holes 17 are adapted to receive pins which pivotally secure links 18 to the driven member 14 which is keyed to the magneto shaft 2 by a key and keyway 19 and further held on the shaft, which is preferably tapered, by the nut 4 shown in Fig. 1. The part 7 constituting a part of the driving member has two studs 5 and 6, previously referred to, securely fastened thereto in any suitable manner. Pivotally mounted on the studs 5 and 6 are two weighted arms 20 and 21. Each of these arms are preferably constructed of punched pieces, the top and bottom pieces being

shown in Fig. 5 and numbered 22, while the two central pieces are like part marked 23 shown in Fig. 6. These parts when assembled are fastened together by rivets 24. The pieces 22 have holes 25 therein which are for the purpose of receiving rivets 26 that pass through the hole in one end of the link 18; this end of the link 18 operating within the cutaway portion 27 of the pieces 23. The pieces 22 and 23 are flattened off at 28 and 29 for the purpose of attaching, as by screws the spring members 30—31—32 and 33. Springs 30—31 and 32 abut against shoulder 34 on the two pieces 22 constituting the upper and lower elements of the weighted arm as shown in Figs. 2 and 3 while spring 33 passes between the shoulders 34 since these shoulders do not appear on the two central pieces 23. The function of the spring 33 will be hereinafter referred to.

Considering the operation of my device with reference to Fig. 2 without the spring 33 as it will be understood that the weighted arms 20 and 21 are in the position of relatively low speed of the engine and hence of the driving and driven parts of my governing device. In this position the spring 30 rests against the inside edge of the flange 12 thereby preventing the weighted arms 20 and 21, from rattling. As the engine is given more fuel it begins to speed up and, on account of centrifugal force, the arms 20 and 21 begin to move out toward the flange 12 and shortly the spring 31 is brought into operation and as the speed further increases the spring 32 is brought into operation so that an increasing force is applied to overcome the effect of centrifugal force acting on the weighted arms. On account of the construction hereinbefore described, it is seen that as the weighted arms 20 and 21 move outward the links 18 serve to shift the driven member 14 toward advance position whereby the rotating member of the magneto is automatically advanced. It is to be understood that the breaker mechanism, field poles and rotating element of the high tension magneto illustrated are properly timed and fixed with respect to each other for most efficient operation and hence remain in constant relationship, my automatic governing device merely shifting the relation of the spark with reference to the engine pistons.

The curve of operation of my governing device without the spring 33 is shown in Fig. 9. For some classes of service, however, where it is advantageous that the spark should begin to advance with reference to the engine, sooner and more gradually, I make use of an additional modifying means such as a spring 33, that is to say, the spring 33 serves to modify the effect of the springs 30—31 and 32 and this effect is illustrated in the curve shown in Fig. 8, wherein it is seen that the automatic advance begins at about 100 revolutions lower than in Fig. 9 and that the advance is more gradual over the range of lower speeds. From an inspection of Figs. 2 and 3 this effect can be predicted, inasmuch as in Fig. 2 the spring 33 serves to nullify part of the effect of spring 30 at the beginning, consequently the weighted arms are more susceptible to centrifugal force and the advance will start sooner but as the speed increases the effect of the spring 33 becomes less and less until the upper part of the curve of Fig. 8 is substantially like the upper part of the curve of Fig. 9.

In Patent #1,202,463, issued October 24, 1916, to John Wilkinson, there is shown and described a governing device having controlling springs which function somewhat like the device shown in my present invention which is intended to be a decided improvement in many ways over the device shown in said Wilkinson patent.

In the construction of my device I have aimed to make as few parts as possible, designing them so that they may be duplications one of the other and arranging them so that they are interchangeable; for example, when it is necessary to change the direction of rotation all that is required is to drive out the pins 17 which connect the links 18 to the ears 16 and remove the arms 20 and 21 from the studs 5 and 6 and merely turn them over and place them back on the studs, shift the driven member the required distance and put back the pivot pins 17. I consider this a very important feature of my construction as it means fewer parts and a cheaper construction.

While I have shown a prefered form of my invention I do not wish to be limited to the exact details shown therein as numerous changes and alterations may be made in various details without departing from the spirit of my invention or the scope of the appended claims.

Having thus described my invention what I claim is:—

1. In a device of the character described, the combination of a multi-part driving member and a driven member, said driven member being housed within the driving member, studs on one of the parts of said driving member provided with means to bind the said parts together, weighted arms responsive to centrifugal force pivoted on said studs, links connecting said arms to the driven member whereby the driven member is responsive to movement of said arms and means for opposing the effect of centrifugal force on said arms as they are rotated.

2. In a device of the character described, the combination of a driving member and a driven member, said driven member being housed within the driving member, studs on said driving member, weighted arms respon-

sive to contrifugal force pivoted on said studs, links connecting said arms to the driven member whereby the driven member is responsive to movement of said arms, and a plurality of springs carried by said arms for opposing the effect of the centrifugal force on said arms, said springs being brought into operation successively as said arms move about said pivots.

3. In a device of the character described, the combination of a driving member consisting of two parts having coöperative flanges and central openings, studs fastened to one of said parts and projecting through the other part with means on said studs for drawing the said flanges tightly together, a driven member positioned within the two part driving member and having hubs extending through said central openings, weighted arms responsive to centrifugal force pivoted on said studs, links connecting said arms to the driven member intermediate said hubs, and means carried by said arms for modifying the effect of centrifugal force on said arms as they are caused to rotate.

4. In a device of the character described, the combination of a driving member consisting of of two parts having coöperative flanges and central openings, studs fastened to one of said parts and projecting through the other part with means on said studs for drawing the said flanges tightly together, a driven member positioned within the two part driving member and having hubs extending through said central openings, weighted arms responsive to centrifugal force pivoted on said studs, links connecting said arms to the driven member intermediate said hubs, and a plurality of springs brought into operation successively for opposing the effect of centrifugal force on said arms.

5. In a device of the character described, the combination of a driving member consisting of two parts having coöperative flanges and central openings, studs fastened to one of said parts and projecting through the other part with means on said studs for drawing the said flanges tightly together, a driven member positioned within the two part driving member and having hubs extending into said central openings, weighted arms responsive to centrifugal force pivoted on said studs, links connecting said arms to the driven member intermediate said hubs, and a plurality of springs carried by said arms and adapted to engage successively the inner part of said flanges to oppose the effect of centrifugal force on said arms for the purpose described.

6. In a device of the character described, the combination of a driving member and a driven member, said driven member being housed within the driving member, studs on said driving member, weighted arms responsive to centrifugal force pivoted on said studs, links connecting said arms to the driven member whereby the driven member is responsive to movement of said arms, a plurality of springs carried by said arms extending toward the extremity thereof and adapted to be brought into operation successively for opposing the effect of centrifugal force on said arms and a modifying means carried by said arms for altering the effect of said plurality of springs as described.

7. In a device of the character described, the combination of a driving member consisting of two parts having coöperative flanges and central openings, studs fastened to one of said parts and projecting through the other part with means on said studs for drawing the said flanges tightly together, a driven member positioned within the two part driving member and having hubs extending into said central opening, weighted arms responsive to centrifugal force pivoted on said studs, links connecting said arms to the driven member intermediate said hubs, means carried by said arms for modifying the effect of centrifugal force on said arms as they are caused to rotate, and means for further modifying the effect produced by the first mentioned means for the purpose described.

8. In a device of the character described, the combination of a driving member consisting of two parts having coöperative flanges and central openings, studs fastened to one of said parts and projecting through the other part with means on said studs for drawing the said flanges tightly together, a driven member positioned within the two part driving member and having hubs extending through said central openings, weighted arms responsive to centrifugal force pivoted on said studs, links connecting said arms to the driven member intermediate said hubs, a plurality of springs brought into operation successively for opposing the effect of centrifugal force on said arms, and a spring normally in operative position but gradually rendered inoperative as said plurality of springs are brought into operation for the purpose described.

9. In a device of the character described, the combination of a driving member consisting of two parts having coöperative flanges and central openings, studs fastened to one of said parts and projecting through the other part with means on said studs for drawing the said flanges tightly together, a driven member positioned within the two part driving member and having hubs extending into said central openings, weighted arms responsive to centrifugal force pivoted on said studs, links connecting said arms to the driven member intermediate

said hubs, a plurality of springs carried by said arms and adapted to engage successively the inner part of said flanges to oppose the effect of centrifugal force on said arms, and a resilient member carried by said ends of the arms normally in engagement with said flange and acting to oppose the early movement of said arms but subsequently offering less and less resistance as and for the purpose described.

10. In a device of the character described, a driving member, a driven member housed within the driving member and mechanism for coupling said members together including centrifugal means for shifting the driven member about its axis relative to the driving member as the speed of the driving member varies, and springs arranged to come into action successively for retarding the advance of the driving member, as and for the purpose described.

11. In a device of the character described, a driving member consisting of two parts flanged together and having central openings therein with means for fastening said parts securely in operative position, a driven member housed within said two parts and positioned in said openings, and mechanism for coupling the driving and driven members together including centrifugal means for shifting the driven member about its axis relatively to the driving member as the speed of the driving member varies, and springs carried by said centrifugal means arranged to come into action successively for retarding the advance of the driving element, as and for the purpose described.

12. In a device of the character described, a driving member, a driven member housed within the driving member and mechanism for coupling said members together including centrifugal means for shifting the driven member about its axis relative to the driving member as the speed of the driving member varies, and springs arranged to come into action successively for retarding the advance of the driving member, and an auxiliary device for modifying the effect of said springs, as and for the purpose described.

13. In a device of the character described, a driving member consisting of two parts flanged together and having central openings therein with means for fastening said parts securely in operative position, a driven member housed within said two parts and positioned in said openings, and mechanism for coupling the driving and driven members together including centrifugal means for shifting the driven member about its axis relatively to the driving member as the speed of the driving member varies, and springs carried by said centrifugal means arranged to come into action successively for retarding the advance of the driving element, and an auxiliary spring carried by said centrifugal means for modifying the effect produced by said first mentioned springs as and for the purpose described.

14. In a governing device, a driving member consisting of two parts flanged together at their periphery and having central openings with means for holding said parts in operative position, a driven member having ears thereon positioned within said two parts and having hubs projecting into said central opening and mechanism for coupling said members together including pivotally mounted laminated weighted arms with links pivoted at one end between the outer of said laminations of the weighted arms and pivoted at the other end between said ears on the driven member, whereby movement of said arms serve to shift the driven member about its axis relative to the driving member as the speed of the driving member varies, and springs arranged to come into action successively for retarding the advance of the driving member, as and for the purpose described.

In witness whereof, I affix my signature.

EDWARD MOORE.