T. M. MUELLER.

DEVICE FOR TIMING MAGNETOS TO OPERATE WITH TWO CYLINDER GAS ENGINES SET V-SHAPED.

APPLICATION FILED OCT. 12, 1907.

964,298. **Patented July 12, 1910.**

Fig. 1.

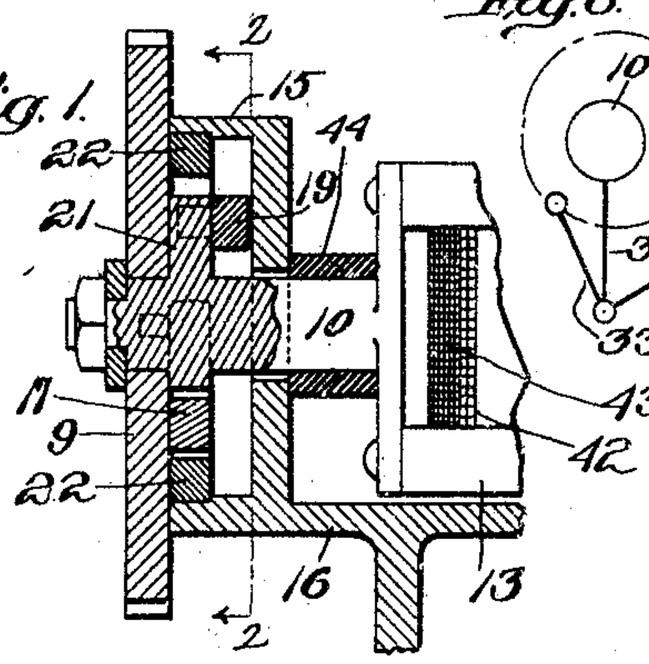


Fig. 8.

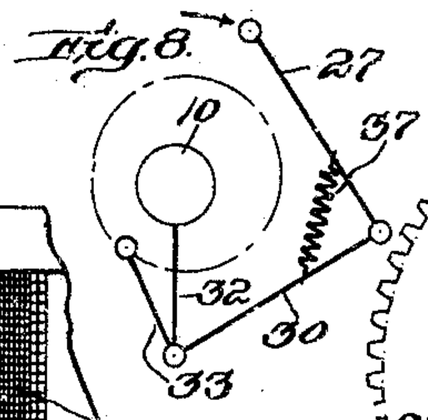


Fig. 2.

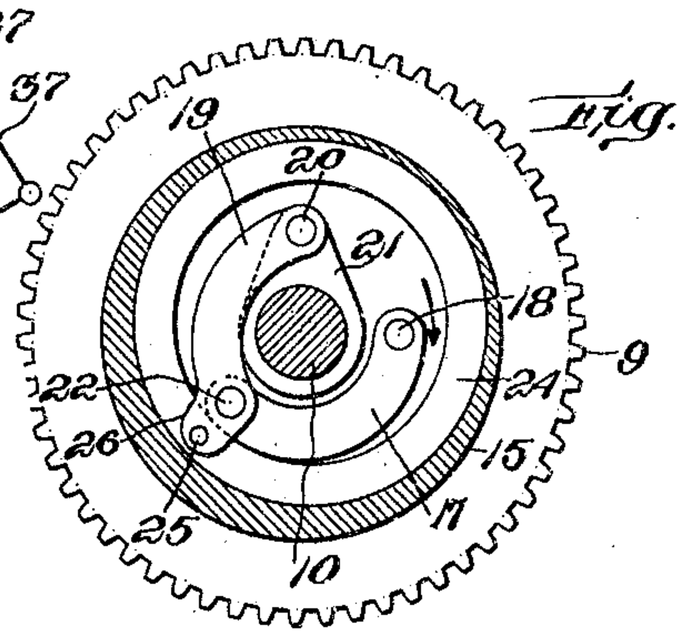


Fig. 3.

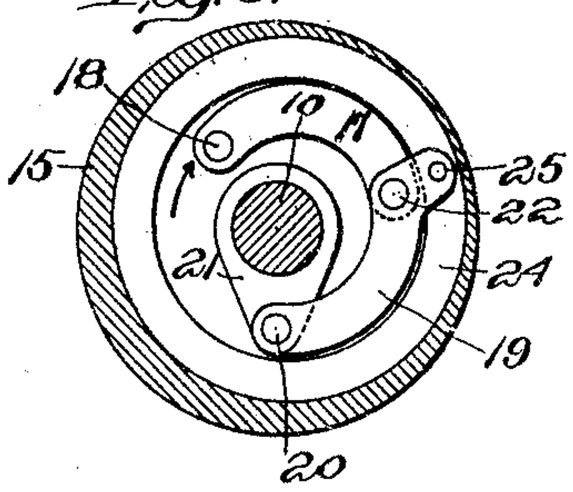


Fig. 4.

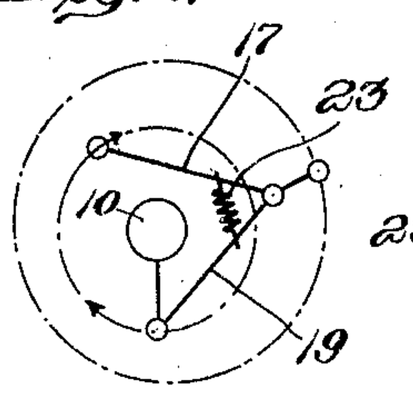


Fig. 5.

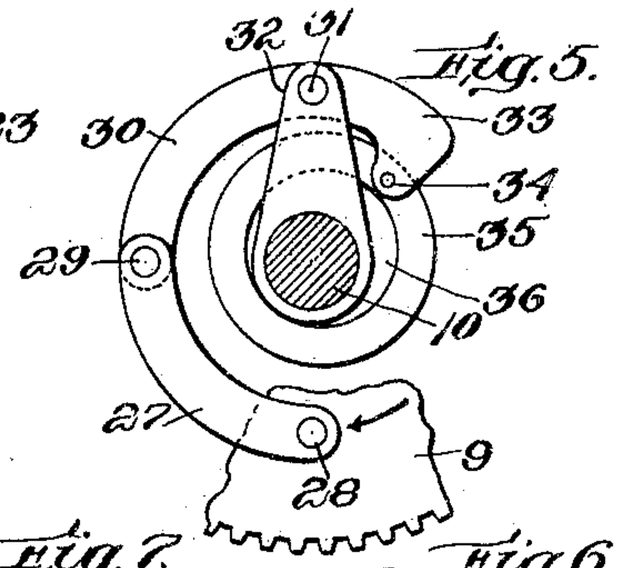


Fig. 9.

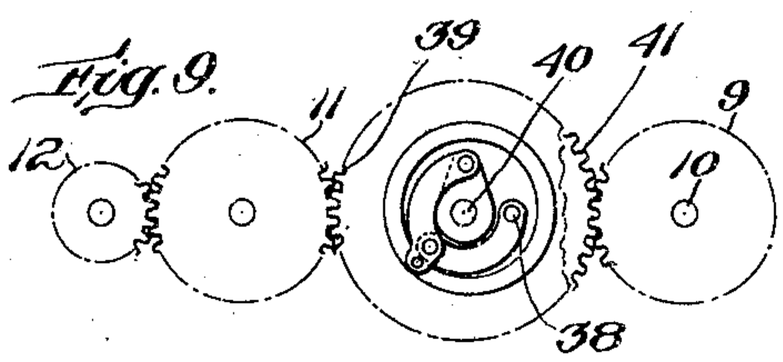


Fig. 7.

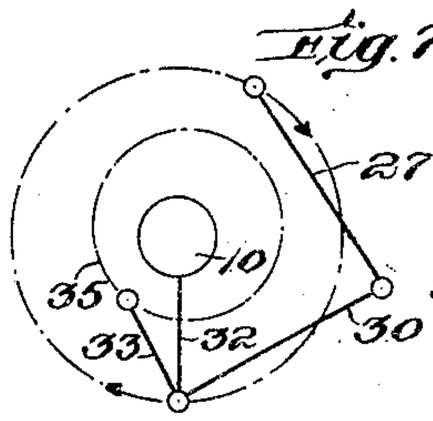


Fig. 6.

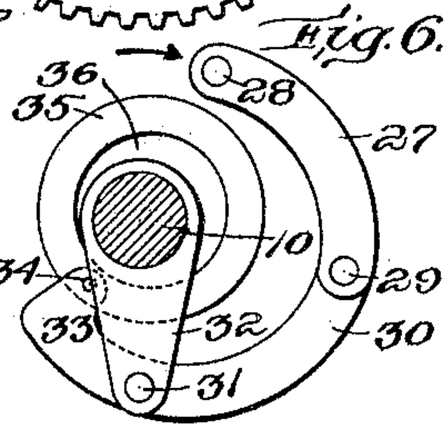


Fig. 10.

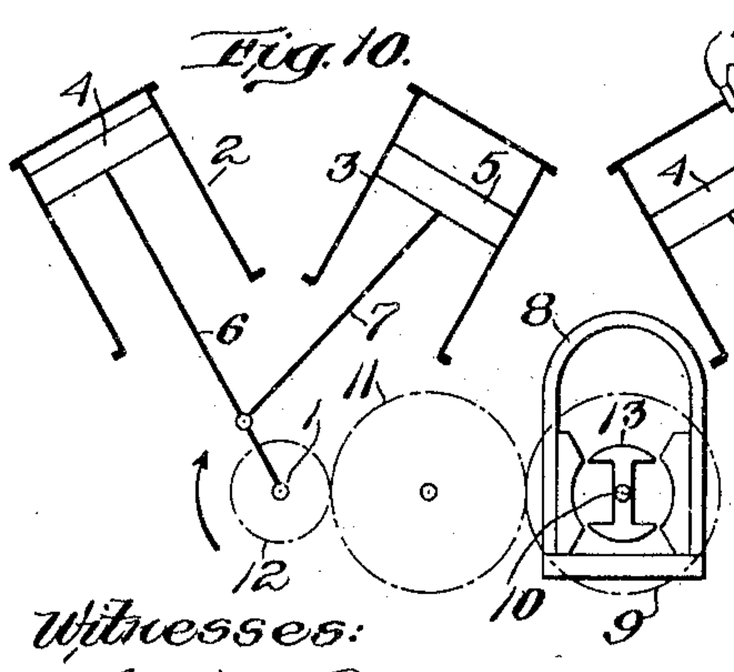
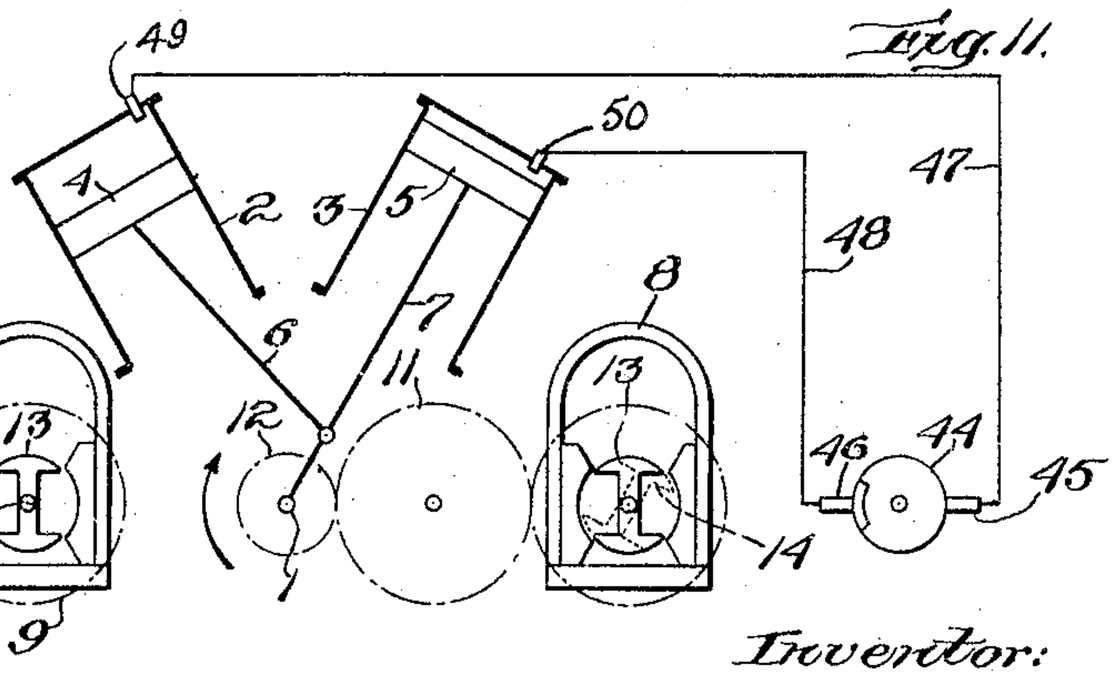


Fig. 11.



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Atty.

THE NORRIS PETERS CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

THEODOR M. MUELLER, OF BRAINTREE, MASSACHUSETTS.

DEVICE FOR TIMING MAGNETOS TO OPERATE WITH TWO-CYLINDER GAS-ENGINES SET V-SHAPED.

964,298. Specification of Letters Patent. Patented July 12, 1910.

Application filed October 12, 1907. Serial No. 397,120.

To all whom it may concern:

Be it known that I, THEODOR M. MUELLER, a subject of Germany, residing at Braintree, in the county of Norfolk and State of Massachusetts, have invented an Improvement in Devices for Timing Magnetos to Operate with Two-Cylinder Gas-Engines set V-Shaped, of which the following description, in connection with the accompanying drawings, is a specification, like numerals on the drawings representing like parts.

In running two-cylinder gas engines in connection with a magneto, difficulty is commonly experienced in getting proper efficiency from the magneto, due to the fact that the cylinders of the engine are set V-shape or at an angle of less than 180 degrees, whereas, the poles of the magneto being 180 degrees apart, the sparking of the magneto commonly takes place at equal intervals, *i. e.*, 180 degrees apart, which does not correspond to the angle of the cylinders; and accordingly my invention aims to provide means for synchronizing the movement of the magneto to correspond to the relative position of said two cylinders which are set V-shape, so that the spark will be produced by the magneto at exactly the correct time for each of the cylinders and at the time the current is at its maximum. To this end I interpose between the armature shaft of the magneto and the driving gear thereof, means for converting the uniform rotation of the latter into alternately accelerated and retarded movement of the armature, the result being that there is a long interval between two successive interruptions of the primary current of the magneto and then a short interval, said intervals corresponding to the cycles of movement of the engine and depending upon the angle of the two cylinders.

While my invention may be carried out by a wide variety of mechanism, I have herein shown and described only the preferred embodiments thereof, the drawings showing in, Figure 1 a transverse sectional view of one embodiment of the invention applied to a usual magneto; Fig. 2 a cross sectional view on line 2—2, Fig. 1 showing in end elevation the means for accomplishing the variable movement; Fig. 3 a similar sectional view showing the parts in another position; and Fig. 4 a partially diagrammatic view of a modification. In Figs. 5, 6, 7 and 8 I have shown similar views of further modifications, the latter two being partly diagrammatic; Fig. 9 is a similar end view, partly diagrammatic, illustrating a further application or modification of the invention; and Figs. 10 and 11 are diagrammatic views representing my invention in operative relation to the engine.

I have deemed it unnecessary to show the mechanism of the magneto as any kind may be employed, for instance, such as is shown in my Patent No. 845,368 Feb. 26, 1907.

As already stated, my invention resides in providing between the engine or source of driving power and the armature of the magneto, means for driving the latter at varying speeds, such that it will cause the interruptions of the primary current to take place when the current is at its maximum and when the pistons of the two V-set cylinders are at the right position respectively therefor. Preferably said means is applied directly to the magneto, although I wish it understood that it may be applied at any point between the source of driving power and the magneto whereby the armature of the latter will receive the desired variations of speed at the proper moments.

Referring to the diagrammatic Figs. 10 and 11, I have indicated a usual crank shaft 1 of the engine, having two cylinders 2, 3 containing pistons 4, 5, whose piston rods 6, 7 are driven by said crank shaft, said cylinders being set V-shape or at an angle to each other less than 180 degrees, as is usual in this type of engine. The magneto 8 is shown as driven by a gear 9 fast on its armature shaft 10 and in mesh with the engine cam shaft 11, which in turn is engaged with a gear 12 on the crank shaft, the armature being indicated at 13. In Fig. 10 the parts are shown in the right position of the armature of the magneto for firing cylinder 2, whose piston is then just ready to begin its down stroke. If the armature is driven at uniform speed it is evident that when the piston 5 of cylinder 3 is in the corresponding position, ready to be fired, as shown in Fig. 11, the armature will then be in the position shown in dotted lines at 14 Fig. 11, whereas for proper efficiency it should be in the position shown in full lines in Fig. 11. To retard its movement therefore, so that instead of occupying the dotted

line position it will occupy the full line position Fig. 11 when the cylinder 3 is to be fired, and will thereafter be advanced so that when the cylinder 2 is again ready to be fired, the armature will have been rotated so as to bring it again into the position shown in Fig. 10, I interpose at some convenient point between the crank shaft 1 or source of driving power, and the magneto armature shaft 10, the variable speed mechanism hereinafter described, which is preferably connected directly to the armature shaft itself.

Referring to Figs. 1 and 2, I have provided a controller shown as an eccentric cam 15 held stationary by any suitable means as by being mounted directly on the frame 16 of the magneto, and have mounted the gear 9 loosely on the shaft 10 of the magneto. Between said shaft and gear I interpose a knuckle joint, one link 17 thereof being pivoted at 18 to the gear 9 and the other link 19 being pivoted at 20 to an ear 21 fast on the shaft 10, said two links 17 and 19 being pivoted together at 22 so as to permit them to buckle or bend outwardly as their revolving force is being controlled by the eccentric wall or flange of the cam 15. This outward and inward movement of the links causes a shortening or bringing together of the two pivot points 18 and 20 when the pivot 22 is traveling over the short radius side of the eccentric, and causes a lengthening or separation of the two pivots 18 and 20 when the pivot 22 is traveling over the long radius side of the eccentric, and as the pivot 18 is compelled by the gear 9 to move at an absolutely uniform speed, the result is that the pivot 20 and hence the armature shaft 10 and its armature are compelled to move at a varying speed. The links 17 and 19 may be held outward by any convenient means, a spring 23 being shown in Fig. 4 and a ring 24 being shown in Figs. 2 and 3. The ring 24 construction makes it absolutely positive that the varying speed shall be under the perfect control at all times of the eccentric flange, inasmuch as the ring fits the eccentric (thereby rendering this species of cam preferable) and is carried around by a pin 25 projecting from an ear 26 of the link 19, said pin 25 being outside of the pivot 22 as shown in Figs. 2 and 3. Fig. 2 corresponds in the position of parts to the diagrammatic view in Fig. 10, and Fig. 3 corresponds to Fig. 11.

In Figs. 5—8 I have shown a modification of the previously described construction, in which a link 27 is pivoted as before at 28 to the gear 9 and is pivotally connected at 29 to a link 30, which is intermediately pivoted at 31 to an arm 32 projecting rigidly out from the armature shaft 10, the free end 33 of said link 30 being pivoted at 34 to a sliding ring 35 mounted on a stationary eccentric 36 which surrounds the armature shaft 10. The ring 35 may be omitted and a spring 37 employed, as shown in Fig. 8, performing the same office as the spring in Fig. 4. The parts are shown in Fig. 5 in the position corresponding to Fig. 10, and in Fig. 6 corresponding to Fig. 11. In Fig. 7 I have shown diagrammatically the mechanism in the same position as in Fig. 6 for the purpose of illustrating the operation of the devices somewhat more clearly.

For the purpose of making more apparent the fact that my invention need not be applied necessarily directly to the armature shaft but may be interposed at any other place between the source of driving power and said armature shaft, I have indicated in Fig. 9 the variable speed mechanism as pivoted at 38 to a gear 39 loose on a shaft 40 which has fast thereon a second gear 41, the latter being in mesh with the gear 9 and the former, gear 39 being in mesh with gear 11. This view is inserted simply to make clear the breadth of my invention. In Fig. 1 I have indicated the primary winding at 42, the secondary winding at 43, and the collector ring at 44, the brushes being shown at 45, 46, in Fig. 11, whence the conductor wires 47, 48 connect to the spark plug 49, 50 of the engine cylinders 2, 3, respectively.

As I have already briefly described the operation in connection with my description of the details of construction, and accordingly it will be sufficient to point out in each instance that as the engine, through its train of gears, drives the magneto gear forward at an even, continuous speed, the latter, through the pivot pin 18 or 28 as the case may be, moves the link 17 or 27 forward at the same even speed, but as said link and its connected link 19 or 30 is caused by the adjacent eccentric to move alternately toward and from the magneto shaft and thereby correspondingly advance and retard the ear 21 or arm 32, the result is that the magneto shaft (which fixedly carries said ear or arm) and its armature, are correspondingly advanced and retarded. This advancement and retardation are so arranged with relation to each other that they cause the armature to break the magneto circuit at the same point or position with relation to their pole pieces for firing each of the two cylinders 2, 3 notwithstanding the fact that the latter are set V-shape with relation to each other. In other words, the magneto current is interrupted at its maximum for both cylinders when their pistons are in the same position respectively. By reason of my invention it is no longer necessary to fire cylinder 2 a little prior to the arrival of its piston 4 at the most desirable point therefor and to fire cylinder 3 a little after the arrival of its

piston 5 at the most desirable point therefor, due to the fact that the magneto was driven at the same unvarying speed as the engine and hence its current was interrupted at points corresponding to successive positions of the crank shaft 180 degrees apart, but because of the variable speed mechanism interposed between the magneto and the crank shaft, the latter is automatically retarded and advanced so as to interrupt the magneto current when the crank shaft is in corresponding positions for each of the two V-set cylinders. I prefer to employ the eccentric as it gives uniform acceleration and retardation to permit the employment of the position-maintaining rings 24, 35, but I do not intend to limit myself to this form of cam surface or controller nor to this form of position-maintainer, and it will be understood also that the form of the cam surface of path controller will depend upon the angle of the cylinders.

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

1. The combination with a magneto and its armature and a gas-engine having V-set cylinders, of a driving gear, connections from said gear to said armature including means having an unvarying movement with relation to the armature, and yielding mechanism between said means and said gear to similarly position the armature at the exploding moments of said cylinders respectively, and a cam for determining the variations of said yielding mechanism and thereby controlling the resulting variable speed of the armature with relation to said gear.

2. The combination with a magneto and its armature shaft and a gas-engine having V-set cylinders, of a driving gear, yielding connections between said gear and said shaft for timing the movements of the armature to the positions of the pistons in said cylinders, a cam for determining the variations of said yielding connections, and means coöperating with said cam and said yielding connections for compelling the latter to be governed at all times by the cam.

3. The combination with a magneto and its armature shaft, of driving means, yielding connections between said driving means and said shaft, an eccentric for determining the variations of said yielding connections, and a slide ring coöperating with said eccentric and said yielding connections for compelling the latter to be governed at all times by the eccentric.

4. The combination with a magneto and its armature shaft, of a driving gear loose on said shaft, links pivotally connected to each other and one link being pivoted to said gear, the other link being pivoted to said shaft, said links being capable of moving radially toward and from said shaft at their intermediate pivotal connection, and a cam for governing said radial movement and thereby producing, through the links, forward and backward movement of the shaft with relation to the gear.

5. The combination with a magneto and its armature shaft, of a driving gear loose on said shaft, links pivotally connected to each other and one link being pivoted to said gear, the other link being pivoted to said shaft, said links being capable of moving radially toward and from said shaft at their intermediate pivotal connection, a cam for governing said radial movement, and sliding means connected to said links and maintained at all times in sliding engagement with said cam, thereby producing, through the links, forward and backward movement of the shaft with relation to the gear.

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

THEODOR M. MUELLER.

Witnesses:

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JOHN F. TROY.