A. RILLING.

MEANS FOR USE IN AUTOMATICALLY CONTROLLING THE TIMING IN MAGNETO IGNITION APPARATUS.

APPLICATION FILED NOV. 25, 1911. RENEWED DEC. 6, 1917.

1,273,095. Patented July 16, 1918.

2 SHEETS—SHEET 1.

Fig. 1

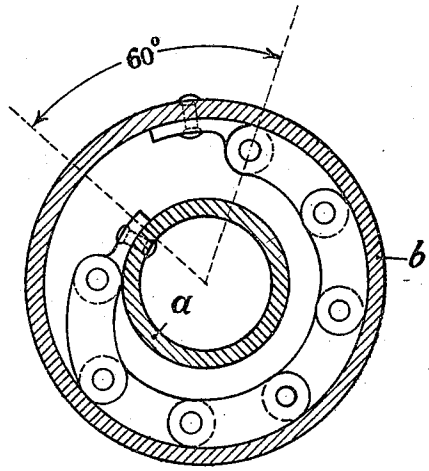


Fig. 2

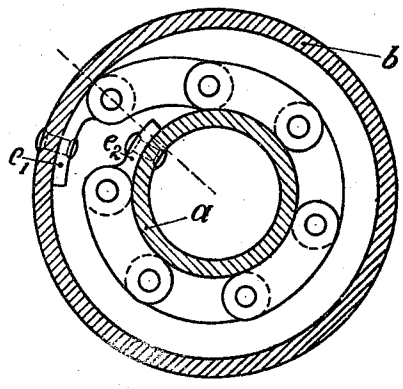


Fig. 3

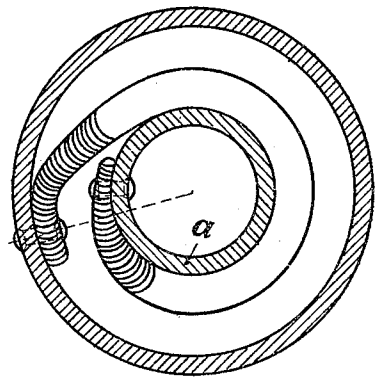
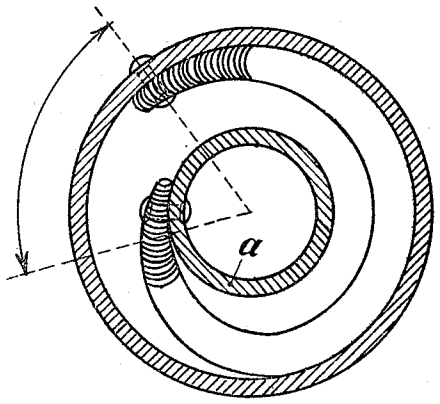


Fig. 4



Attest:
Edna C. Moeland
Alan C. McDonnell

Inventor:
Albert Rilling
by Geo. Scherr & Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

A. RILLING.

MEANS FOR USE IN AUTOMATICALLY CONTROLLING THE TIMING IN MAGNETO IGNITION APPARATUS.

APPLICATION FILED NOV. 25, 1911. RENEWED DEC. 6, 1917.

1,273,095.

Patented July 16, 1918.

2 SHEETS—SHEET 2.

Fig. 5

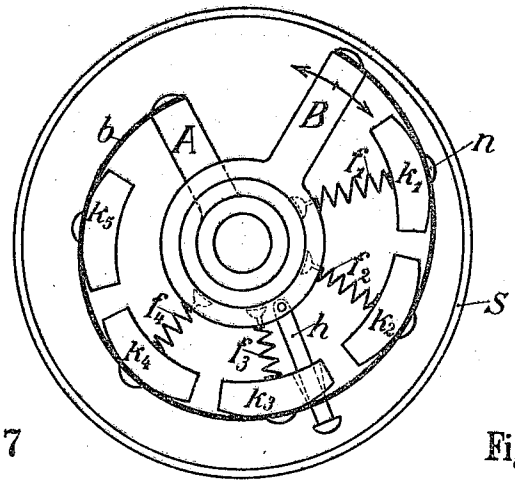


Fig. 7

Fig. 8

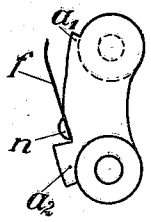
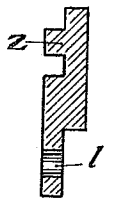
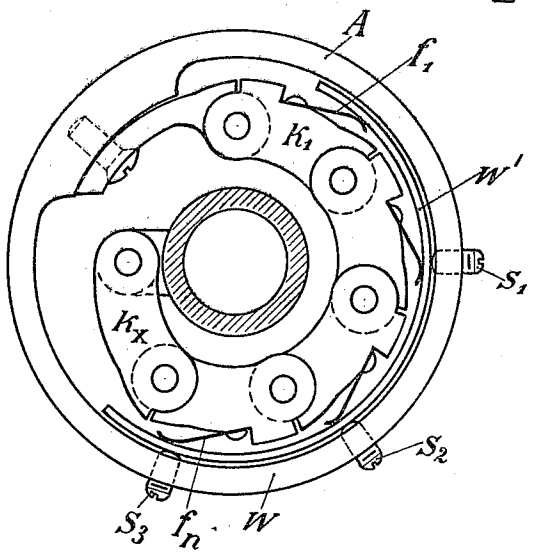


Fig. 6





Attest:
Edna A. Moreland
Alan C. McDonnell

Inventor:
by Albert Rilling
Edw. Scheer Jr. Atty.

NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ALBERT RILLING, OF FRANKFORT-ON-THE-MAIN, GERMANY, ASSIGNOR TO THE FIRM OF MAFAM MOTOR-APPARATE G. M. B. H., OF FRANKFORT-ON-THE-MAIN, GERMANY.

MEANS FOR USE IN AUTOMATICALLY CONTROLLING THE TIMING IN MAGNETO IGNITION APPARATUS.

1,273,095. Specification of Letters Patent. Patented July 16, 1918.

Application filed November 25, 1911, Serial No. 662,263. Renewed December 6, 1917. Serial No. 205,896.

To all whom it may concern:

Be it known that I, ALBERT RILLING, a citizen of the German Empire, and residing at Frankfort-on-the-Main, in the Kingdom of Prussia, Province of Hesse-Nassau, Germany, have invented certain new and useful Improvements in Means for Use in Automatically Controlling the Timing in Magneto Ignition Apparatus, of which the following is a specification.

This invention relates to improved means for use in automatically controlling the timing in magneto ignition-apparatus, such as commonly employed in connection with internal combustion engines. Such timing is dependent upon the angular position of the magneto-shaft whereon the armature is mounted in relation to that of the motor-shaft, or shaft driven therefrom.

Many attempts have been made to vary such angular position automatically upon a change occurring in the speed of the engine. According to one method, a centrifugal governor operates a sliding sleeve mounted on a spindle formed with a quick-pitch thread; any longitudinal movement of the sleeve imparting a rotative movement to the spindle, thereby advancing or retarding the angular position of the armature.

As, in the construction of such apparatus, the space available is somewhat restricted, it is difficult to secure a large angular variation; the latter being normally limited to about 30 to 40°. In practice, however, an angular displacement extending through as many as 60° is often required. Various means have accordingly been proposed for increasing the relatively small movement; for example, by providing the turning shaft of the lever with a toothed-wheel engaging with a corresponding toothed-wheel pertaining to the parts to be relatively displaced. According to another construction, the centrifugal bodies, situated symmetrically in relation to each other, are connected in such a manner that their movements are cumulative.

The design of such devices nevertheless presents certain difficulties and their manufacture entails appliances of a somewhat expensive character. The object of the present invention is to provide means whereby the desired result may be obtained in a comparatively simple manner; namely, by the employment of an element which, though in itself flexible, is susceptible to the influence of centrifugal force.

In the drawings, Figure 1 is a view of the driving and driven parts (the armature and the shaft) in section, and of the flexible connecting element in side elevation, with the said driving and driven parts in one relative position; Fig. 2 is a view similar to Fig. 1, but showing the driving and driven parts in another relative position; Figs. 3 and 4 are views similar to Figs. 1 and 2 respectively, showing another form of flexible connection; Fig. 5 is a view in side elevation illustrating a modified form of flexible connection; Fig. 6 is a view similar to Fig. 5, illustrating still another modification; Fig. 7 is a view in side elevation of one of the chain links shown in Fig. 6; and Fig. 8 is a section through the link shown in Fig. 7.

In the accompanying drawings, Figs. 1, 2, 3 and 4, illustrate, in side elevation, two forms of flexible centrifugal devices such as I prefer to employ between the shaft a and the armature b; but it will be understood that any other flexible device (such as a tube filled with mercury, a cable or the like) would be equally appropriate.

The great advance in the employment of a flexible chain, shaft, cable or the like, as compared with a system of rigid levers, is due to the fact that the flexible element, which, in a small space permits the employment of heavy operating weights, needs no complicated system of levers to produce the required result.

To utilize to the best advantage the small space usually available, a chain c (Figs. 1 and 2) the links of which are made heavy, is arranged in such a way that, in the position of rest, its ends e_1, e_2, overlap each other. For this purpose, the extremities are reduced in size and serve as points of attachment. For the sake of clearness half of the flexible element only is shown in the drawings. The reader must, therefore, imagine the other half of it, which is arranged in such a manner that in every position, a condition of perfect symmetry prevails, in order to avoid unequal pressures. In Figs. 3 and 4 the flexible element c consists of a flexible shaft but may consist

equally well of a hose charged with mercury, small shot or the like.

In the constructions hitherto known a varying state of equilibrium may be observed according to the speed and, furthermore, the centrifugal bodies sometimes oscillate, with the result that the timing of the ignition is rendered irregular. On the other hand it is unsafe to rely upon the single spring in some cases employed, as the latter is liable to break or to slacken, whereby not only the timing of the ignition would be varied in an undesirable manner but also the symmetry of the whole rotating structure would be destroyed which, under some circumstances, would seriously endanger the bearings.

The construction to which the present invention relates present the further advantages that, instead of a single spring, a plurality of such springs are arranged at different points. In the construction illustrated in side elevation in Fig. 5 of the accompanying drawings, a chainlike contrivance is used, which, in connection with controlling springs, presents certain advantages referred to later on.

Referring more particularly to this figure, k_1—k_x are centrifugal bodies which are attached to the inner side of a band spring b, and together form a flexible connecting element.

Upon the band spring contracting so that its extremities approach one another the effect of the rotating centrifugal bodies is counteracted, and the spring connects the parts A and B whereof the angular position is to be regulated.

It may also, in certain cases, replace the usual outer casing which, by its weight, causes unnecessary strain upon the bearings, thus permitting of the employment of a dust-cap only. On the other hand centrifugal bodies having their movements unrestricted would not safely take the curve required for obtaining the maximum angular displacement. On the contrary the danger exists that at some points, for instance, at the link k_3, the centrifugal force may increase until the chain breaks.

To prevent the centrifugal bodies from flying too far, springs f_1—f_4 are provided but any other suitable means for limiting the movement may be used in addition, for example a lever h which is able to yield to the lateral displacement of k_3, as shown in Fig. 5.

The centrifugal bodies k_1—k_5 are preferably fixed with rivets n formed integral with them. On the side adjacent to the spring, they are curved so that they cannot hinder the contraction of the spring b. If the weights are affixed to the outer side of the spring b, their side planes would come close together thus limiting their movement.

Fig. 6 illustrates in side elevation an alternative construction wherein a chain is employed in conjunction with feather springs instead of spiral springs. This construction has the advantage that the centrifugal bodies abut successively against the limiting wall w as the pressure prevailing in the section between any two springs increases.

This pressure varies with each particular link k_1—k_x. If now an oscillation occurs, it is not suddenly communicated to all of the links, one of the advantages resulting from the employment of a plurality of springs in the manner described being that it allows of a stable adjustment for any number of revolutions within the whole range of efficiency of the timing device.

The construction shown in Fig. 6, wherein a series of links are united in the form of a chain, is especially adapted to the use of a plurality of springs arranged around the periphery. It is obvious that the springs can be mounted in a much more reliable manner than in the case of a flexible shaft. Furthermore, such links are adapted for production on a large scale.

The form of link, which I prefer, is illustrated in side elevation in Fig. 8, and is made out of a solid block and so arranged, that the pin z engages immediately with the recess l of an adjacent link, thus avoiding special connections. By this arrangement, without requiring more space, greater centrifugal force is obtained as compared with block or roller chains of the ordinary kind which, owing to their great number of bearings and the friction produced thereby, are not suitable for this purpose. Another advantage is connected with the employment of externally situated band springs which, though not immediately adhering to the inventive idea, may be mentioned nevertheless. By means of a wall w^1 movable for example by screws s_1 s_2, the angle of adjustment may be limited in accordance with the number of revolutions. The wall as well as the screws need not be carried by the piece A but can be connected to b in any suitable manner. The arrangement of the wall w permits also to place the wall w^1, which for technical reasons is originally made round, afterward eccentrically, whereby a certain ratio of dependence of the number of revolutions is obtained.

However, these arrangements are only necessary if the adjustment is required to be very precise as, for instance, in the case of flying machines.

To prevent the springs from being overexerted, and the centrifugal bodies from flying too far outwardly, the links are provided with projecting pieces a_1 a_2, which, when the chain is flying outward, limit the efficiency of the latter. In cases where the

centrifugal bodies press strongly against the fixed wall the springs are protected by the piece a_2 from over-exertion and fracture.

The employment of a plurality of springs presents the further advantage that the movement of the free ends of the springs f can be adjusted, thus allowing the timing of the ignition to be brought into direct relation to the number of revolutions. To this end a series of screws, one opposite each of the springs, are screwed into the fixed wall w, by the turning of which the adjustment of the springs f_1—f_n is obtained. It is not necessary to provide each of the springs with a displaceable abutment, fewer screws thus sufficing. According to a further modification the limiting wall w is connected with the screws or other adjusting contrivance by means of a movable spring or of several springs. In such case the adjustment of the spring f is preferably made in the first instance instead of afterward from the exterior. In the case of a smaller angle of adjustment, it will be advisable to insert a special wall w^1, preferably in the shape of a ring segment, between the casing A and the chain. This auxiliary wall can be provided with recesses for allowing the screws s_1—s_3 to pass through. For the inner wall a number of stops may be substituted.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I claim:—

1. In apparatus of the class described, the combination of a driving part, a driven part, and an elongated flexible element connecting said parts to centrifugally vary their relative angular position.

2. In apparatus of the class described, the combination of a driving part, a driven part, an elongated flexible element connecting said parts to centrifugally vary their relative angular position, and a casing whose interior limits the outer centrifugal position of the flexible element.

3. In apparatus of the class described, the combination of a driving part, a driven part, and an elongated flexible element connecting said parts to centrifugally vary their relative angular position, and comprising a series of heavy bodies mounted on a spring band.

4. In apparatus of the class described, the combination of a driving part, a driven part, and an elongated flexible element connecting said parts to centrifugally vary their relative angular position, and springs spaced along the flexible element tending to resist its centrifugal outward movement.

5. In apparatus of the class described, the combination of a driving part, a driven part, an elongated flexible element connecting said parts to centrifugally vary their relative angular position, a casing whose interior limits the outer centrifugal position of the flexible element, and springs acting between the casing and the different parts of the flexible element to resist its centrifugal outward movement.

6. In apparatus of the class described, the combination of a driving part, a driven part, and an elongated flexible element connecting said parts to centrifugally vary their relative angular position, and radially adjusting inclosing means which adjustably limits the outer centrifugal limits of the flexible element.

7. In apparatus of the class described, the combination of a driving part, a driven part, one within the other, and a chain-like element connecting said parts in their plane or zone of rotation.

8. In apparatus of the class described, the combination of a driving part, a driven part, a spring band connecting them, and a series of heavy bodies responsive to centrifugal action and acting on the spring band to vary the relative angular position of the parts upon rotation thereof.

In testimony whereof I have affixed my signature in presence of two witnesses.

ALBERT RILLING.

Witnesses:
JEAN GRUND,
CARL GRUND.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."