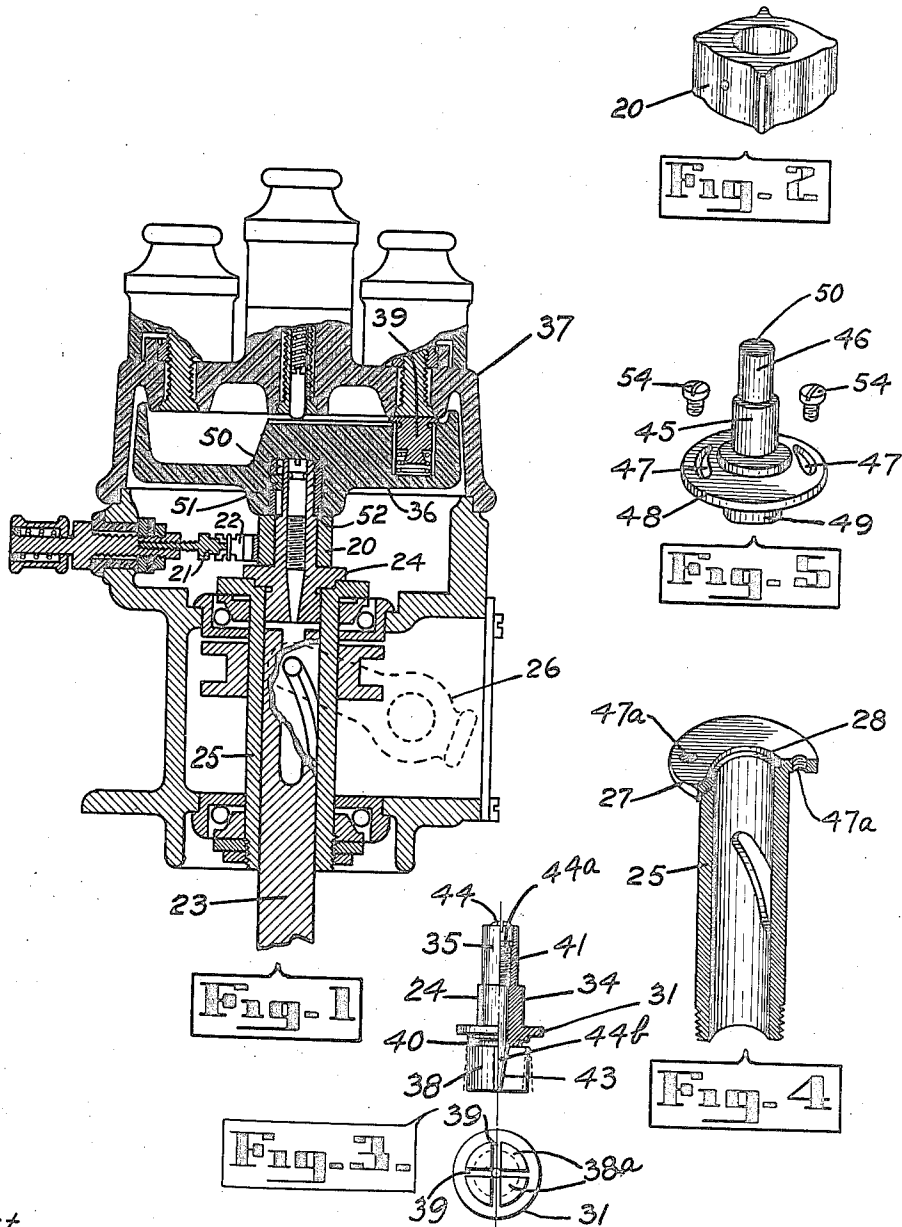


C. F. KETTERING & W. A. CHRYST.
IGNITION SYSTEM,
APPLICATION FILED MAY 25, 1915.

1,253,389.

Patented Jan. 15, 1918.
2 SHEETS—SHEET 1.



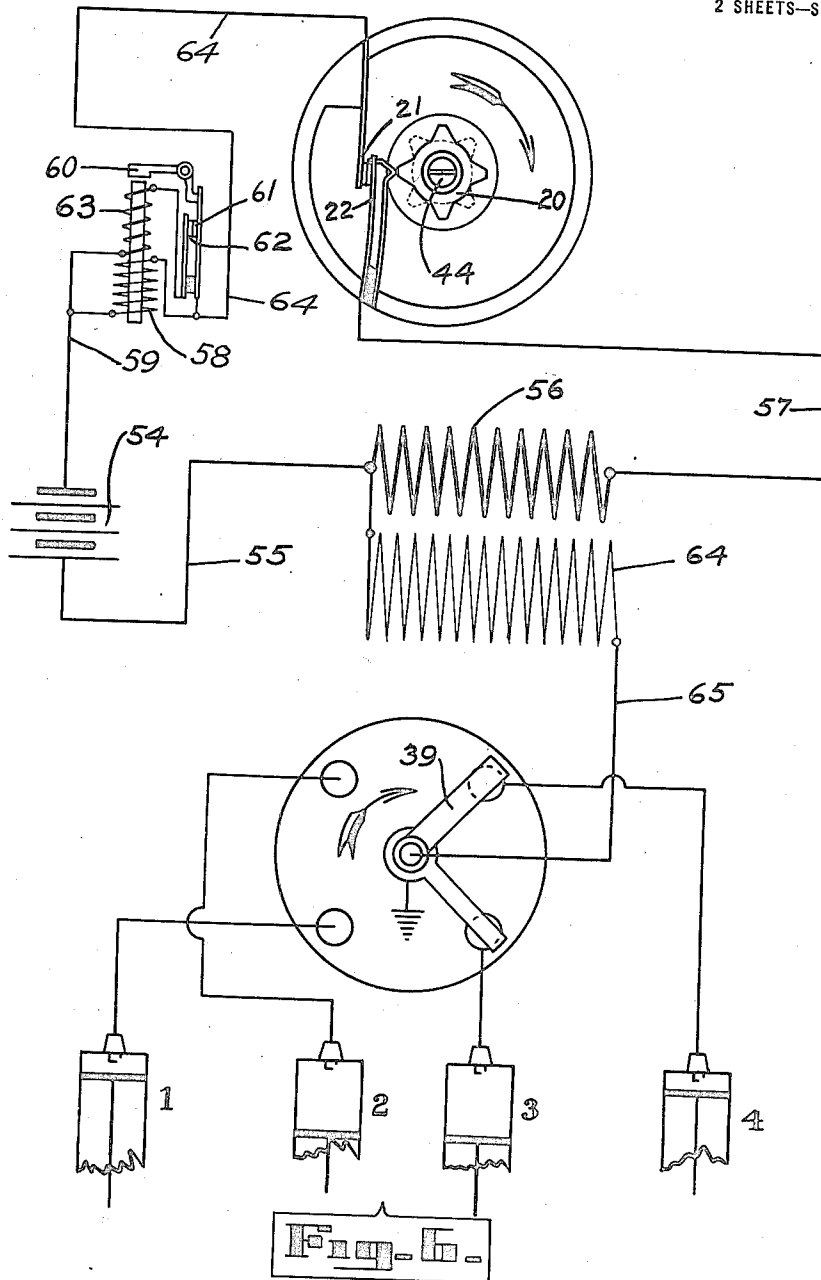
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UNITED STATES PATENT OFFICE.

CHARLES F. KETTERING AND WILLIAM A. CHRYST, OF DAYTON, OHIO, ASSIGNORS TO
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IGNITION SYSTEM.

1,253,389.

Specification of Letters Patent.

Patented Jan. 15, 1918.

Application filed May 25, 1915 Serial No. 30,398.

To all whom it may concern:

Be it known that we, CHARLES F. KETTERING and WILLIAM A. CHRYST, citizens of the United States of America, residing at Dayton, county of Montgomery, and State of Ohio, have invented certain new and useful Improvements in Ignition Systems, of which the following is a full, clear, and exact description.

10 This invention relates to an improvement in ignition systems, and more particularly to that type of ignition systems which are combined with combustion or explosion engines, and which include mechanism for properly timing and distributing the sparking impulses of the ignition system.

One of the primary objects of the present invention is to provide means, whereby certain of the mechanical elements of the ignition system may be readily adjusted, without the use of special tools, to change or vary the time of occurrence, and the distribution of the sparking impulses.

20 The present invention tends to provide an ignition system embodying what may be termed a "fixed adjustment" for certain of the elements of the ignition system, which is operated in a manner entirely independent from the mechanism which, in many cases, is provided for adjusting the time of occurrence of the ignition spark and the distribution thereof, during the operation of the engine.

25 This greatly facilitates the manufacturing and assembling of the elements of the ignition system, inasmuch as no special attention need be paid to the relative position of the various cooperating elements of the ignition system, at the time of initially assembling said elements, for the reason that the necessary adjustments of said elements may be readily made, after the system has been installed or applied in operative position.

30 The present invention may be used to equal advantage in ignition systems, wherein the ordinary adjustment is provided for changing or varying the time of occurrence of the spark, during the operation of the engine, or in systems wherein, what is termed the "fixed spark ignition" is employed.

35 Further objects and advantages of the present invention will be apparent from the following description, reference being had

to the accompanying drawing, wherein a preferred form of one embodiment of the present invention is clearly set forth.

In the drawings:

Figure 1 is a vertical sectional view of the timing and distributing unit, of an ignition system embodying the present invention.

Figs. 2, 3 and 4 are detail perspective views of certain of the component parts of the present invention.

Fig. 5 is a view showing a modified form of the adjusting element.

Fig. 6 is a diagrammatic view of an ignition system, embodying the present invention.

In ignition systems of the type shown in Patent No. 1,040,349, issued to Mr. Charles F. Kettering, on October 8, 1912, there is embodied a unitary structure which includes not only a timing mechanism for controlling the primary circuit of an ignition system, but also a distributing mechanism, which selects the cylinder wherein the sparking impulse is to occur.

In the construction and installation of ignition systems having certain characteristics of the system embodied in the above mentioned patent, it frequently occurs that the elements comprising the timing mechanism, are not properly located or positioned, relative to each other, to effect their proper function at a determined time, with reference to the cycle of the engine.

Thus, it may happen that if the timing and distributing mechanism are not installed in correct position, relative to the driving means, the timing of the spark and the distribution thereof, will not be effected at the proper time, to efficiently provide the engine with ignition.

The present invention is adapted to overcome the objections set forth, by providing for the synchronous adjustment of the movable element of the timing and adjusting mechanism, relative to the driving mechanism thereof, and the stationary cooperating parts of said mechanism.

The present invention, as shown in the accompanying drawing, embodies a timer cam 20, which is adapted to effect the closing and opening of the contacts 21 and 22, to intermittently close and open the primary circuit of the ignition system. This cam 20 is connected indirectly with the shaft 23, in a manner substantially the

same as that set forth in the above mentioned patent to Mr. Charles F. Kettering, 1,040,349, October 8, 1912.

The shaft 23 is connected with any suitable engine driven mechanism, and is adapted to be operated at a predetermined speed, relative to the speed of the engine, regardless of any variations therein.

Intermediate the shaft 23 and the cam carrying element 24, there is a suitable sleeve 25, having a slot and pin connection with the shaft 23, in such a manner that the sleeve 25, together with the cam carrying element 24, may be adjusted relative to the shaft 23, during the operation of the engine, by means of the manually controlled lever 26.

This adjustment is to provide for a certain range of advancement and retardation of the time of occurrence of the sparking impulses and the distribution thereof, so that suitable adjustments may be made from time to time during the operation of the engine, to meet the varying conditions thereof. The tubular sleeve 25, at its upper end, has a flanged head 27, counterbored as at 28 to form a seat for the shoulder 31, formed on the cam carrying element 24.

This element 24, as is shown in detail in Fig. 3, comprises a hollow shank portion 34, adapted to have the cam 20 secured thereto in any suitable manner. The upper portion of this shank may be reduced as at 35, and is adapted to carry and support the rotor 36 of the distributing mechanism. This distributing mechanism includes beside the rotor, the distributor head 37, which is of substantially the same type as that shown, described and claimed in the patent heretofore mentioned.

It will be seen from the above arrangement of parts, that the element 24 not only supports and carries the cam 20, but also the rotor 36, in a fixed relative position, and both of these elements in an adjustable relation to the sleeve 25. At the opposite end of the cam carrying element 24, the shank portion 38 is split into segments, as at 38^a, by a plurality of slots 39. A depression 40 is formed in the shank portion 38, adjacent to the flange or shoulder 31, so as to increase the resiliency of the segments 38^a. The shank 34 is tubular and is internally threaded, as at 41. The portion of said element which is slotted, is so formed that an inverted conical shaped opening, as at 43, is provided, the purpose of which will be explained hereinafter.

44 designates an operating screw, which is threaded at 44^a and has a conical shaped portion as at 44^b, so arranged as to correspond with the relative screw-threaded portion 41 and the conical shaped interior faces of the segments 38^a respectively, of the cam carrying element.

Now, supposing that in assembling the various elements of the present invention, the cam and the rotor of the distributor are mounted on the element 24, in an improper position relative to the contact plates included in the primary circuit, and to the contact brushes forming a part of the secondary circuit and cooperating with the brush 39 of the rotor 36 of the distributor.

Up to the present time, in certain ignition systems, it has been necessary to unpin the cam 20 and then redrill the shank 34 of the element 24, in order to properly locate the cam. It was also necessary to remove the rotor 36 of the distributor, and to relocate the slot 50, which receives the pin 51, carried by the sleeve 52.

In the present invention, however, it is simply necessary to loosen the screw 44, thus permitting the segments 38^a to return to their normal position, whereby the cam carrying element may be easily turned in the sleeve 25, until the cam 20 and the rotor 36 of the distributor are properly positioned relative to the contact plates 21 and 22, and the contact brushes carried by the distributor head.

When the proper adjustments have been made, it is only necessary to operate the screw so as to expand the split shank portion and consequently cause the segments 38^a to press outwardly against the inside surface of the sleeve 25. The depression 40 reduces the amount of metal at this point, thereby increasing the resiliency of the segments 38^a.

Referring to the diagrammatic view shown in Fig. 6, with reference to the cylinders, it will be noted that the one marked 4, is in position to fire. However, the timer cam 20, as shown in dotted lines, is improperly located, relative to the contact elements 21 and 22, so that the closing of the primary circuit of the ignition system, by the timer cam, would not occur until after the piston within the cylinder 4 had passed beyond the proper point in its cycle of movement.

However, when the elements included in the present invention, which have been clearly described above, have been adjusted so that the timer cam will be in position as is shown in full lines in Fig. 6, it will be obvious that the primary circuit of the system will be closed at a predetermined time, relative to the position of the piston, said time of course being regulated in any suitable manner by means of the ordinary automatic or mechanical spark control mechanism.

In Fig. 6, a system is shown, which is substantially the same as that described and shown in the co-pending application, Serial No. 592,291, filed November 14, 1910, and the Patent No. 1,040,349, October 8, 1912, and includes the current interrupter or relay, and the distributor, which are employed re-

spectively to break the main circuit, after it has initially been closed by the operation of the timer cam, and to select the cylinder, wherein the sparking impulses, generated by the operation of the current interrupter, or relay, are to be discharged.

It will be obvious, however, that the type of system shown and described in the above mentioned Fig. 6, is not intended as a limitation in any sense, inasmuch as the relay or interrupter and the distributor may be entirely eliminated or replaced by any other suitable mechanism.

Referring to the diagrammatic view shown in Fig. 6, when the cam 20 closes the contacts 21 and 22 as shown, the current passes from the storage battery 54, via the wire 55, through the primary winding 56 of the induction coil, through wire 57, contacts 22 and 21, through the wire 64, across the normally closed contacts 61 and 62, through the primary winding 63, back to the battery via the wire 59.

The current continues to pass through the winding 63 of the relay, until the core thereof is sufficiently energized to attract the armature 60, which action opens the contacts 61 and 62, thus breaking the main circuit through the winding 63. However, a small amount of current will continue to flow through the fine wire winding 58, which is of much higher resistance than the winding 63.

Now as soon as the main circuit is broken at contacts 61 and 62, an impulse will be induced in the secondary winding 64 of the induction coil, in the usual manner. However, a closed circuit will be maintained through the fine wire winding 58, until the action of the timer breaks the circuit at the contacts 21 and 22, so that only a single sparking impulse will occur during each successive interval that the main circuit is closed by the timer cam.

In Fig. 5, there is shown a modification of the above mentioned adjusting or cam carrying element. This consists of the shank 45, which is adapted to have the cam 20 pinned thereto, in a suitable manner. The upper portion of this shank is reduced as at 46, and is adapted to carry and support the rotor 36 of the distributor mechanism, this distributor mechanism including the rotor and distributor head 37, comprises substantially the same construction as that shown, described and claimed in the patent heretofore mentioned.

The flange or shoulder 48, formed adjacent to the cam carrying shank 45, is provided with a pair of oppositely disposed slots 47, which are so arranged and posi-

tioned that a portion thereof will be in alignment with the threaded bores 47^a, located in the flange 27 of the sleeve 25. The cam carrying element 24, is thus readily secured to the said sleeve 25, by means of the screws 54, which are passed through the slots, and screwed in the threaded bores 47^a, thus permanently connecting the cam carrying element 24 and the sleeve 25, until such a time as the screws 54 are loosened.

The shank 49, located at the lower extremity of the cam carrying element 24, fits loosely into the sleeve and simply acts as a pilot or guide for said element.

In ignition systems which are capable of manual adjustment during the operation of the engine, to vary the time of occurrence of the sparking impulses, that is, either to advance or retard the same, to provide for the varying engine conditions, the present invention is especially adaptable, inasmuch as the range of said manual adjustment may be varied as desired to meet any special conditions.

In ignition systems, however, which employ what is known as "fixed spark" ignition, and wherein no adjustment is provided for, for compensating for the varying conditions of the engine, the present invention will also be found to be particularly adaptable.

While we have set forth one preferred form of the present invention, it will be understood that the foregoing description and the accompanying drawings are not intended as a limitation of our invention, but that we reserve the right to make whatever changes in the elements and combinations of elements, comprising the present invention, as may come within the scope of the appended claim.

What we claim is as follows:

In an ignition system, a timing and distributing mechanism for controlling the time of occurrence of the sparking impulses, comprising a circuit controlling element; driving mechanism therefor, including a hollow shaft; a support for said circuit controlling element, having a tubular shank and adapted to fit within said hollow shaft; and means operable relative to said support to expand said shank to secure the support to the driving mechanism.

In testimony whereof we affix our signatures in the presence of two subscribing witnesses.

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WILLIAM A. CHRYST.

Witnesses:

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