

J. M. RHETT.
 TIMER AND SWITCH ARRANGEMENT FOR INTERNAL COMBUSTION ENGINES.
 APPLICATION FILED NOV. 27, 1911.

1,054,240.

Patented Feb. 25, 1913.
 2 SHEETS—SHEET 1.

Fig. 1.

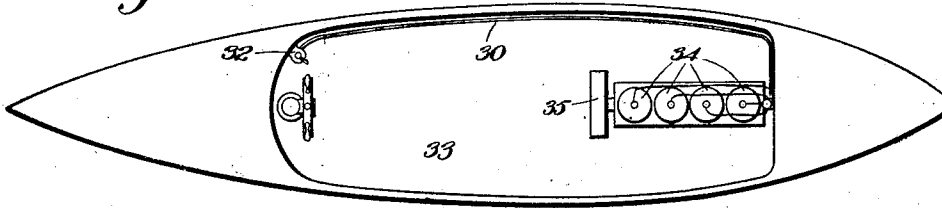
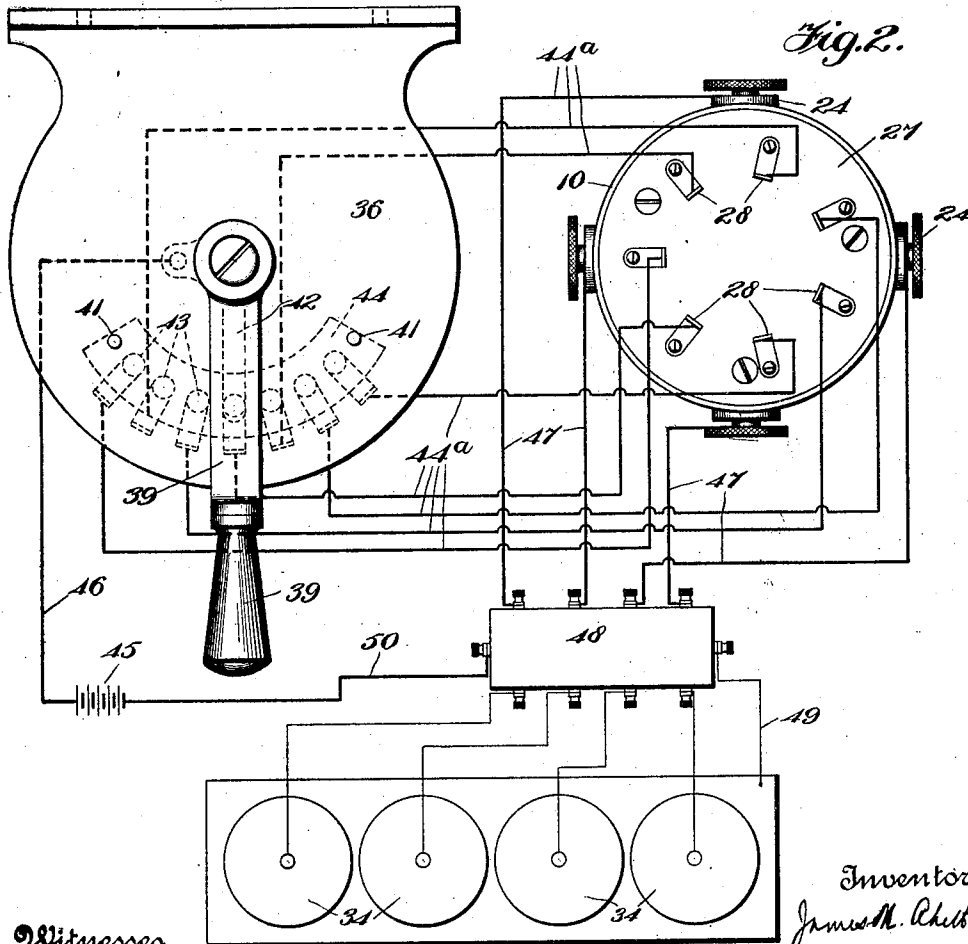


Fig. 2.



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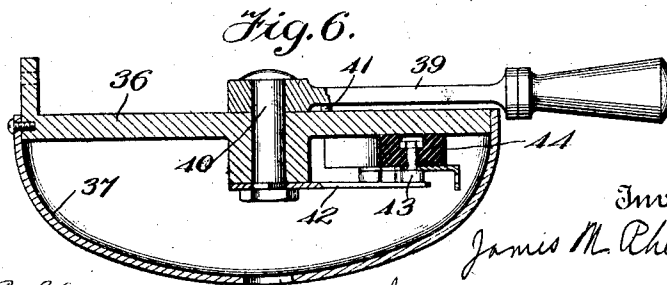
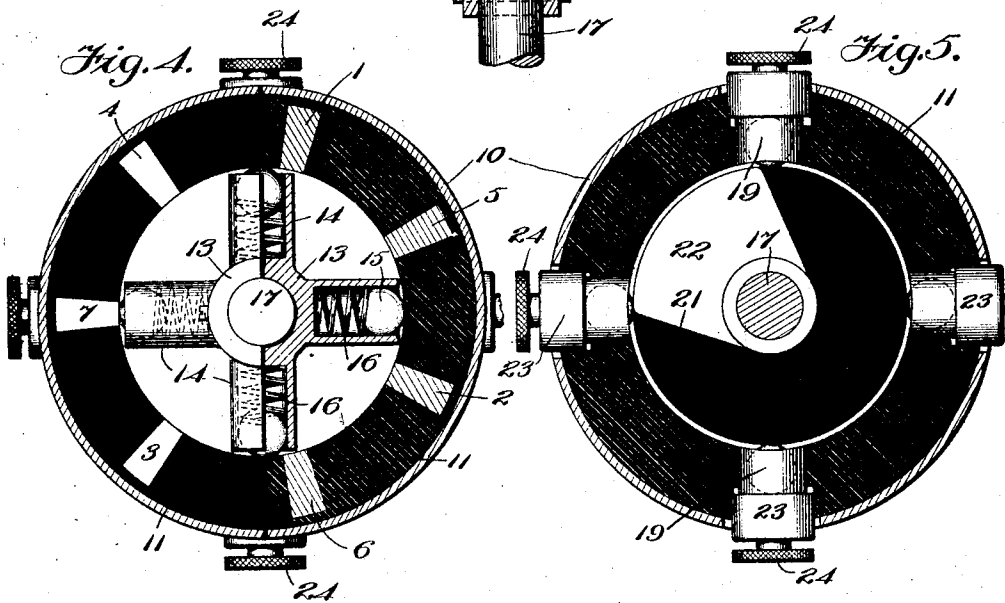
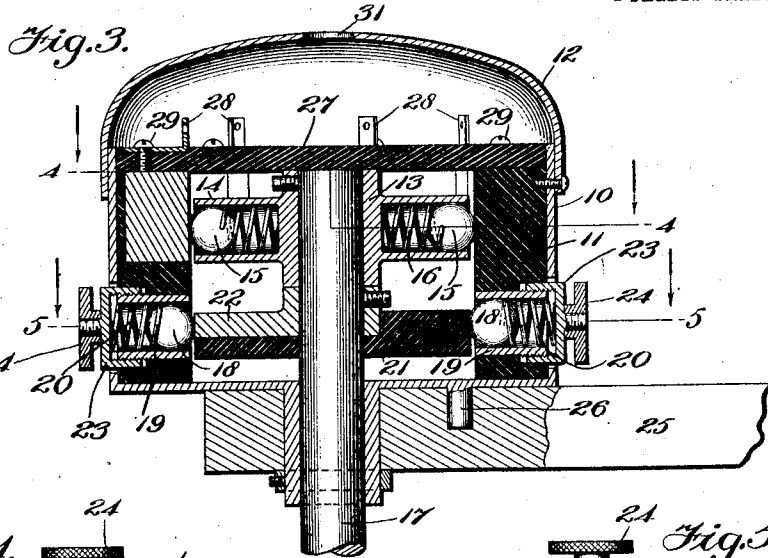
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UNITED STATES PATENT OFFICE.

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TIMER AND SWITCH ARRANGEMENT FOR INTERNAL-COMBUSTION ENGINES.

1,054,240.

Specification of Letters Patent.

Patented Feb. 25, 1913.

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To all whom it may concern:

Be it known that I, JAMES M. RHETT, a citizen of the United States, residing at Beaufort, in the county of Beaufort and State of South Carolina, have invented certain new and useful Improvements in Timer and Switch Arrangement for Internal-Combustion Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to means for timing the sparks whereby explosions are produced in gasoline and other internal combustion engines, for the purpose of controlling the power and speed thereof.

It is one of the advantages of my invention that it makes it possible to accomplish the ends above named by means which are not subjected to the wear and tear of manual operation, thereby securing superior accuracy and efficiency of electric contacts. This produces a more durable device and more accurately timed ignition.

Another advantage of this invention is that it makes it possible to instantly and accurately adjust the time of spark occurrence by means of a switch, which may be located in any convenient position; as, for instance, the bow of a motor boat. This feature renders it unnecessary for the operator to go to the engine when he wishes to alter its speed or power.

While the invention is particularly useful in motor boats and the like, it is equally capable of use in connection with motor cars or even with stationary engines.

Certain features of the invention are useful with a one-cylinder engine, but in its preferred form, my improvement is intended for use with engines having any number of cylinders. Therefore, it is to be understood that, although I have illustrated my invention as adapted to a four-cylinder engine, a simple modification for engines having more or less than four cylinders will be obvious to those skilled in the art and will be covered by my claims.

The preferred form of my invention which I have selected for illustration of its characteristics is shown in the accompanying drawings, wherein—

Figure 1 is a diagram showing a relative location of the various parts which will be found convenient in a motor boat, Fig. 2 is

a diagram of the electric circuits employed, Fig. 3 is a vertical section of the timer and its case, Fig. 4 is a view, partly in horizontal section on the line 4—4 in Fig. 3, and partly in plan, of the timer with the top cover and insulating contact disk removed, Fig. 5 is a horizontal section of the timer on the line 5—5 in Fig. 3, and Fig. 6 is a vertical section through the middle of the controlling switch.

In its simplest form (suitable for a one-cylinder engine) my invention comprises an automatic selecting switch, a manual selecting switch, and suitable circuits connecting said switches with each other and with the sparking appliances of the engine; these last usually comprising spark coils and sparking plugs.

In its more developed embodiment, however, my invention comprises further an automatic distributor, whereby the time-selecting functions carried out by the selecting switches are made available in proper sequence in a plurality of engine cylinders. This more developed form is the one illustrated.

In the specific form shown, the automatic selecting switch and the automatic distributor are clearly associated within the body of a single convenient apparatus which may be termed the "timer". This device as shown in Figs. 3 to 5 of the drawings comprises an outer casing 10, surrounding a core or body 11 of insulating material, made annular in shape and surrounding a central cylindrical space within which revolve the movable parts of the timer. A cover 12 may be applied over the whole. The selecting switch and distributor are placed the one over the other within the timer, and in the preferred arrangement shown, the selective switch is placed above the distributor.

The selective switch comprises preferably a central revoluble hub 13, carrying radial arms 14, within which are carried contact balls 15, normally urged outward by suitable springs 16, all combined with a circular series of fixed contact pieces numbered successively 1, 5, 2, 6, 3, 7, 4 in Fig. 4. The switch thus arranged is adapted to make efficient electric connection between the hub 13 and each of the fixed contacts in the order of the numerals applied to them in Fig. 4; and this is accomplished as many times for each revolution of the hub 13 as there are arms 14. In the particular form

shown this number is four, and it will always be equal to the number of cylinders in the engine for which the timer is intended. The production of the connections in the order named is brought about by the fact that the circle is divided by the fixed contact pieces into a number of equal arcs not divisible by the number of the arms 14. The number seven, being a prime number, and affording a convenient range for selective timing, I have shown seven fixed contact pieces in my preferred switch. It is clear from inspection of Fig. 4 that, in the time any one ball 15 passes from one fixed contact piece to the next, all of the contact pieces have been touched by one or the other of the balls, and that such contacts occur in the order of the numerals applied to the fixed contact pieces in Fig. 4. The hub 13 is fixed upon a timer shaft 17 which is axially located within the timer, and is rotated at a suitable speed from the engine itself in any manner whereby one revolution of the timer shaft corresponds to one explosion in all the cylinders of the engine.

When more than one cylinder is employed on the engine, a distributor must be employed, whereby the seven successive electric contacts produced in the selective switch may be made to correspond to one cylinder at a time, and to one cylinder after the other in appropriate order. For this purpose the automatic distributor is provided, and I prefer to arrange this in the convenient and compact form shown in the drawings, wherein the distributor is directly actuated by the same timer shaft 17, that actuates the automatic selective switch. In the preferred form shown the distributor comprises four fixed contact devices (one for each arm 14 in the switch) symmetrically disposed around a rotatable contact arm fixed upon the timer shaft 17. I prefer to employ contact balls 18, within suitable metal holders 19, containing springs 20, which act to press the balls inward against a rotary insulating disk 21 fixed upon a timer shaft 17. The distributor arm 22 is carried by this disk and connected electrically to the hub 13. This connection is preferably secured by connecting both the arm 22 and the hub 13 to the timer shaft 17. The peripheral surface of the arm 22 is extended sufficiently so that it breaks contact with one ball 18 just before making contact with the next, and so that contact with each ball is prolonged during the period that the entire seven successive contacts are made in the automatic selective switch. In the form shown, each spring 20 is confined by a screw cap 23, whereby the tension of the spring may be easily adjusted, and the threaded terminals 24, for facilitating connection with external wires are preferably mounted upon these caps.

The timer as a whole is preferably mounted upon a bracket 25 on the engine, and is provided with appropriate means, such as the lug or projection 26, for preventing rotation of the timer upon the bracket.

For convenience in making proper external connections, I prefer to place an insulating disk 27 within the timer casing over the selective switch, upon which are mounted upright terminals 28, electrically connected respectively with the seven fixed terminals 1, 5, 2, 6, 3, 7 and 4, either by screws 29 or otherwise. The external connecting wires, carried by the cable 30 (Fig. 1) may be carried down through the opening 31 and be suitably connected with the terminals 28. The manual switch 32 is connected in a suitable manner at the opposite end of the cable 30, and may have any convenient location; for instance in the bow of the boat 33 (Fig. 1). Here the engine cylinders are indicated at 34 and the usual fly-wheel at 35. This manual switch may take a variety of forms which will suggest themselves to those skilled in the art, and I have shown, as an example, the construction illustrated in Figs. 2 and 6. The switch base is shown at 36 and a cover 37, carried thereby, serves to protect the switch proper. The external wires are brought in through the opening 38. The operating handle 39 is fixed to a stud 40, passing down through a suitable bearing in the switch base 36. This handle may be swung between the limits imposed by suitable stops 41 on the base. Under the base 36, and fast upon the stud 40, is placed the metallic contact arm 42, whose extremity may be made to slide over the circularly disposed series of fixed contact pieces 43, mounted on the insulating sector 44. This movement is accomplished by means of the handle 39. Beginning at the left in Fig. 2, the contact pieces 43 are connected respectively by external wires 44^a, and by means of the terminals 28, to the fixed contact pieces 1, 2, 3, 4, 5, 6 and 7 of the automatic switch in the timer. One terminal of the battery 45 or other suitable source of electricity is connected, by wire 46, to the stud 40 and arm 42, and the terminals 24 of the timer are connected, by wires 47, through the spark coils 48, to the spark plugs of the respective cylinders. The wires 49 and 50 supply the common return through the spark coils. The fixed terminal 43 at one end of the manual switch series, for instance on the left in Fig. 3, corresponds to the extreme retard of the switch, while the contact piece at the opposite end of the series corresponds to the extreme advance. Intermediate conditions are obtained by placing the switch upon intermediate contact pieces, and I prefer to make the arm 42 just broad enough to reach from

one contact piece 43 to the next, so as never to break circuit entirely in the manual switch.

The operation of the device is as follows.

5 Assuming the engine to be running, the circuit causing the spark will only be closed in any given cylinder, at the moment when two conditions coincide within the timer. First, the periphery of the arm 22 must be in contact with the particular ball 18 which is connected by a wire 47 with the cylinder in question. Second, the hub 13' must be in electric connection through one of the arms 14 with the particular fixed contact piece 1, 15 2, 3, 4, 5, 6 or 7 which is connected by wire 44^a with the particular contact piece 43 which is in circuit at the time. It follows, therefore, that the position of the lever 42 and handle 39 will always determine the instant of time, with relation to the movement of the timer shaft 17, when a spark occurs. It is also evident that this relation of time will be established for all the cylinders, and the proper sequence in their action 25 will be preserved.

Many changes may be made in the construction and arrangement of my improvement, and of its various parts, and I do not limit myself to the details herein shown and described.

30 What I claim is—

1. A spark timing device for internal combustion engines, comprising in combination a manual selective switch, an automatic selective switch, suitable means for electrically connecting said switches to each other and to said engine, and means actuated by the engine for operating said automatic selective switch, substantially as described.

40 2. A spark timing device for multiple-cylinder internal combustion engines comprising in combination a manual selective switch, an automatic selective switch, a distributor, suitable means for electrically connecting said switches and distributor to each other and to the engine, and means actuated by the engine for operating said automatic selective switch and said distributor, substantially as described.

50 3. A spark timing device for multiple-cylinder internal combustion engines comprising in combination an automatic selective switch and a distributor mounted together near the engine, a manual selective switch conveniently placed at a distance 55 from the engine, means for electrically connecting said switches and said distributor to each other and to the engine, and means actuated by the engine for operating said automatic selective switch and said distributor, substantially as described.

4. In a spark timing device, an automatic selective switch comprising a rotary member having a number of contact arms, means 65 actuated by the engine for rotating the same,

and a circular series of fixed contact pieces arranged around said arms and adapted to successively make contact therewith, the number of said contact pieces being indivisible by the number of said arms, substantially as described. 70

5. In a spark timing device, an automatic selective switch comprising a rotary member having a number of contact arms, means actuated by the engine for rotating the same, 75 and a plurality of contact pieces arranged in a circular series around said rotary member, the number of said arms having no plural factor in common with the number of said contact pieces, substantially as described. 80

6. In a spark timing device for internal combustion engines, a manual selective switch arranged for closing any one of a number of circuits at will, an automatic selective switch, adapted to successively close 85 an equal number of circuits, means for electrically connecting said switches with each other and with the engine, and means actuated by the engine for operating said automatic switch, substantially as described. 90

7. In a spark timing device for multiple-cylinder internal combustion engines, a manual selective switch having a number of fixed contact pieces, an automatic selective switch having an equal number of fixed contact pieces and comprising a rotary member having as many contact arms as there are cylinders in the engine, an automatic distributor connected electrically with said automatic switch, electric connections between the fixed contact pieces on the manual switch and those on the automatic switch, and means actuated by the engine for operating said automatic switch and said distributor, 105 substantially as described.

8. In a spark timing device for internal combustion engines having a plurality of cylinders, a timer comprising a timer shaft, an automatic switch having contact arms 110 mounted upon said timer shaft, and a distributor having an arm mounted upon said shaft and electrically connected to said arms, substantially as described.

9. In a spark timing device for internal combustion engines having a plurality of cylinders, a timer comprising a timer shaft, an automatic switch comprising as many contact arms as the engine has cylinders, and a distributor comprising an arm mounted 120 upon said shaft and electrically connected with said arms, and also comprising as many fixed contacts as the engine has cylinders, substantially as described.

10. In a spark timing device for internal combustion engines having a plurality of cylinders, a timer comprising a timer shaft, a hub fast thereto having as many radial hollow arms as the engine has cylinders, contact balls and springs in said arms, fixed 130

contact pieces arranged around said arms, a distributing arm fast on said timer shaft and electrically connected to said hub and arms, and a number of fixed contact points
 5 equal to the number of cylinders on the engine, arranged to make successive contact with said distributor arm as it rotates, substantially as described.

11. In a device of the class described, a
 10 timer comprising a timing rod adapted to rotate, an automatic selective switch having

a rotary member mounted upon said rod, and a distributor having an arm mounted upon said rod below said automatic selective switch, substantially as described. 15

In testimony whereof, I affix my signature, in presence of two witnesses.

JAMES M. RHETT.

Witnesses:

W. L. SHOTSWELL,
 DANIEL MANN.

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