J. M. RHETT.

AUTOMATIC REVERSING AND TIMING SWITCH FOR GAS ENGINES.

APPLICATION FILED DEC. 12, 1910.

1,014,723. Patented Jan. 16, 1912.

3 SHEETS—SHEET 1.

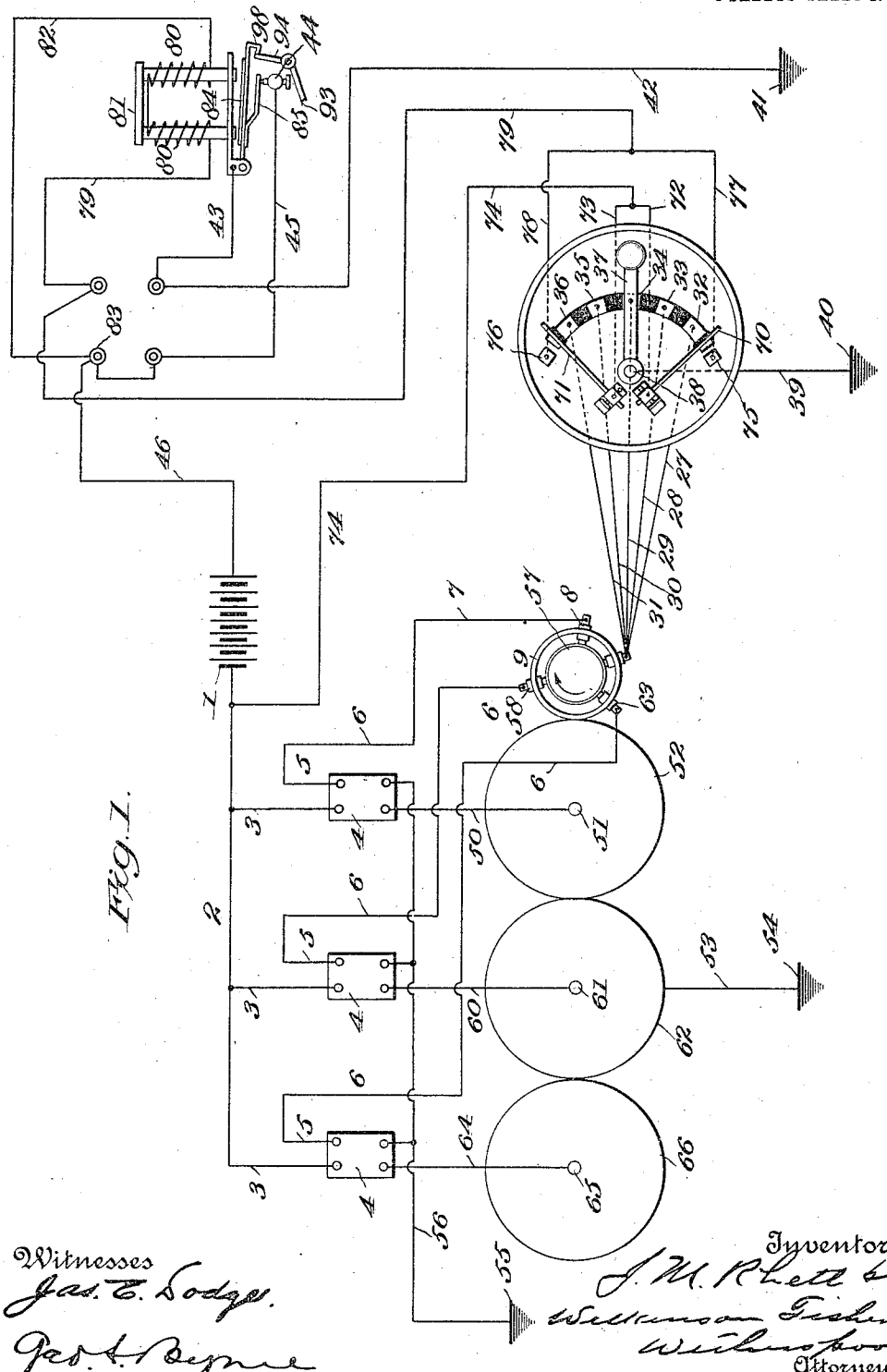

Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 2.

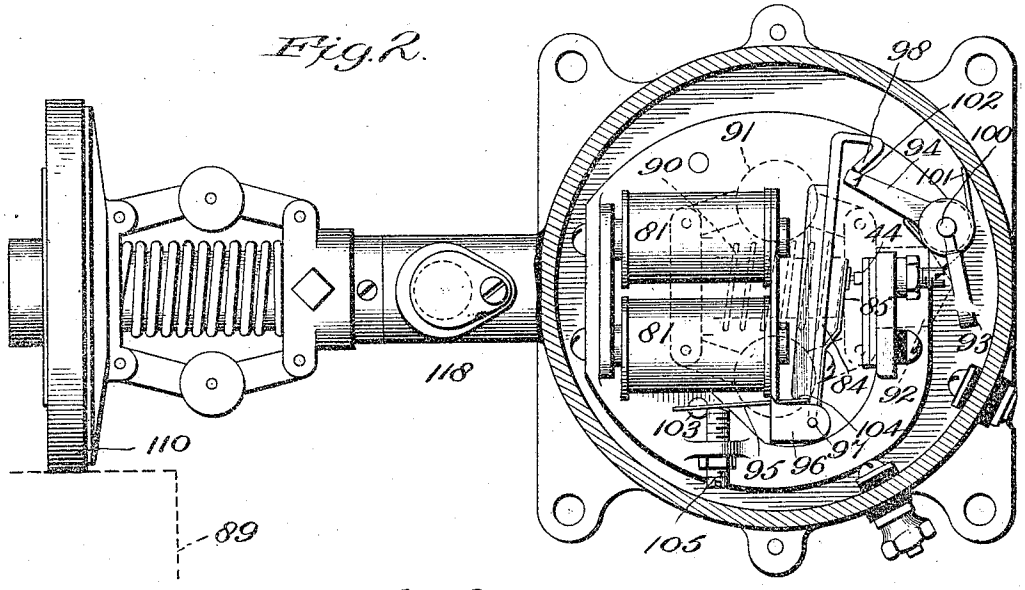


Fig. 3.

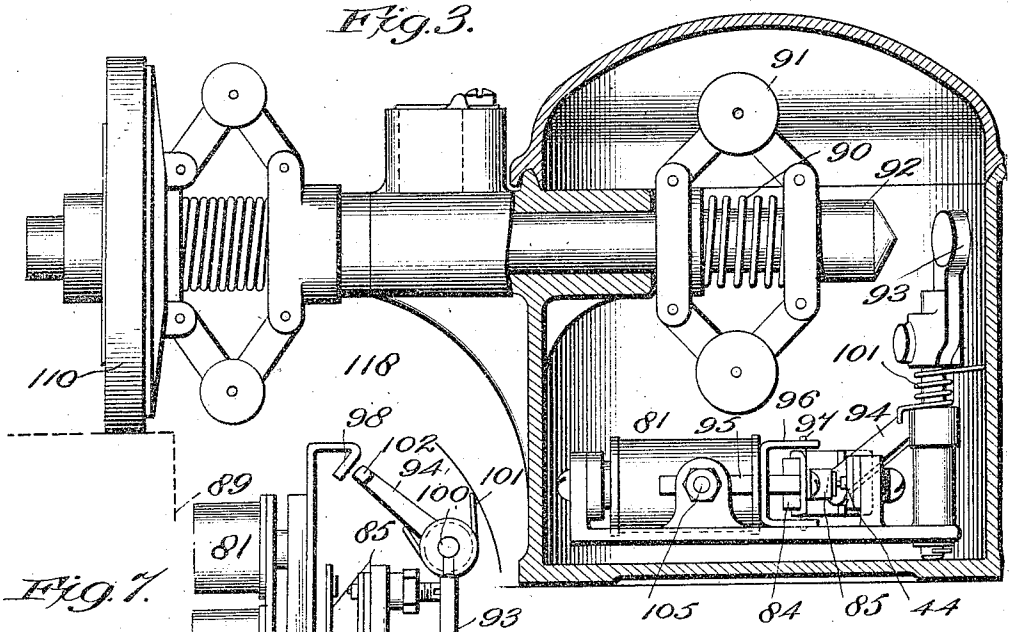


Fig. 7.




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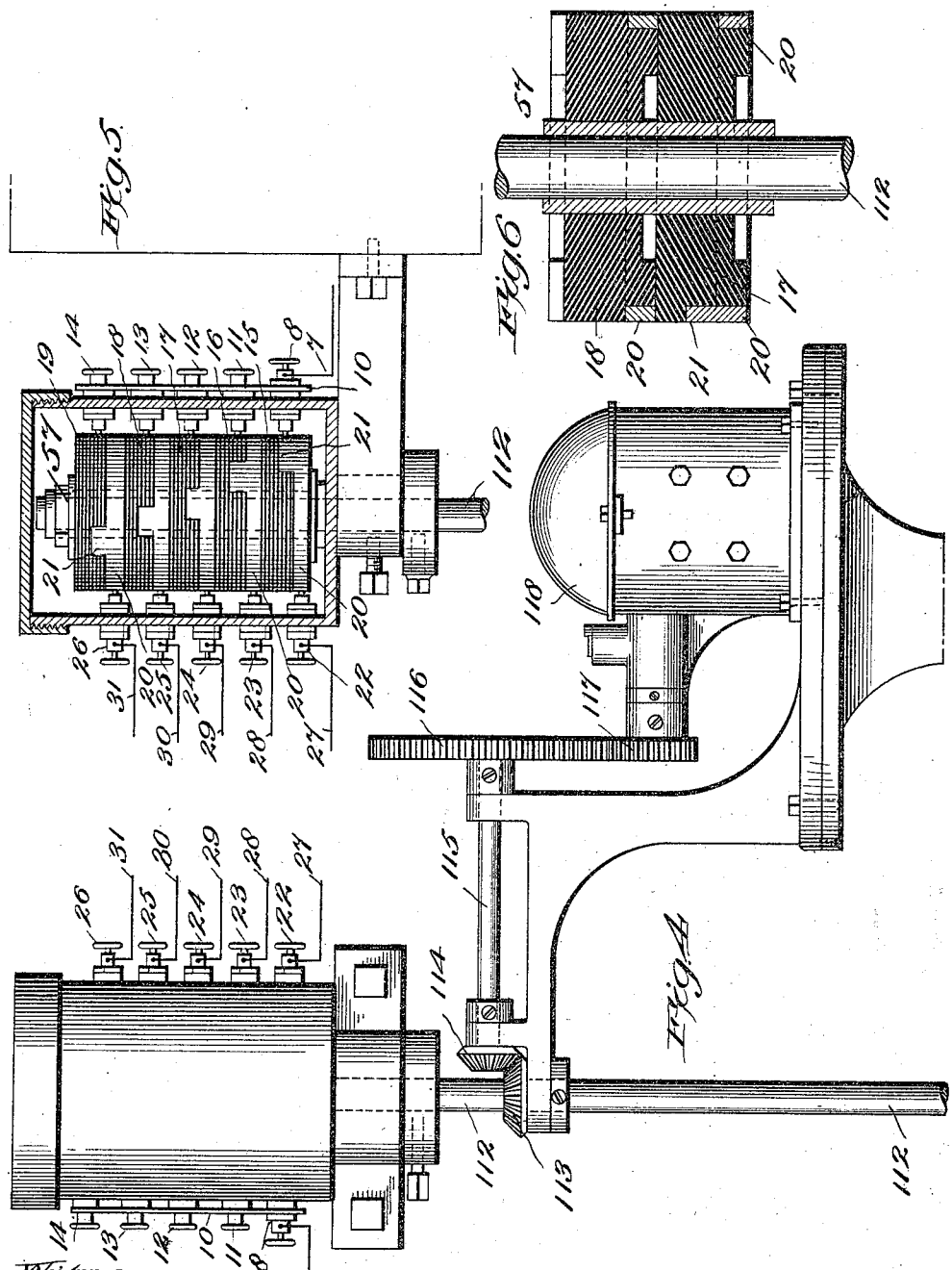


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# UNITED STATES PATENT OFFICE.

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## AUTOMATIC REVERSING AND TIMING SWITCH FOR GAS-ENGINES.

1,014,723. Specification of Letters Patent. Patented Jan. 16, 1912.

Application filed December 12, 1910. Serial No. 596,933.

*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 Automatic Reversing and Timing Switches for Gas-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.

This invention relates to automatic switches for reversing gas engines, and has for its object to improve the switch shown in my prior Patent #950,704, dated March 1, 1910, as well as the switch disclosed in my pending application #587,276, filed October 15, 1910, and entitled automatic reversing switch for gas engines.

With these ends in view, the invention consists in the novel combinations of parts and details of construction more fully hereinafter disclosed and particularly pointed out in the claims.

Referring to the accompanying drawings forming a part of this specification in which like numerals refer to like parts in all the views:—Figure 1 is a diagrammatic view showing the circuits and the essential features of my invention; Fig. 2 is a plan view of the governor portion of the invention with certain parts shown in section; Fig. 3 is a vertical sectional view of the parts shown in Fig. 2 with certain of the parts shown in elevation; Fig. 4 is an elevational view of the timing switch and governor mechanism showing a gear connection to the engine; Fig. 5 is a sectional view of the timing switch; Fig. 6 is an enlarged detail sectional view of a portion of the disks of the timer; and Fig. 7 is a detail view showing the armature in its locked position.

1 represents any suitable source of current, 2 a conductor leading therefrom, from which extend the branches 3 to the induction coils 4 or other transformers. The current, after passing through the branches 3, leaves the said induction coils as by the conductors 5, and from the conductors 5 the said current passes to wires 6. One of said wires 6 is joined to the wire 7 which leads to the terminal 8 of the timer 9. The terminal 8, as best shown in Figs. 4 and 5, is connected as by the conductor 10, to a series of other terminals 11, 12, 13 and 14, each of which normally contact, as shown in Fig. 5, with non-conducting rings 15, 16, 17, 18 and 19, respectively. Each of the non-conducting rings 15 to 19 is associated with conducting rings 20, provided with offsets or tongues 21 distributed in a spiral manner around the circumference of the cylinder of the timer, and is, therefore, angularly offset with respect to each other. The tongues 21 lie in the paths of contact of the terminals 8 to 14, and, therefore, at certain intervals each tongue 21 makes electrical contact with said terminals 8 to 14, as will be clear from Fig. 5.

Normally contacting with the conducting rings 20 are the terminals 22, 23, 24, 25 and 26, so that whenever the terminals 8 to 14 make contact with their respective tongues 21, there is a conducting path through the rings 20 to the respective terminals 22 to 26.

Connected to the terminals 22 to 26 are the wires 27, 28, 29, 30 and 31, respectively, which lead respectively to the contacts 32, 33, 34, 35 and 36, over which the switch lever 37 is adapted to pass. The said switch lever is pivoted as at 38 and is connected as by the wire 39 to the ground 40. 41 is another ground to which the wire 42 is joined, and current may pass from the ground 40 to the ground 41, wire 42 and wire 43 to the contact 44, wire 45 and wire 46 back to the battery. In other words, if the switch lever 37 is in the position shown, it is evident that current may pass from the battery 1 over the main ignition circuit comprising the wires 2, 3, 5, 6, 7, terminal 8, terminal 12, tongue 21, ring 20, terminal 24, wire 29, contact 34, switch lever 37, wire 39, grounds 40, 41 and wires 42, 43, contact 44 and wires 45 and 46 back to the battery. Upon the current thus passing through the right hand induction coil 4, as seen in Fig. 1, an induced current will pass from the secondary of said coil through the wire 50, spark plug 51 of the cylinder 52, wire 53 to the grounds 54 and 55, wire 56, and back to the other end of the secondary of said coil as shown. As soon, however, as the contact of the terminal 12 passes off of its tongue 21, the current will be broken, and the spark will cease in the cylinder 52. As the cylinder 57 of the timer, however, continues to revolve, a series of terminals 58, which are in all respects, similar to the terminals 8 to 14, and which likewise normally contact with the insulating

rings 15 to 19, will be brought into successive contacts with the tongues 21, and will, therefore, afford conducting paths through the rings 20 to the terminals 22 to 26, respectively. If the lever 37 remains in the position shown in Fig. 1, immediately after the spark has passed in cylinder 52, as above described, the continued rotation of the cylinder 57 will bring a terminal in the series 58 corresponding to the terminal 12, into contact with its tongue 21, and will, therefore, cause a continuous main ignition circuit from the battery 1 through the middle induction coil and said terminal in the series 58, through the same wire 29, lever 37, grounds 40 and 41 and wires 42 to 46 back to the battery, so that an induced current will pass through the wire 60, spark plug 61, cylinder 62 and grounds 54, 55 and wire 56, back to the said middle induction coil. In like manner, as the cylinder 57 of the timer continues to revolve, a series of terminals 63, in all respects like the terminals 8 to 14, will be likewise brought into contact with the conducting tongues 21. When this happens, supposing the parts to remain in the position shown in Fig. 1, a current will pass from the battery 1, over the main ignition circuit comprising the wire 2, through the terminal of the left hand induction coil 4, shown in Fig. 1, through the wires 6 and to a terminal of the series 63, also corresponding to the terminal 12 in Fig. 5. When the proper tongue 21 makes contact with this said terminal in the series 63, a current will accordingly pass through the wire 29, the lever 37 and over the path previously described back to the battery, so that an induced current will pass over the wire 64, through the spark plug 65 and cylinder 66 to the ground 54 and back over the wire 56 to complete the secondary circuit.

It is evident that so long as the lever 37 remains in the position shown, and the cylinder 57 of the timer continues to revolve, sparks will successively pass through the spark plugs 51, 61 and 65 of their respective cylinders. In other words, it is evident that so long as the parts remain undisturbed the engine will continue to run. Now supposing it is desired to increase or to retard the speed of the engine, which is usually accomplished by advancing or retarding the spark, it is only necessary to throw the lever 37 down or up, as shown in Fig. 1. That is to say, suppose the lever 37 to be moved downwardly so as to touch the contact 33, then the circuits above disclosed will pass over the wire 28, and through the terminals 11 and 23, so that the spark will be slightly advanced over those produced when the terminals 12 and 24 are in circuit. In the same way if the lever 37 is thrown down until it touches the contact 32, the circuits above disclosed will include the wire 27, and the terminals 8 and 22. In the same way should the lever be thrown upward to touch the contacts 35 and 36, the sparks would be correspondingly retarded in each of the cylinders, and the engine would be correspondingly slowed down. In all cases, however, no matter on what contact the lever 37 may happen to rest, the speed of the engine will remain constant so long as it is on that contact.

As is well known, it is also customary to reverse gas engines by cutting out the sparking, and reëstablishing the same before the pistons complete their strokes. In order to thus reverse an engine equipped with my invention, I provide the spring contacts 70 and 71, connected respectively by the wires 72 and 73 to the wire 74, leading from one pole of the battery, and adapted to be brought into electrical connection with the contacts 75 and 76, respectively. These latter contacts are connected as by the wires 77 and 78, respectively, with the wire 79 which is connected with the coils 80 of the electro magnet 81, and which in turn are connected as by the wire 82 to the plug 83, and by the wire 46 to the other pole of the battery. It is evident that if the spring contact 70, for example, should be thrown against the contact 75, either by pushing the lever 37 sharply over against said contact 70, or by hand, that current in that case would flow over the wire 74, to the wire 72, spring contact 70, contact 75, wire 77, wire 79, coils 80, wire 82, plug 83 and wire 46, back to the battery. The energizing of the coils 80 will cause the magnet 81 to retract its armature 84 and to break contact between spring 85 and the screw contact 44. The breaking of the circuit between the contacts 85 and 44 will consequently stop all sparking in the engine, and, therefore, the fly wheel of the same will slow down.

When the armature 84 is thus attracted by the magnet 81, the latch 94 pivoted at 100 will, under the influence of its spring 101, force its nose 102 behind the hook-like projection 98 of said armature and into the position shown in Fig. 7. When said nose is thus positioned although the current may be cut off through the magnet, the armature cannot move sufficiently far toward the right, as seen in Figs. 2 and 7, to cause the circuit to be made at the contact 44. As the fly wheel 89 continues to slow down, the spring 90 controlling the centrifugal balls 91 and the movable nose 92 of the engine governor will force said nose 92 toward the right as seen in Fig. 3, and will cause the said nose finally to contact with the arm or projection 93 of the said latch 94, as indicated in dotted lines in Fig. 2. When this happens, the said latch 94 will be swung on its pivot 100, in a counter clockwise direction, and thereby release its nose 102

from contact with the hook-like projection 98 of said armature, and permit said armature to resume the full line position shown in Figs. 1 and 2, and in which position the circuit from the contacts 44, 85 is made. When this happens, the said hook-like projection 98 will be in frictional contact with the said nose 102, as plainly indicated in Fig. 2, and in order that the movement of the armature 84 to said full line position shall be as quick as possible, and shall be done with certainty, I preferably provide a spring such as 95, which is secured at one end to the post 103, and at its other end to a portion 104 of said armature, and I also provide a set screw 105 contacting with said spring 95 between the points 103 and 104, and adapted to regulate the tension of said spring. It is evident that the pressure of the spring 95 will be directed upon said armature 84, to the left as seen in Fig. 2 of the pivot 97 of said armature, and that, therefore, said spring 95 will force said armature over to the right or into its full line position, as seen in Fig. 2. When said armature 84, however, reaches the full line position shown, the contacts 44 and 85 being made, sparking will be resumed in the cylinders owing to the operation above disclosed.

The width of the lever 37 is preferably so chosen that when it causes the contact 70 to touch the contact 75, it is sufficiently wide to still be in electrical connection with the contact 32, and thereby avoid breaking the main line circuit at the point 32. In the same way when said lever 37 forces the contact 71 into electrical connection with the contact 76, the main line circuit is preferably still made at the contact 36. The effect of thus not breaking the main line circuit at the contact 32 and 36 is to cause the sparking to immediately start when the engine has slowed down sufficiently to remake the main line circuit between the points 44 and 85. This would not be the case should the lever 37 be too narrow to maintain its connection with the contacts 32 and 36, and should the operator throw said lever to one of its extreme positions and leave it there.

As there is usually a mark on the fly wheel which denotes when the piston is up, it is evident that the parts may be so timed as to cause the sparking to begin again at any portion of the stroke of the piston desired. It being of course understood that the governor is either run by reason of one of its parts such as the disk 110 being in contact with the fly wheel 89, or that some other suitable connection is employed between a movable part of the engine and a suitable portion of the governor. In fact, in Fig. 4, I have shown a rod 112, which may be connected in any suitable manner with any suitable movable part of the engine, which rod operates the timer, and is provided with a gear 113, meshing with a gear 114, carried by the rod 115, provided with the gear 116, meshing with the gear 117, which in turn is connected with and operates the governor 118.

The operation of my invention will be clear from the foregoing, but may be briefly summarized as follows:—So long as the lever 37, shown in Fig. 1, touches one of the contacts 32 to 36, sparking in the cylinder or cylinders of the engine will continue, and whenever said switch 37 is moved from one contact 32 to another contact 33, 34, 35 or 36, the sparking will be advanced or retarded in said cylinders according to the direction of said movement, and thereby the speed of the engine will be increased or decreased accordingly. Also when one of the springs 70 or 71 is momentarily thrown against its contact 75 or 76, as the case may be, either by hand, or by moving the lever 37 over against such springs 70 or 71, then the magnet 81 will be energized, and the main sparking circuit will be broken at the contacts 44, 85. Since the current which causes the initial breaking of the sparking circuit is momentary, the said main circuit would be immediately reëstablished were it not for the fact that the nose 102 of the latch 94 will be forced immediately behind the hook-like extension 98 of the armature 84, and hold said contacts 44 and 85 separated as best shown in Fig. 7. The main sparking circuit will be thus held open, until the engine slows down sufficiently to cause the nose 92 of its governor to swing said latch 94 in such a direction as to release the armature 84, and to permit its controlling spring 95 to reëstablish the main circuit between the points 44 and 85. The parts are so timed that the reëstablishment of the main circuit takes place at that portion of the stroke as will cause a reversal of the engines.

It will be observed that the timing device and its controlling switch 37 is of general application, and may be used with or without the reversing mechanism, and it is likewise evident that the reversing mechanism may be used with or without this particular timing mechanism. In fact, it is further evident that the switch controlling the advancement or retardation of the sparking may be in one portion of a boat or an automobile and the reversing mechanism may be located at some other point. But, of course, it will generally be most convenient to locate both the reversing switch or timing switch at or near the same point. However, it is further evident that a plurality of reversing or timing switches could be located at different points of the boat or other moving vehicle.

It is evident that those skilled in the art may vary the details of construction and arrangement of parts without departing from the spirit of my invention and, therefore, I do not wish to be limited to such features except as may be required by the claims.

What I claim is:—

1. In a reversing switch for gas engines, the combination of a main ignition circuit; magnetic means for breaking said circuit; means for holding said circuit open; and a governor operated by the engine adapted to move said last mentioned means when said engine slows down and thereupon permit said circuit to be closed, substantially as described.

2. In a reversing switch for gas engines, the combination of a main ignition circuit; magnetic means comprising an armature for breaking said circuit; means comprising a latch for locking said armature and thereupon holding said circuit open; and a governor operated by the engine adapted to move said latch and thereupon permit said circuit to be closed, substantially as described.

3. In a reversing switch for gas engines, the combination of a main ignition circuit; a timer in said circuit; a magnetically controlled contact in said circuit; a latch adapted to hold said contact in its open position; and a governor operated by the engine adapted to move said latch and permit said circuit to be reclosed at a predetermined period of the stroke of the piston, substantially as described.

4. In a reversing switch for gas engines, the combination of a main ignition circuit; a timer in said circuit; means for causing said timer to advance or to retard the spark as desired; contacts for controlling said circuit; an armature; a contact controlled by said armature adapted to break said circuit; a latch adapted to hold said contact in its open circuit position; and a governor operated by the engine adapted to move said latch and permit said circuit to be reclosed at a predetermined period of the stroke of the piston, substantially as described.

5. In a reversing switch for gas engines, the combination of a main ignition circuit; a revolving timer provided with a plurality of contacts in said circuit; means for causing said contacts to be made at different periods during the revolution of said timer and thereupon to advance or to retard the sparking as desired; contacts for controlling said main circuit; an armature; a contact controlled by said armature for breaking said circuit; a spring controlled latch for holding said last mentioned contact in its open circuit position; and a governor operated by said engine for moving said latch out of its locking position, substantially as described.

6. In an automatic reversing switch for gas engines, the combination of a main ignition circuit; a contact for controlling said circuit; a latch for holding said contact in its open circuit position; a governor for operating said latch to release said contact; and a spring for causing said contact to close said circuit after said governor has released said latch, substantially as described.

7. In an automatic reversing switch for gas engines, the combination of a main ignition circuit; a timer provided with a plurality of contacts in said circuit; a switch provided with a plurality of contacts connected to said timer contacts; means for connecting any one of said last mentioned contacts in said circuit; and magnetic means controlled by said last mentioned means for causing said circuit to be broken, substantially as described.

8. In an automatic switch for gas engines, the combination of a main ignition circuit; a timer provided with a plurality of contacts so located when made as to aid in advancing or retarding the sparking; said timer also comprising a plurality of switch contacts connected with said timer contacts; and means to join at will any one of said switch contacts in said circuit, substantially as described.

9. In an automatic switch for gas engines, the combination of a main ignition circuit; and a timer provided with a plurality of contacts angularly displaced with relation to each other adapted when made to advance or to retard the sparking, said timer also having a plurality of switch contacts connected with said timer contacts, and comprising a lever to join at will any one of said switch contacts in said circuit, substantially as described.

10. In an automatic switch for gas engines, the combination of a main ignition circuit; a timer provided with means for advancing or retarding the sparking joined in said circuit; and a reversing switch mechanism also joined in said circuit, said timer provided with means common to both said spark advancing means and said reversing mechanism for joining either at will in said circuit, substantially as described.

11. In a reversing switch for gas engines, the combination of a main ignition circuit; magnetic means for breaking said circuit; means for holding said circuit open; a governor operated means adapted to move said last mentioned means and thereupon permit said circuit to be closed; and a switch adapted to close a circuit through said magnetic means while maintaining the main ignition circuit, substantially as described.

12. In a reversing switch for gas engines, the combination of a main ignition circuit; a timer in said circuit; an armature; a contact controlled by said armature adapted to

break said circuit; a latch to hold said contact in its open circuit position; a governor operated by the engine adapted to move said latch and permit said circuit to be reclosed at a predetermined period; and a switch controlling the circuit passing through said magnet and adapted to maintain the main ignition circuit while closing said magnetic circuit, substantially as described.

13. In a reversing switch for gas engines, the combination of a main ignition circuit; means comprising an electro-magnet for breaking said circuit; means comprising an engine actuated device and an armature for closing said circuit at a predetermined period of the stroke of the piston; and a timer in said circuit, substantially as described.

14. In a reversing switch for gas engines the combination of a main ignition circuit; electro-magnetic means for breaking said circuit; means comprising an engine actuated device for closing said circuit at a predetermined period of the stroke of the piston; a timer in said circuit; and means associated with said timer and electro-magnetic means for retarding or advancing the spark, substantially as described.

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

JAMES M. RHETT

Witnesses:
DANIEL MANN,
PROCTOR GLOVER.