

J. M. SMITH.
CURRENT DISTRIBUTER AND TIMER.
APPLICATION FILED JAN. 13, 1909.

1,038,451.

Patented Sept. 10, 1912.

3 SHEETS—SHEET 1.

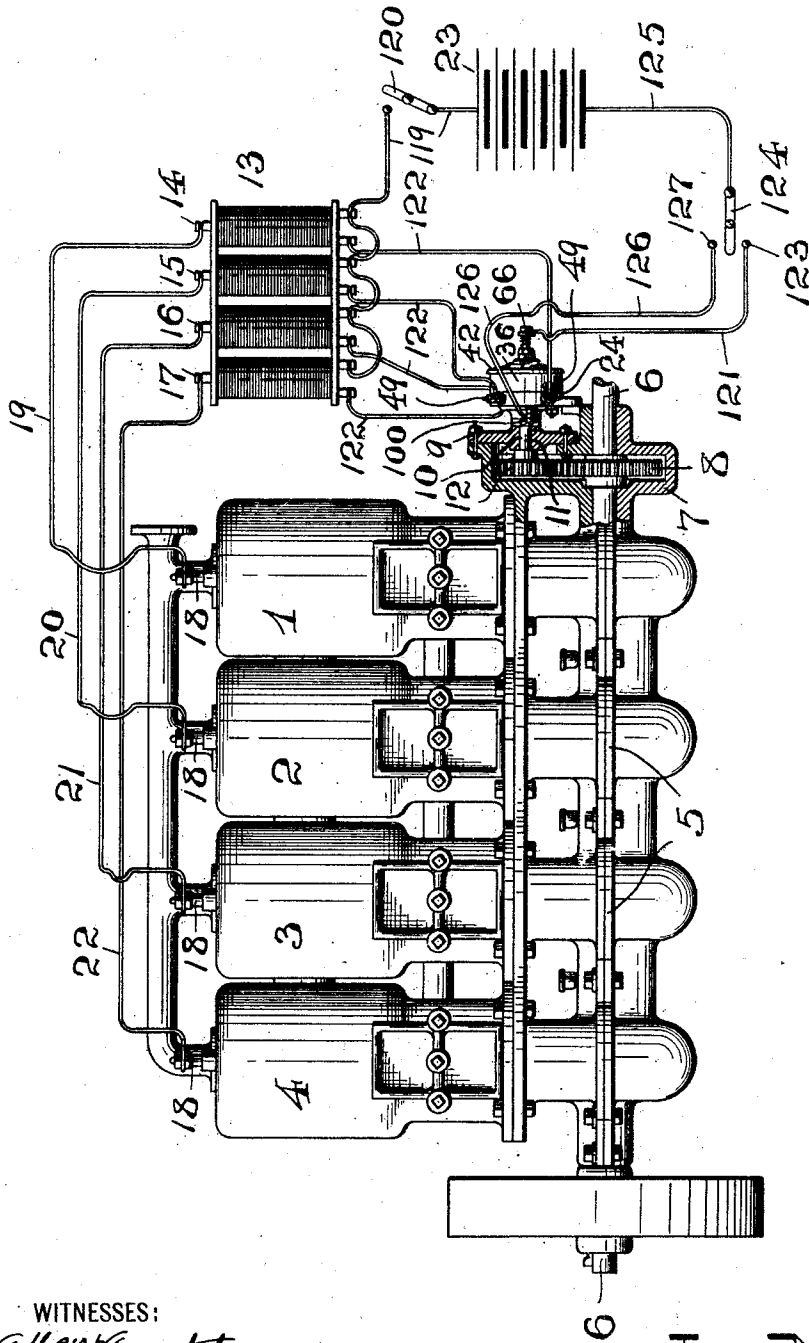


Fig. 1

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Anna H. Allen

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Graentzel and Richards,
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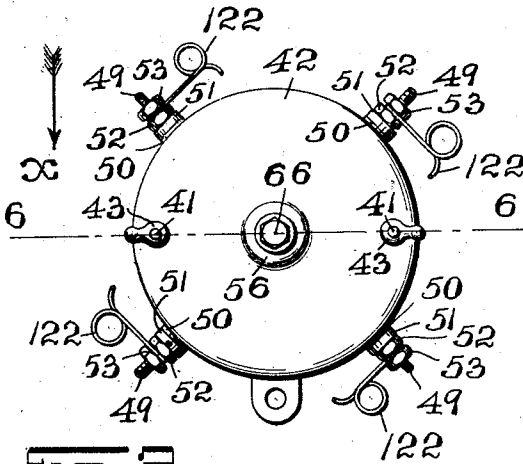


FIG. 2

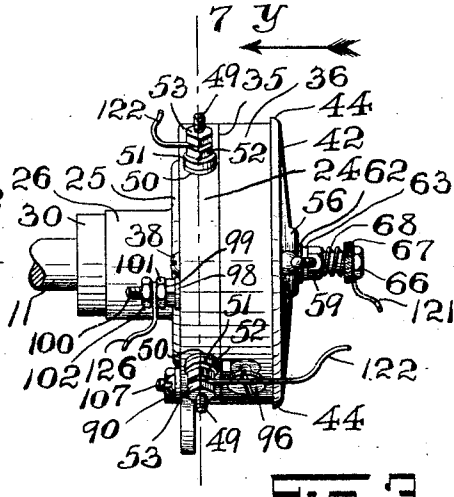


FIG. 3

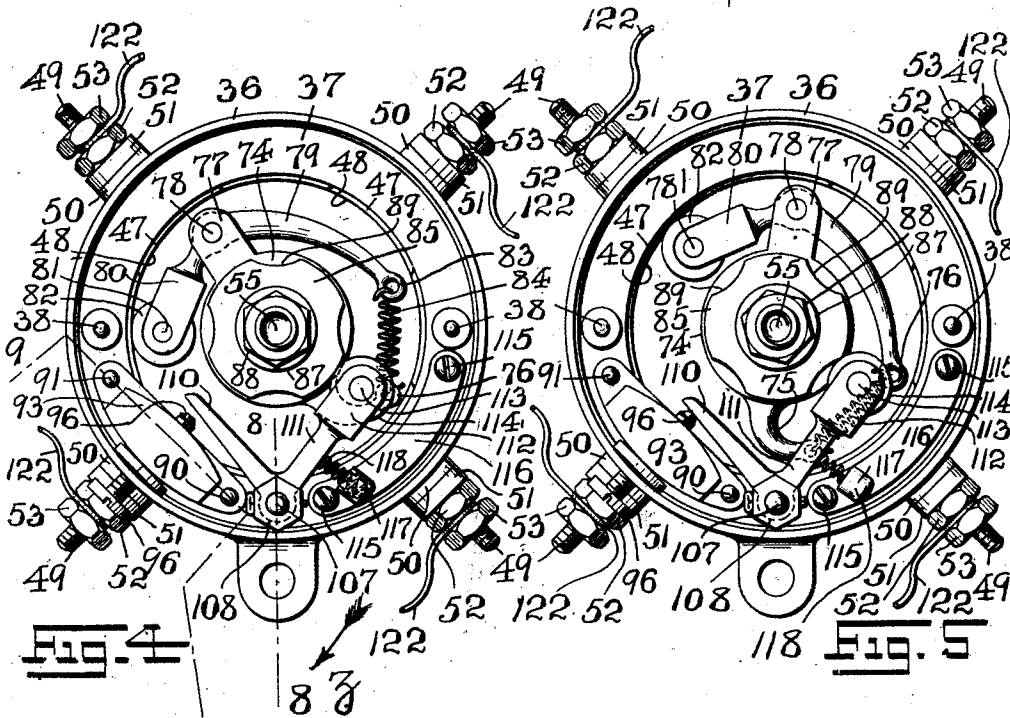


FIG. 4

FIG. 5

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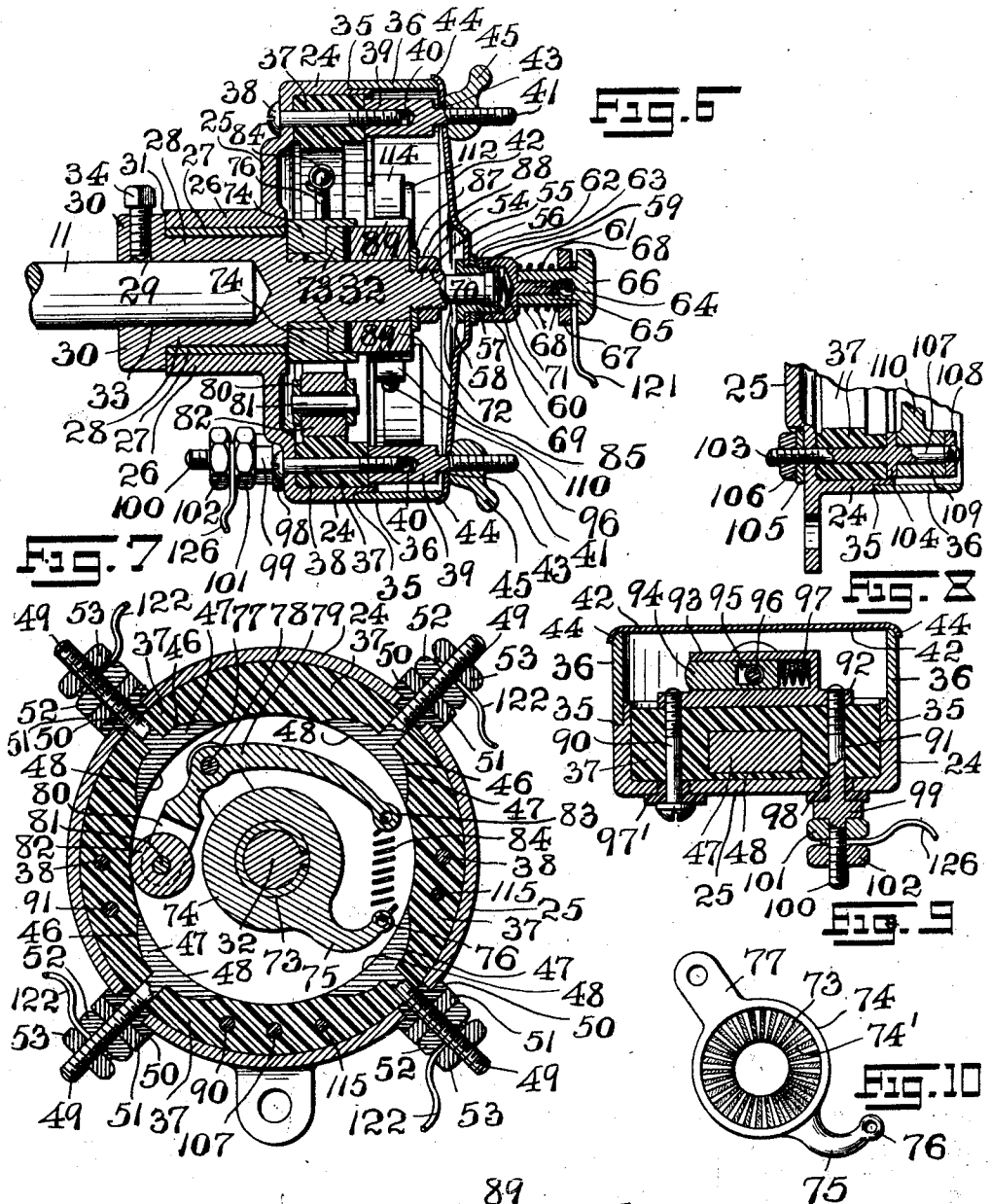
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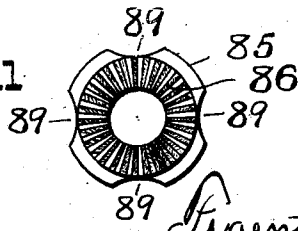
3 SHEETS—SHEET 3.



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FIG. 11



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UNITED STATES PATENT OFFICE.

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CURRENT DISTRIBUTER AND TIMER.

1,038,451.

Specification of Letters Patent. Patented Sept. 10, 1912.

Application filed January 13, 1909. Serial No. 472,096.

To all whom it may concern:

Be it known that I, JAMES M. SMITH, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Current Distributors and Timers; 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, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

This invention relates, generally, to improvements in explosive gas-engines; and, the present invention has reference, more particularly, to an electrical appliance or apparatus in the form of a timer for intermittently making and breaking the electric circuits and successively connecting the sparking terminals or devices of a number of engine-cylinders with the source or generator of the electricity, so as to successively ignite or fire the charges of the explosive medium in the explosion chambers of a multi-cylinder engine.

My present invention has for its principal object to provide a novel, simple and efficient electric device or appliance which acts as an electric timer, and produces an automatically operating contact-producing means for causing a longer dwell or long current-producing intervals when running the engine at high rates of speeds, and causing a short dwell or short current-producing intervals when running the engine at slow rates of speeds, thus resulting in great economy and a saving of electricity while running at slow speeds.

A further object of this invention is to provide an electric device the contact-making and breaking devices or parts of which can be manually and easily and quickly adjusted, without having to remove the parts of mechanism from their assembled positions within the casing of the timing device, so that the electric circuit can be interrupted before the contact-producing element leaves the contact-plate, thus successfully overcoming the production of sparking within the combined contact-making and breaking device and timer, and thereby overcoming the "pitting" or oxidizing of the surfaces and

other detrimental features ordinarily existing in appliances of this character.

A further object of this invention is to simplify and reduce the amount of apparatus and the electrical connections required for the sparking mechanism of a multi-cylinder internal combustion engine, the device to be used with a multi-coil induction apparatus by which it is possible to produce any desired multiplicity of charge-igniting sparks in a corresponding number of engine-cylinders.

The invention has for its further object to provide a means for varying the times of the formations of the sparks in the various cylinders by providing two-part circuit-portions of the return-circuit to the battery, any one of said two-part circuit portions being thrown into the primary circuit by the operation of a circuit switch, and thereby changing the flow of the electric current through the parts of the timer, so as to produce a longer or shorter dwell of electrical contact, as may be desired, corresponding to the running of the engine at greater or lower speeds.

Other objects of this invention not at this time more particularly enumerated will be clearly evident from the following detailed description of my present invention.

With the various objects of my present invention in view, the invention consists, primarily, in the novel electrical contact-making and breaking appliance or timer hereinafter set forth; and, the invention consists, furthermore, in the novel arrangements and combinations of the devices and parts, as well as in the details of the construction of the same, all of which will be more fully described in the following specification, and then finally embodied in the clauses of the claim which are appended to and which form an essential part of the said specification.

The invention is clearly illustrated in the accompanying drawings, in which:—

Figure 1 is a view of a multi-cylinder internal combustion engine, a portion of the engine-frame being represented in vertical section, a side view of the electric contact-making and breaking appliance or timer, a multi-coil induction apparatus, and the primary and secondary circuits. Fig. 2 is a front face view of the electric contact-making and breaking appliance or timer; and

Fig. 3 is a side view of the same, both of said views being made on an enlarged scale. Fig. 4 is a front face view of the appliance, made on a still larger scale, with the front

5 plate removed, said view showing the general arrangement for the contact-making and breaking devices within the casing of the appliance, in their normal initial positions, at the time when there is no electrical
10 contact between the various parts; and Fig. 5 is a similar view of the same devices and parts, showing the parts in the electrical contact-making positions. Fig. 6 is a horizontal
15 section taken on line 6—6 in said Fig. 2, looking in the direction of the arrow *a*, said view being made on an enlarged scale; Fig. 7 is a vertical cross-section on line 7—7 in
20 Fig. 3, looking in the direction of the arrow *y*; Fig. 8 is a detail vertical sectional representation, taken on line 8—8 in Fig. 4; and Fig. 9 is a detail vertical section, said section being represented as taken on line 9—9
25 in said Fig. 4, looking in the direction of the arrow *z* in the said figure. Figs. 10 and 11 are face views of the serrated faces of a contact-making arm-carrying sleeve or collar
30 and of a serrated adjustable cam-disk, respectively, employed with the main spindle of the appliance, said sleeve or collar and said cam-disk being shown in their detached relations.

Similar characters of reference are employed in all of the above described views, to indicate corresponding parts.

35 Referring now to the several figures of the drawings, the reference-characters 1, 2, 3 and 4 indicate in this case, the four cylinders of an internal combustion engine, and 5 indicates any suitable form of engine-
40 frame.

The reference-character 6 indicates the main-shaft of the engine, and 7 is a suitable casing, in which is arranged a gear-wheel 8 suitably mounted upon the said main shaft
45 6. The said casing 7 is provided with a cover or plate 9 provided with a bearing 10 in which is mounted and revolves therein a spindle 11 which is also provided with a gear-wheel 12 in mesh with and driven from
50 the gear-wheel 8.

The reference-character 13 indicates any usual form of induction coil, of the multiple-coil form, the reference-characters 14, 15, 16 and 17 indicating the binding posts of
55 the secondary bindings of the coil, the said windings of said coil 13 being in circuit with the sparking plugs 18 of the engine by means of the wires 19, 20, 21 and 22.

The reference-character 23 indicates a
60 suitable battery which is arranged in the primary circuit wired up with my novel form of electrical contact-making and breaking device and timer in the manner hereinafter more fully described. This contact-making
65 and breaking device or timer consists, es-

entially, of a suitable casing comprising a preferably cylindrical body-portion or shell 24 formed with an end-wall 25 which is made with a tubular hub 26. Arranged
70 within the tubular portion of the hub is a suitable sleeve 27 and rotatably arranged within said sleeve is a main arbor or spindle 28, which has an annular enlarged end-portion or head 30, forming a shoulder 31, and with a reduced portion 32, substantially
75 as illustrated in Fig. 6 of the drawings. The said arbor or spindle 28 is provided with a receiving recess or socket 33 for the arrangement of the make and break appliance and timer upon the end-portion of the
80 previously mentioned spindle 11, the device being suitably affixed in its operative position upon said spindle 11 by means of a set-screw 34, working in a screw-threaded hole 29, or other suitable fastening means, as will
85 be clearly evident. The body-portion or shell 24 is preferably made with an annular off-set, as 35, and the reference-character 36 indicates a metal ring which is suitably secured upon said off-set 35 and thus forms a
90 part of the main casing or shell of the device, as will be clearly evident. Suitably arranged within the said body-portion or shell 24 is a ring-shaped member or element, as
95 37, which is made of a suitable material or composition of matter, such as fiber, hard rubber, or the like, which is a non-conductor of electricity, the said member or element being suitably secured in place by means of
100 screws 38 which are passed through holes in the end-wall 25 and through the element or member 37, the said screws having their screw-threaded-end-portions screwed into screw-threaded receiving recesses 40 of suitable
105 socket-pieces or blocks 39, substantially in the manner shown in Fig. 6 of the drawings. The said socket-pieces or blocks 39 are provided with suitable screw-threaded shanks 41 which extend through correspond-
110 ingly placed holes 43 in a cover or face-plate 42 which has its marginal edge-portion preferably slightly bent in an inward direction, as at 44, so as to be fitted over the marginal edge-portion of the metal ring 36, the said
115 cover or face-plate being secured in its detachable position upon said ring 36 by means of suitable nuts or tightening devices 45 screwed down upon the free end-portions of the screw-threaded shanks 41.

As shown more particularly in Fig. 7 of
120 the drawings, the ring-shaped member or element 37 is made, in this case, with four receiving depressions 46, preferably of the configuration shown, in which are arranged correspondingly formed contact-blocks or
125 plates 47, each plate being made with the concave surface 48 conforming to the cylindrical curvature of the inner portion of the ring-shaped member or element 37, so that a smooth contact-surface will be produced. 130

Each contact-block or plate 47 is made with a screw-threaded shank 49, and arranged upon each shank is an insulating washer 50, disposed in an opening or hole in the side of the body-portion or shell 24, so as to insulate the metal shank from the metal body-portion or shell 24, as will be clearly evident. Upon each shank 49 is also arranged a metal washer or disk 51, and a pair of binding nuts 52 and 53, for the securing therebetween and the attachment of the primary circuit-wires to each binding-post, thus provided. The said nuts 52 and 53 are also employed to permanently secure the contact-blocks or plates 47 in their fixed positions, as will be clearly understood.

As shown, the reduced portion 32 of the arbor or spindle 28 has a screw-threaded stud-like end-piece 54 made in its end with a concave depression 55. The said cover or face-plate 42 is provided with a centrally disposed and perforated portion 56, in which is arranged a tubular member or sleeve 57, provided with an annular flange 58 bearing upon the inner face of said central portion 56, said sleeve being formed with an externally screw-threaded part 59 and an internally enlarged portion 60. A chambered or hollow nut-shaped body 61 is screwed upon said externally screw-threaded part 59, against a pair of washers 62 and 63 arranged upon said sleeve or member 57. The said nut-shaped body 61 is also provided with a screw-threaded shank 64 upon which is screwed a binding post 65 provided with an enlarged portion 66, and slidably arranged upon the shank of said post 65 is a disk 67, a coiled spring 68 which encircles said post bearing against said disk 67 so as to force it against the enlarged portion or head 66. Arranged in the internally enlarged portion 60 of the tubular member or sleeve 57 is the head 69 of a contact-plug or pin 70, a coiled spring 71 being employed to force the convex or rounded end-portion 72 of the said plug or pin 70 in constant contact with the concave depression 55 of the stud-like end-piece 54, as clearly illustrated in Fig. 5 of the drawings.

The reference-character 73 indicates a suitably flanged disk-like member provided with serrations or suitable holding portions 74' in one of its flat faces, as shown more particularly in Fig. 10 of the drawings, said member 73 being fixed upon the reduced portion 32 of the arbor or spindle 28, so as to revolve with the same, said disk-shaped member 73 being fitted in a chambered part of an arm-carrying sleeve 74, in the manner indicated in said Fig. 6 of the drawings, the said sleeve 74 being thereby suitably secured in position, so as to revolve with the arbor or spindle 28, as will be clearly evident. Extending from one side

of the arm-carrying sleeve 74 is an arm or horn 75 which is provided in its free end-portion with a hole or perforation 76. Extending from the opposite side of the arm-carrying sleeve 74 are a pair of perforated ears or lugs 77 with a pivot or pin 78 extending across the space between said ears or lugs 77, said pivot or pin having its ends suitably arranged and secured in the perforations of said ears or lugs 77. Pivotally arranged upon the said pivot or pin 78 is a contact-making arm 79, which is provided with a bifurcated end-portion 80 formed with holes or perforations for the arrangement and securing therein of a pivot or pin 81, upon which is mounted a suitable roller 82. The said arm 79, which is preferably curved, as shown in Figs. 4, 5 and 7 of the drawings, is provided in its opposite end-portion with a hole or perforation 83. Suitably secured in this hole 83 and in the hole 76 of the arm or horn 75 are the respective ends of a coiled spring 84, the action and purpose of this spring being to produce alternately a constant rolling contact of the roller 82 with the cylindrical surface-portions of the ring-shaped member or element 37 and the concave surfaces 48 of the metal blocks or plates 47, when the parts are being revolved with the arbor or spindle 28. Suitably arranged upon the said reduced portion 32 of the arbor or spindle 28 is a cam-disk 85 having serrations or other suitably shaped holding portions 86 in engagement with the serrations or holding portions 74' of the sleeve or disk 73, said cam-disk 85 being adjustably secured in its position by means of a washer 87 and a nut 88 both arranged upon the screw-threaded stud-like portion 54 of the arbor or spindle 28. In its peripheral surface the said cam-disk 85 is provided with a multiplicity of concave depressions or recesses 89, the number of depressions corresponding to the number of contact-blocks or plates 47. Suitably secured upon the said ring-shaped member or element 37, by means of a screw 90 and a screw-threaded binding-post 91, see more particularly Fig. 9 of the drawings, is a suitable plate 92 which is formed with a box 93 in which is slidably arranged a bar 94 having an elongated opening or slot 95. Suitably screwed into screw-threaded holes in the sides of the said box 93 is a contact-screw 96 formed with a slotted head for the adjustment of said screw. The said contact-screw 96 extends through the elongated opening or slot 95, and the bar 94 is forced into frictional binding relation with the said screw by means of a coiled spring 97, as shown in said Fig. 9. The purpose of this arrangement is, that although the contact-screw 96 may be readily turned by manipulating its head to adjust the distance of the projection

of its end from the box 93, the frictional engagement of said bar 94 with the shank of said contact-screw 96 is sufficient to prevent the latter from jarring or turning away from the position to which it has been adjusted. The screw 90 is insulated from the back or end-wall 25 of the body-portion or shell 24 by means of a fiber or other suitable washer 97¹. The post 91 is similarly insulated from the end-wall 25 by a fiber or other suitable washer 98, said post having an annular enlargement 99 and a screw-threaded stud-like portion 100 upon which are screwed a pair of binding nuts 101 and 102.

Extending through the back or end-wall 25 of the shell 24, and through the member or element 37, as shown more particularly in Fig. 8 of the drawings, is a screw-threaded shank or member 103, held in position by means of an annular rib 104, and a washer 105 and nut 106, substantially in the manner shown. Upon a portion 107 of the said shank or member 103 and secured in its oscillatory relation upon said portion 107, by means of a nut 108, or other suitable retaining means, is the hub 109 of a contact making and breaking element from which extends an arm 110 which is adapted to be brought in contact with the end of the contact-screw 96. A second arm 111 extends from said hub 109, said arm being made with a bifurcated or yoke-shaped end 112 across which extends a pin or pivot 113 upon which is a roller 114. Suitably secured upon the said ring-shaped member or element 37, by means of screws 115, or other suitable fastening means, is a plate 116 having a socketed post or element 117 in which is secured a coiled spring 118, said spring having a portion extending from said socketed post and engaging with the side of the arm 111, so that the roller 114 will be forced into rolling contact with the cam-disk 85 and the depressions thereof, and thereby at proper times causing the arm 110 to be brought against the end of the contact-screw 96.

Having thus described the general construction of the combined contact-making and breaking device and timer, I will now briefly set forth its use and operation in connection with the electric battery 23 and the induction apparatus 13.

Leading from the battery is a circuit-wire 119 in which there may be a switch 120, the said wire 119 suitably connecting the terminals of the primary coils of the apparatus 13, substantially as shown in said Fig. 1 of the drawings.

The reference-character 122 indicates suitable circuit-wires, in this case four, which connect the negative poles or terminals of the primary coils with the respective shanks 49 of the various contact-blocks or plates 48, as clearly indicated in the several

figures of the drawings. Suitably connected with the binding post 65, substantially as shown in Figs. 1 and 6 of the drawings, is a return-circuit 121 leading to a contact post 123 of a switch 124, a circuit-wire 125 connecting the said switch with the battery 23. A second return-circuit 126 which is connected with the shank 100 of the binding post 91 leads to a second contact-post 127 of the switch 124, the circuit being adapted to be completed through the wire 125 with the battery 23, as will be clearly understood. By this means, a "long-dwell" circuit or a "short-dwell" circuit can be made at will, for the purposes previously stated.

Suppose the switch 120 to be closed, and the switch 124 to have been moved over upon the contact 123, by starting the main shaft 6, the arbor or spindle 11 is also caused to be revolved, thus revolving the spindle 28. The result will be that the contact-making roller 82 will alternately roll over the non-conducting ring-shaped member or element 37 and the metal contact-blocks or plates 48. A "long dwell" primary circuit is thereby established during the contact of the roller 82 with each block or plate 48, according to the exposed contacting surface of each block, the circuit being completed through the pintle 81, the arm 79, the pintle 78, the lugs 77, the members 73 and 74, the reduced portion 32 of the spindle 28, the contact-plug 70, the parts 56, 61 and 65, the circuit-wire 121, the switch 124, and the circuit-wire 125 back to the battery, the electric circuit being intermittently made and broken, as will be clearly evident. At the same times that such intermittent primary electric circuits are established, the secondary coils of the apparatus 13 intermittently become active, and through the respective circuit-wires 19, 20, 21 and 22, produce electric sparks in the respective cylinders 1, 2, 3 and 4, the electric circuit being completed through the engine-body and frame, the casing 7, the spindle 11, arbor or spindle 28, the contact-plug 70, the parts 56, 61 and 65, the circuit-wire 121, the switch 124, and the circuit-wire 125 through the battery 23 and circuit-wire 119 finally back to the induction apparatus 13.

To produce a "short-dwell" circuit, the switch 124 is moved over so as to make contact with the contact post 127. The result will be that the primary electric circuits are made through the circuit-wires 119, with the binding posts 49, the respective blocks or plates 48, the roller 82, the pintle 81, the arm 79, the pintle 78, the lugs 77, the members 73 and 74, the cam-disk 85, the roller 114, the pintle 113, the arms 111 and 110, and by means of the contact-screw 96, the circuit-wire 126, switch 124, and the circuit-wire 125 back to the battery, the electrical contact with the end of the screw 96

being only of such duration that the roller 114 rolls in each depression 89 of the cam-disk 85. The secondary circuit is established in the same manner as above stated, being completed with the induction apparatus 13, through the various parts of the mechanism, the circuit-wire 126, switch 124, circuit-wire 125, battery 23, and circuit-wire 119 finally back to the induction apparatus 13. By the adjustment of the contact-screw 96 in an inward or outward direction, the electrical contact can be varied; so as to be made of a longer or shorter duration, thereby correspondingly varying the electric sparks at the sparking devices; or, by slightly unscrewing the nut 88, so as to turn the cam-disk 85, and again tightening the nut 88, the positions of the recesses 89 may be changed sufficiently so as to alter the time of contact with the contact-screw 96, so as to establish an earlier or later circuit, as may be desired, and also regulating the time of such contact, at the will of the operator.

From the foregoing description of my present invention it will be clearly obvious that I have produced a novel electrical appliance in the form of a current-distributor and timer for a four-cylinder internal combustion engine, but it will be readily understood that various changes may be made in the general arrangements and combinations of the devices and parts, without in any way departing from the scope of my present invention, so as to adapt the appliance for its use with any number of engine-cylinders and corresponding electric spark-producing plugs.

I claim:—

1. A current distributor and timer for a sparking system comprising a casing, an arbor rotatably arranged in said casing, a non-electric insulating element connected with said casing, a metal supporting member thereon, an adjustable contact-screw mounted in said supporting member, a means of electrical connection connected with said supporting member, a pivot-post mounted upon said insulating element, a contact making and breaking device pivoted upon said post, comprising a pair of arms, a spring-receiving socket upon said insulating element, a spring in said socket having a portion in engagement with one of the arms of said pivoted contact making and breaking device for causing the latter to make contact with said contact-screw, a contact-establishing sleeve upon said arbor, a contact-establishing disk movably and adjustably mounted upon said arbor, said sleeve being provided upon one of the faces with serrations, and the said disk being also provided upon one of its faces with serrations in separable engagement with the serrations of said sleeve for the adjustment of said

disk with relation to said sleeve and the contact-making and breaking devices, said disk being provided with a multiplicity of peripheral depressions, and a roller carried by the other arm of said pivoted contact making and breaking device in rolling contact with said peripheral surface-portions and said depressions of said disk, substantially as and for the purposes set forth.

2. A current distributor and timer for a sparking system comprising a casing, an arbor rotatably arranged in said casing, a non-electric insulating element connected with said casing, a metal supporting member thereon, an adjustable contact-screw mounted in said supporting member, a means of electrical connection connected with said supporting member, a pivot-post mounted upon said insulating element, a contact-making and breaking device pivoted upon said post, comprising a pair of arms one of which is adapted to make contact with said contact-screw, a contact-establishing sleeve upon said arbor, a contact-establishing disk movably and adjustably mounted upon said arbor, said sleeve being provided upon one of the faces with serrations, and the said disk being also provided upon one of its faces with serrations in separable engagement with the serrations of said sleeve for the adjustment of said disk with relation to said sleeve and the contact making and breaking devices, and means upon the other arm of said pivoted contact making and breaking device in engagement with said contact-establishing disk, all of the said parts being arranged to provide a short-dwell contact, and a second set of contact making and breaking elements upon said arbor and within said casing to produce a long-dwell contact, substantially as and for the purposes set forth.

3. A current distributor and timer for a sparking system comprising a casing, an arbor rotatably arranged in said casing, a non-electric insulating element connected with said casing, a metal supporting member thereon, an adjustable contact-screw mounted in said supporting member, a means of electrical connection connected with said supporting member, a pivot-post mounted upon said insulating element, a contact making and breaking device pivoted upon said post, comprising a pair of arms, one of which is adapted to make contact with said contact-screw, a contact-establishing sleeve upon said arbor, a contact-establishing disk movably and adjustably mounted upon said arbor, said sleeve being provided upon one of the faces with serrations, and the said disk being also provided upon one of its faces with serrations in separable engagement with the serrations of said sleeve for the adjustment of said disk with relation to said sleeve and the contact mak-

ing and breaking devices, said disk being provided with a multiplicity of peripheral depressions, and a roller carried by the other arm of said pivoted contact making and breaking device in rolling contact with the peripheral surface portions and the depressions of said contact-establishing disk, all of the said parts being arranged to provide a short-dwell contact, and a second set of contact making and breaking elements upon said arbor and within said casing to produce a long dwell contact, substantially as and for the purposes set forth.

4. A current distributor and timer for a sparking system comprising a casing, an arbor rotatively arranged in said casing, a non-electric insulating element connected with said casing, a metal supporting member thereon, an adjustable contact-screw mounted in said supporting member, a means of electrical connection connected with said supporting member, a pivot-post mounted upon said insulating element, a contact-making and breaking device pivoted upon said post, comprising a pair of arms, a spring-receiving socket upon said insulating member, a spring in said socket having a portion in engagement with one of the arms of said pivoted contact-making and breaking device for causing said arm to make contact with said contact-screw, a contact-establishing sleeve upon said arbor, a contact-establishing disk movably and adjustably mounted upon said arbor, said sleeve being provided upon one of the faces with serrations, and the said disk being also provided upon one of its faces with serrations in separable engagement with the serrations of said sleeve for the adjustment of said disk with relation to said sleeve and the contact-making and breaking devices, and means upon the other arm of said pivoted contact-making and breaking device in engagement with said contact-establishing disk, all of the said parts being arranged to provide a short-dwell contact and a second set of contact-making and breaking elements upon said arbor and within said casing to produce a long-dwell contact, substantially as and for the purposes set forth.

5. A current distributor and timer for a sparking system comprising a casing, an arbor rotatively arranged in said casing, a non-electric insulating element connected with said casing, a metal supporting member thereon, an adjustable contact-screw

mounted in said supporting member, a means of electrical connection connected with said supporting member, a pivot-post mounted upon said insulating element, a contact-making and breaking device pivoted upon said post, comprising a pair of arms, a spring-receiving socket upon said insulating member, a spring in said socket having a portion in engagement with one of the arms of said pivoted contact-making and breaking device for causing said arm to make contact with said contact-screw, a contact-establishing sleeve upon said arbor, a contact-establishing disk movably and adjustably mounted upon said arbor, said sleeve being provided upon one of the faces with serrations, and the said disk being also provided upon one of its faces with serrations in separable engagement with the serrations of said sleeve for the adjustment of said disk with relation to said sleeve and the contact-making and breaking devices, said disk being provided with a multiplicity of peripheral depressions, and a roller carried by the other arm of said pivoted contact-making and breaking device in rolling contact with the peripheral surface-portions and the depressions of said contact-establishing disk, all of the said parts being arranged to provide a short-dwell contact, and a second set of contact-making and breaking elements upon said arbor and within said casing to produce a long-dwell contact, substantially as and for the purposes set forth.

6. A current distributor and timer for a sparking system comprising a casing, an arbor rotatively arranged in said casing, a contact-establishing sleeve upon said arbor, contact-making and breaking devices in said casing, and a contact-establishing disk also arranged upon said arbor, said sleeve being provided upon one of its faces with serrations, and the said disk being also provided upon one of its faces with serrations in separable engagement with the serrations of said sleeve for the adjustment of said disk with relation to the sleeve and the contact-making and breaking devices, substantially as and for the purposes set forth.

In testimony, that I claim the invention set forth above I have hereunto set my hand this eighth day of January, 1909.

JAMES M. SMITH.

Witnesses:

FREDK. C. FRAENTZEL,
FREDK. H. W. FRAENTZEL.