

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

Patented Dec. 31, 1912.

2 SHEETS-SHEET 1.

1,048,903.

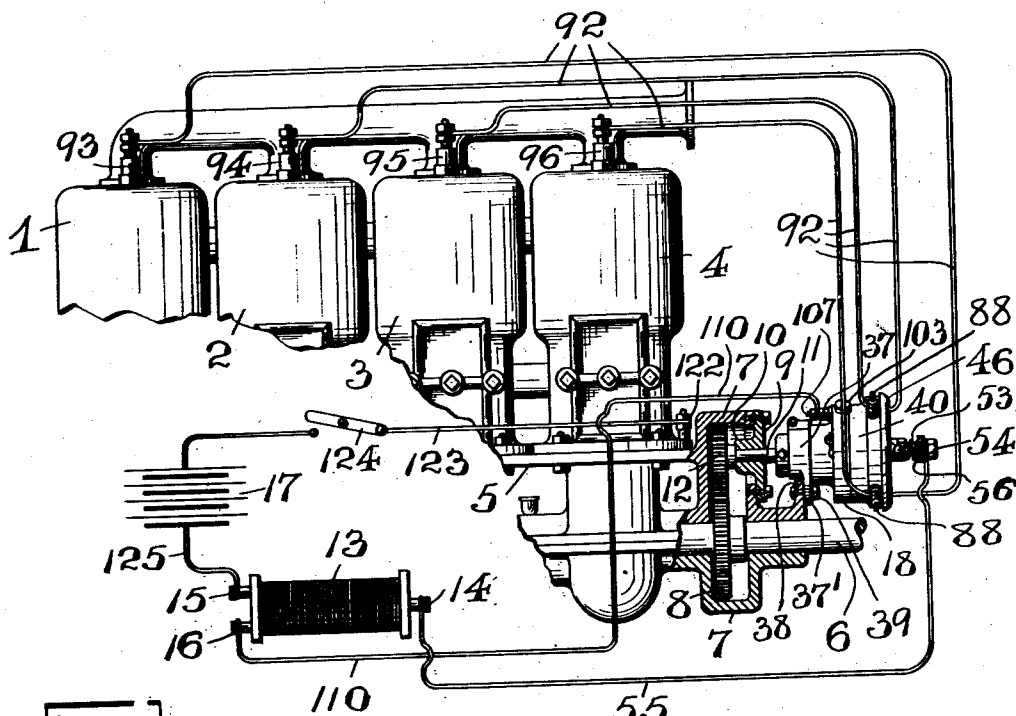


Fig. 1

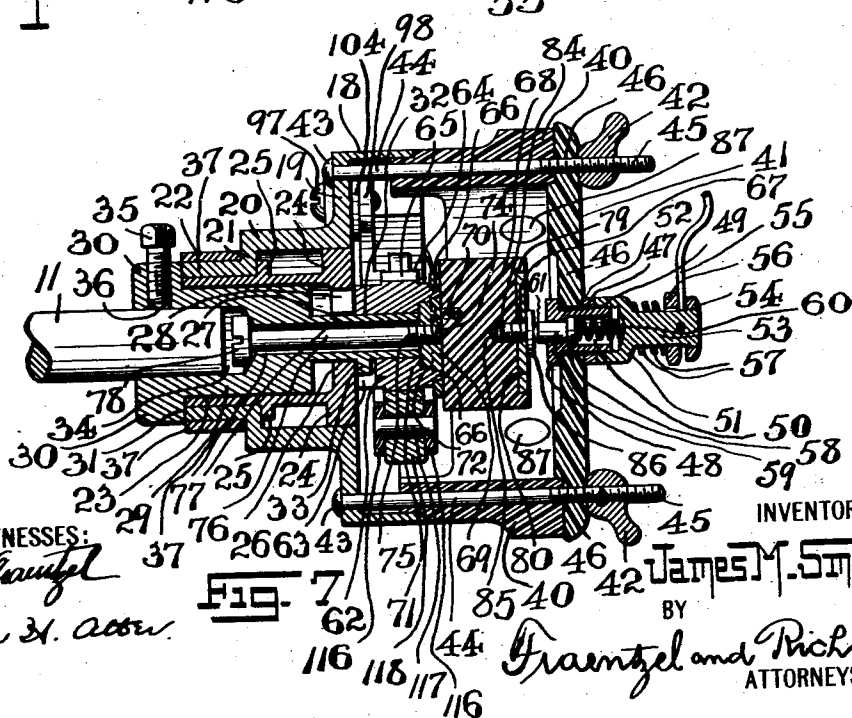


Fig. 7

WITNESSES:
W. H. Graetzel
Anna M. Allen

INVENTOR:

James M. Smith,

BY

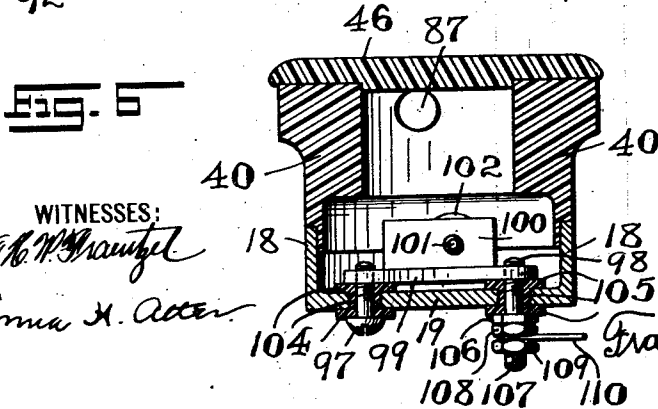
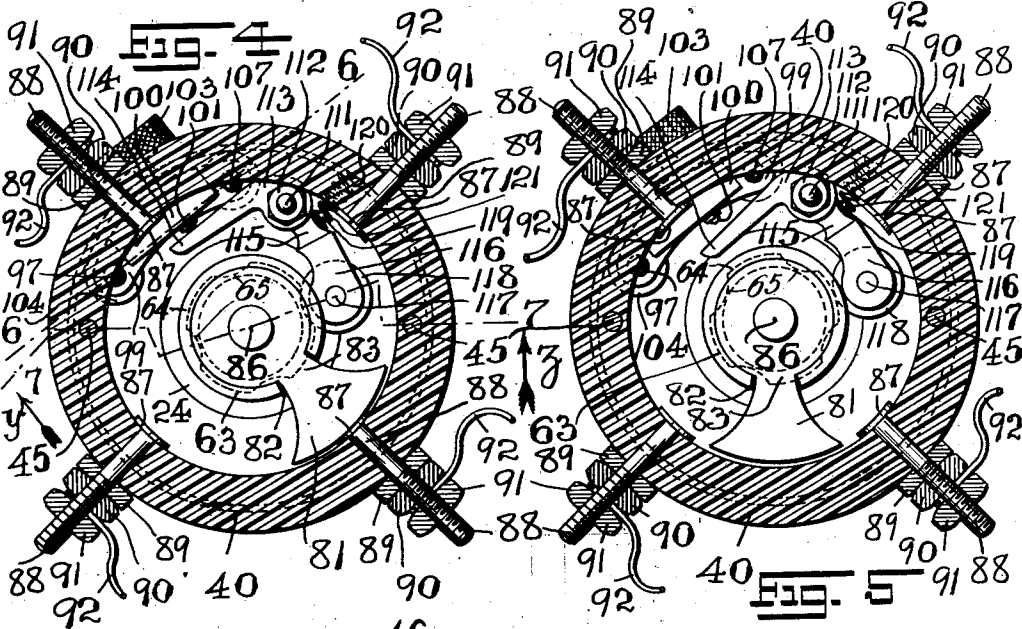
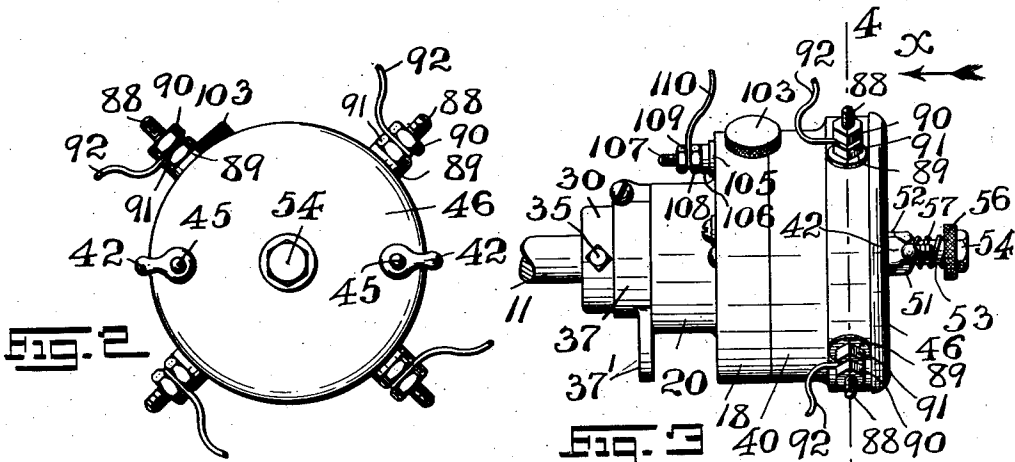
Graetzel and Richards
ATTORNEYS.

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2 SHEETS—SHEET 2.



WITNESSES:
W. H. Graetz
Anna M. Allen

INVENTOR:
James M. Smith,
BY
Graetz and Richards,
ATTORNEYS

UNITED STATES PATENT OFFICE.

JAMES M. SMITH, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-HALF TO CHARLES ADSIT MAGRUDER, OF BRYN MAWR, PENNSYLVANIA.

CURRENT DISTRIBUTER AND TIMER.

1,048,903.

Specification of Letters Patent.

Patented Dec. 31, 1912.

Application filed January 13, 1909. Serial No. 472,097.

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.

The present invention relates, generally, to improvements in explosive gas-engines; and, the present invention has reference, more particularly, to a novel construction of automatic timing and distributing mechanism for controlling an electric current to intermittently make and break the electric circuit thereof, and successively connect the sparking terminals or devices of a number of engine-cylinders with the source of generation of the said electric current, so as to successively ignite or explode the charges of explosive element in the explosion chambers of a multi-cylinder engine.

My present invention has for its principal object to provide a novel, simple and effective mechanism of the character above set forth, adapted to be so geared with the main shaft of an explosion-engine so that its parts move in a proper time-relation to the movements of the different pistons in the cylinder-chambers of said explosive engine, and in so doing properly time and distribute the electric current successively to the sparking terminals or devices for the purpose above set forth.

A further object of the present invention is to provide an automatic timing and distributing mechanism for an electric current whereby the said electric current may be taken from the batteries, when they are the source of generation, and distributed successively from a single spark or vibrator coil, to a plurality of sparking terminals or devices of a multi-cylinder explosive engine, thus obviating the necessity of using a plurality of spark or vibrator coils corresponding in number to the number of sparking

terminals or devices upon the explosive-engine.

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 electric current timing and distributing mechanism 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 explosive-engine, part of the same being broken away, a portion of the engine-frame being represented in vertical section, to illustrate in side elevation the novel construction of automatic timer and distributor, and in proper electrical connection therewith and with the sparking terminals of said engine, showing the electrical source of generation and a single coil induction apparatus with its primary and secondary circuits. Fig. 2 is a front face view of the said automatic timer and distributor mechanism; and Fig. 3 is a side elevation of the same, both of said views being drawn upon an enlarged scale. Fig. 4 is a vertical cross-section of the same, taken on line 4—4 in said Fig. 3, and looking in the direction of the arrow *x*; this view showing the general arrangement of the interior mechanism of the same when in a position to distribute the electrical current to one of the sparking terminals of said explosive-engine. Fig. 5 is a similar view illustrating the same mechanism in a position breaking the electrical circuit and approaching a position to make and distribute the electrical circuit to another of the sparking terminals of said explosive-engine. Fig. 6 is longitudinal cross-section taken on line 6—6 in said Fig. 4, and looking in the direction of the arrow *y*. Fig. 7 is a central lon-

itudinal vertical section of the said novel timing and distributing mechanism, taken on line 7—7 in said Fig. 4, looking in the direction of the arrow *z*.

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

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 or explosive-engine, and 5 indicates any suitable form of engine-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 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 by the gear-wheel 8. The reference-character 13 indicates any usual form of single induction coil, the binding-post 14 indicating the secondary winding of the coil, and the binding-posts 15 and 16 indicating the primary windings of the said coil.

The reference-character 17 indicates a suitable battery which is arranged in the primary circuit wired up with my novel form of automatic electrical current timer and distributor, in the manner hereinafter more fully described.

The novel electrical current timer and distributor embodying the principles of my invention consists, essentially, of a suitable casing comprising a preferably cylindrical body-portion or shell 18, preferably of metal, the same being formed with an end wall 19. Connected integrally with the said end wall 19, being centrally disposed and extending outwardly from the outer side thereof, is another cylindrical shell 20 also provided with an end wall 21 which is made with a tubular hub 22. Arranged within the tubular hub 22 is a suitable sleeve or bushing 23. This sleeve or bushing 23 is provided at its inner end with a flange 24 adapted to fit the opening formed by the cylindrical shell 20 and in such a position that its outer surface is flush with the inner surface of the end wall 19 of the cylindrical body-portion or shell 18. The said sleeve or bushing is further provided upon its outer surface with another flange 25 adapted to be brought in engagement with the inner side of the end wall 21 of the cylindrical shell 20. The said sleeve or bushing 23 is closed at its inner end by means of a wall 26, this said wall being provided with a suitable and centrally disposed hole or opening 27 from the edge of which extends a slot 28. Rotatably arranged within said sleeve or bushing 23 is a main arbor or spin-

dle 29, which has an annular enlarged end-portion or head 30, forming a shoulder 31, and is made with a reduced portion 32 adapted to pass through said hole or opening 27 in the wall 26 of the sleeve or bushing 23. The outer surface of this said reduced portion 32 is provided with a rectangular projection or lug 33, which passes through the slot 28 when the parts above described are being assembled. The said arbor or spindle 29 is provided with a receiving recess or socket 34 for the operative arrangement of the novel timer and distributor upon the end portion of the previously mentioned spindle 11, the device being suitably affixed in its operative position upon said spindle 11 by means of a set-screw 35 working in the screw-threaded hole 36, or other suitable fastening means, as will be clearly evident. In order to prevent the said cylindrical body-portion or shell 18, and its integral parts, from turning when its interior parts are operated by the revolving spindle 11, there is provided a yoke-member or collar 37, clamped in any suitable manner in tight holding engagement with the outer surface of the hub 22. This yoke-member or collar 37 is provided with a downwardly extending perforated lug 37¹, which may be secured to a similar perforated lug 38 upon the casing 7, by means of a nut and bolt 39, or the said shell 18 may be held in a non-movable relation to its interior mechanism by any other suitable or desirable means.

Arranged upon the cylindrical body-portion or shell 18, in any suitable manner, is a tubular shell 40, the same being composed of material which is a non-conductor of electricity, and the said tubular shell 40 forming a part of the main casing or shell of the device, as will be clearly evident. A face-plate or cover 41, also composed of material which is a non-conductor of electricity, is arranged upon the outer end of said tubular shell 40. The said face-plate or cover 41, the tubular-shell 40 and the shell 18 are all suitably bound together by means of bolts, the heads 43 of which engage with the outer surface of the wall 19 of said shell 18, while the shanks 44 pass through suitable openings in the shell 18, the tubular shell 40 and the face-plate or cover 41, the screw-threaded ends 45 of said shanks projecting beyond the outer surface of said face-plate or cover and being adapted to receive the binding thumb-nuts 42 which serve to lock or bind all the above said parts together. The said cover or face-plate 41 is provided with a centrally disposed and perforated portion 46 in which is arranged a tubular member or sleeve 47, provided with an annular flange 48 bearing upon the inner surface of said central portion 46, said sleeve being formed with an externally screw-threaded part 49

and an internally enlarged portion 50. A chambered or hollow nut-shaped body 51 is screwed upon said externally screw-threaded part 49, against a screw-threaded washer 52 also screwed upon said externally screw-threaded part 49, so as to bear against the outer surface of said central portion 46. The said nut-shaped body 51 is also provided with a shank 53 provided at its outer end with a screw-thread upon which is screwed a head or nut 54. The said shank 53 is provided with a lateral perforation adapted to receive the end of a wire or electrical conductor 55 of the secondary circuit, subsequently to be described. Slidably arranged upon said shank 53 is a disk 56, a coil-spring 57 which encircles said shank 53 bearing against said disk 56 so as to force it against the wire or electrical conductor 55 and thus assures a tight binding contact between said wire 55 and said shank 53. Arranged within the internally enlarged portion 50 of the tubular member or sleeve 47, is the head 58 of a contact-plug or pin 59, a coiled spring 60 being employed to force the end-portion 61 of said plug or pin 59 outwardly so that the same makes constant electrical contact with internal parts of the mechanism to be subsequently described. Arranged upon the end of the reduced portion 32, which projects into the interior of said shell 18, is a metallic hub 62, the same being provided with a cutaway portion or slot 63 which fits over and engages with the rectangular projection or lug 33 on said reduced portion 32, and whereby the said metallic hub 62 is locked upon said reduced portion 32, so as to turn or revolve therewith. The said hub 62 is provided upon its outer cylindrical surface with a cylindrical shoulder 64. This cylindrical shoulder 64 is formed with a multiplicity of concave depressions or recesses 65. Projecting from the said hub 62 is a pair of lugs 66. The reference-character 68 indicates a hub-member made of a suitable material which is a non-conductor of electricity, and the same is provided at one end with a disk 69 which is secured thereto by means of screws 70. This disk 69 is provided with a centrally disposed boss 71 which is adapted to fit into a corresponding depression 72 in the end of the said metallic hub 62; and, said disk 69 is furthermore provided with suitable holes or receiving sockets which are adapted to receive the above described lugs 66 of the hub 62, and whereby the said hub-member 68 is caused to turn or revolve with the said hub 62. The boss 71 of said-disk 69 is made with a screw-threaded hole or opening 74 into which is screwed the screw-threaded end 75 of a shank 76 which passes through a longitudinal hole or opening 77 in the reduced portion 32 of the arbor or spindle 29, the head 78 of said shank 76

bearing against the bottom of the receiving recess or socket 34, as clearly shown in said Fig. 7 of the drawings, the said shank 76 and its head 78 thereby binding or holding the two hubs 62 and 68, and their parts in their respective operative relations with the arbor or spindle 29, as will be clearly evident. The outer end of said hub-member 68 is provided with a receiving recess or socket 79 which is adapted to receive the disk-portion 80 of a metallic fan-shaped contact 81, the walls of said recess or socket 79 being cut away, as at 82, to permit the passage of the fan-shank 83. The said disk-portion 80 is provided with a centrally disposed hole or opening 67 in which is arranged a screw-threaded shank 84 which screws into a screw-threaded hole 85 in said hub-member 68, the head 86 of said shank 84 bearing against the disk-portion 80 and serving to lock or hold the fan-shaped contact 81 in its operative relation with said hub-member 68. The plug or pin 59 is thus caused to make electrical contact with the head 86 of said screw-shank 84 by the means above described.

As shown more particularly in Figs. 4 and 5 of the accompanying drawings, the tubular shell 40 is provided upon its inner surface with contact-disks 87, each contact-disk 87 being made with a screw-threaded shank 88, said shank passing through suitable holes or openings in the said tubular shell 40 and projecting beyond the outer surface of the same. Upon each shank 88 is also arranged a washer 89 and a pair of binding nuts 90 and 91, for the securing therebetween and the attachment of the circuit-wires or electrical conductors 92 to each binding post, thus provided. These wires or electrical conductors 92 lead to and are connected electrically with the respective sparking terminals or devices 93, 94, 95 and 96 of the engine-cylinders 1, 2, 3 and 4.

Suitably secured upon the inner side of the wall 19 of the shell 18, by means of a screw 97 and a screw-threaded binding-post 98, see more particularly Fig. 6 of the drawings, is a suitable plate 99 which is formed with a box 100 in which is arranged an adjustable contact-screw 101, the shank of said contact-screw projecting through a suitable hole or opening in the said shell 18 and being properly insulated from electrical contact therewith, by means of a collar or washer 102 of any suitable material which is a non-conductor of electricity. The outer end of the shank of the contact-screw 101 is provided with a suitable head 103, by means of which the said contact screw 101 may be manipulated to adjust the same. The screw 97 and the plate 99 adjacent thereto are insulated from the wall 19 of the shell 18 by means of a fiber or other suitable sleeve and washer 104. In a like manner, the post 98,

and plate 99 adjacent thereto, are similarly insulated from said wall 19 of the shell 18 by means of a fiber or other suitable sleeve and washer 105, said post having an annular enlargement 106 and a screw-threaded stud-like portion 107 upon which are screwed a pair of binding nuts 108 and 109, for the securing therebetween and the attachment thereto of the wire or electrical conductor 110, this wire or electrical conductor 110 forming a part of the primary circuit leading from the binding post 16 of said coil 13.

Mounted upon a post 111, which is secured in any suitable manner to the wall 19 of said shell 18, and retained in an oscillatory relation upon said post 111 by means of the nut 112, is the hub 113 of a contact-making and breaking element from which extends an arm 114 which is adapted to be brought in contact with the end of the contact-screw 101. A second arm 115 extends from said hub 113, said arm being made with a bifurcated or yoke-shaped end 116 across which extends a pin or pivot 117, and upon which is mounted a roller 118. The said arm 115 is provided with a stud 119, and a similar stud 120 is secured upon the inner surface of the said shell 18. Between these studs 119 and 120 is arranged a coiled spring 121 which acts upon the said arm 115 in such a manner, that the roller 118 will be forced into rolling contact with the cam-shaped shoulder 64 and the depressions thereof, and thereby, at the proper times, will cause the arm 114 to be brought against the end of the contact-screw 101.

The engine-frame 5 is provided with a suitable ground-binding post 122 to which is attached one end of a wire or electrical conductor 123 which leads to one pole of the battery 17. In this circuit-wire or electrical conductor 123 may be placed the ordinary cut-off switch 124 of any desirable type. The opposite pole of the battery 17 is connected by means of a circuit-wire or electrical conductor 125 with the binding-post 15 of the primary circuit of the coil 13.

Having thus described the general construction and electrical circuits of the novel automatic timer and distributor, I will now briefly set forth its use and operation.

Assuming the switch 124 to be closed, the electrical circuits are then complete and subject to the control of the automatic timer and distributor. The battery 17, generating the electrical current, passes the same through the wire 125 and binding-post 15 into the primary winding of the coil 13, this primary circuit or current passing out of the coil 13 at the binding-post 16, into the wires 110 and thence to the binding-post 98 into the plate 99 and box 100 to the contact-screw 101. When the roller 118 of the make and break device falls into a depres-

sion of the revolving cam-shoulder 64, the arm 114 is brought in contact with the contact-screw 101, and the primary circuit is at that moment completed by permitting the current to pass into said arm 114, and thence into the frame-work 5 of the engine to the binding-post 122, and through the wire 123 and switch 124 back to the battery. The primary circuit being thus completed in the coil 13, the secondary current is thereby generated, the same passing out of the binding-post 14 into the wire 55 to the contact-plug 59, which being in contact with the fan-shaped contact 81, as herein-above described, permits the passage of the current thereinto. In its operation, the relation of this fan-shaped contact 81 to the cam-shoulder 64 is such, that the moment the roller 118 falls into a depression of said cam-shoulder 64 and completes the primary circuit, as above described, this said fan-shaped contact 81 is opposite one of the contact-disks 87, hence the secondary current passes from said fan-shaped contact into said contact-disk and thence through one of the wires 92 to a sparking-terminal or device, as for example, 93, and produces a spark in the combustion-chamber of the cylinder 8, exploding the charge of explosive element therein. The sparking-terminals or devices 93, 94, 95 and 96 are grounded in the engine-casting, so that the secondary circuit is completed through the engine-frame 5, binding post 122, wire 123, battery 17, and thence back to the induction coil 13. Since the cam-shoulder 64 and the fan-shaped contact 81 are revolving together, the moment the roller 118 leaves a depression of the cam-shoulder 64, the contact of the arm 114 with the contact-screw 101 is broken, and the primary circuit is interrupted. At the same time, the secondary current also ceases. At the time that the fan-shaped contact 81 has passed away from one contact-disk 87, it approaches another disk 87 which is in circuit with and leads to another spark-terminal or device, as for example 94, as shown more particularly in Fig. 5 of the drawings. Thus, it will be clearly evident, that the primary circuit is intermittently and automatically closed and broken, while at the same time, the secondary current is successively distributed to the sparking-terminals or devices 93, 94, 95 and 96 of the respective engine-cylinders 1, 2, 3, and 4, by the revolving fan-shaped contact 81 as it is brought successively in contact with the respective contact-disks 87 with which the respective sparking-terminals or devices 93, 94, 95 and 96 are connected. It will thus be readily understood, that the electrical energy developed in the secondary circuit of a single coil may be utilized to electrically operate the sparking-terminals

or devices of any suitable number of engine-cylinders, all in proper time and rotation or succession, as is desirable.

From the foregoing description of my present invention it will be clearly evident, that I have produced a novel and automatic device for controlling, timing and distributing electrical energy to the sparking-terminals of a multi-cylinder combustion or explosive 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 or device for its use with any number of engine-cylinders and corresponding sparking-terminals.

I claim:—

1. In a device of the kind described, a contact-screw, and a pivoted make and break device connected in a primary electrical circuit, a rotatable element, a hub connected with said rotatable element, a cylindrical shoulder extending from said hub provided with a plurality of short depressions, said depressions being each intermediate of comparatively long unbroken intervals of the cylindrical surface of said shoulder, a roller connected with said pivoted make and break device riding upon said cylindrical shoulder whereby a contact of said pivoted make and break device with said contact screw is briefly produced when said roller rides into a depression of said cylindrical shoulder, a hub-portion of non-conducting material connected with said rotatable element, a metallic contact provided with a wide fan-shaped end carried by said hub-portion, means for connecting said metallic contact in a secondary electrical circuit, and a plurality of contact-points connected in said secondary electrical circuit and adapted to be successively engaged by said wide fan-shaped end of said

metallic contact to produce a long-dwell contact therewith, said parts being so related that said make and break device is operated to quickly close and again break the primary circuit, while said metallic contact dwells upon one of said contact-points.

2. In a device of the class described, a means for opening and closing a primary electrical circuit, a plurality of insulated contact-points, a rotary distributing device connected in a secondary electrical circuit, said distributing device comprising an insulated hub, a metallic contact secured thereon, said contact having a wide fan-like end adapted to successively engage each contact-point with a long sweeping contact.

3. In a device of the class described, an adjustable contact-screw, a pivoted make and break device, both included in a primary electrical circuit, means for impelling said make and break device in circuit closing contact with said contact screw, comprising a rotating element provided with a cylindrical shoulder having a plurality of short depressions, said depressions being each intermediate of comparatively long unbroken intervals of the cylindrical surface of said shoulder, a plurality of insulated contact-points, a rotary distributing device connected in a secondary electrical circuit, said distributing device comprising an insulated rotating hub, and a metallic contact secured thereon, said contact having a wide fan-like end adapted to engage successively each contact-point with a long sweeping contact.

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.