Nov. 10, 1942. E. B. NOWOSIELSKI 2,301,571

ELECTRICAL APPARATUS

Original Filed June 26, 1929 3 Sheets-Sheet 1

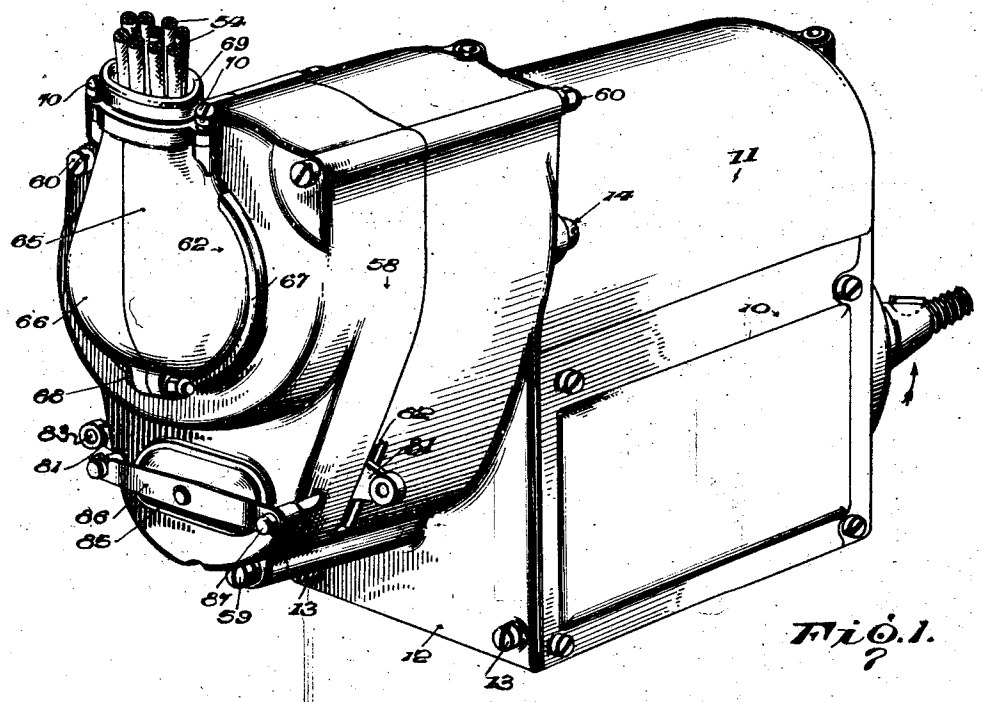


FIG. 1.

FIG. 6.

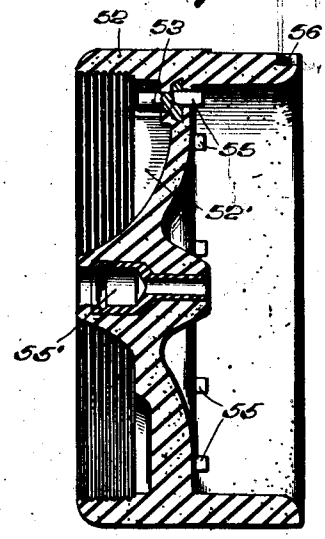
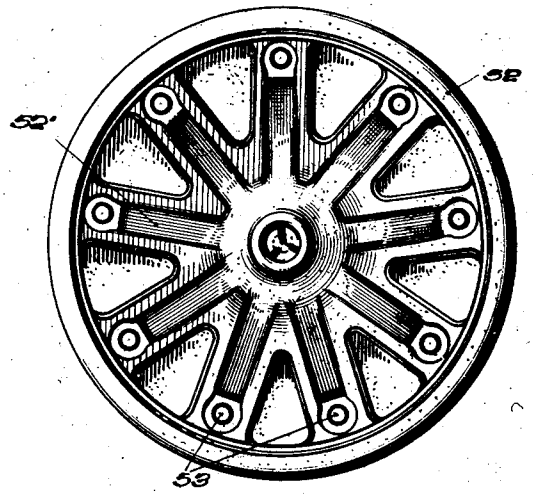


FIG. 7.



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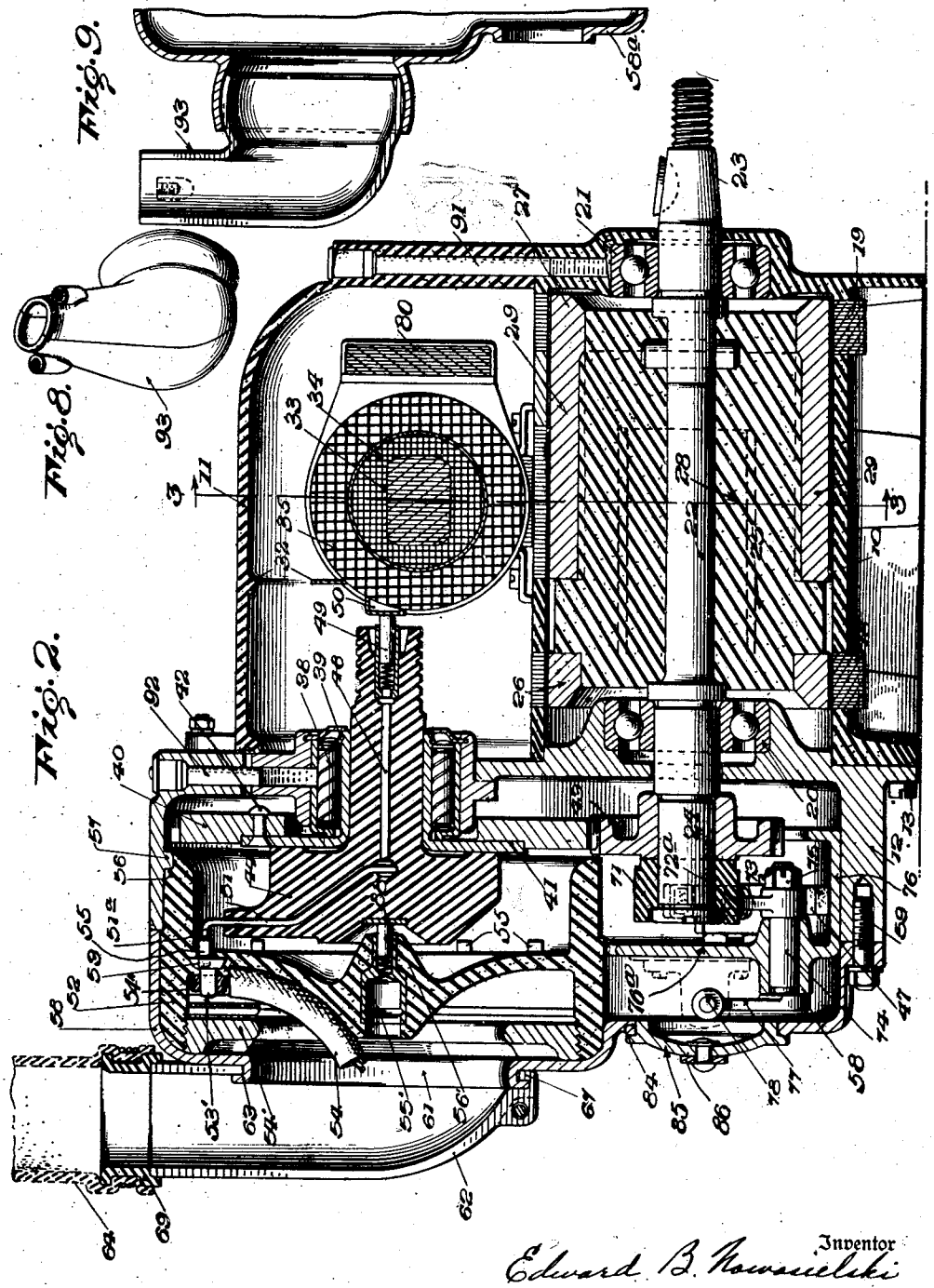
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Fig. 9.

Fig. 8.

Fig. 2.



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ELECTRICAL APPARATUS

Original Filed June 26, 1929 3 Sheets-Sheet 3

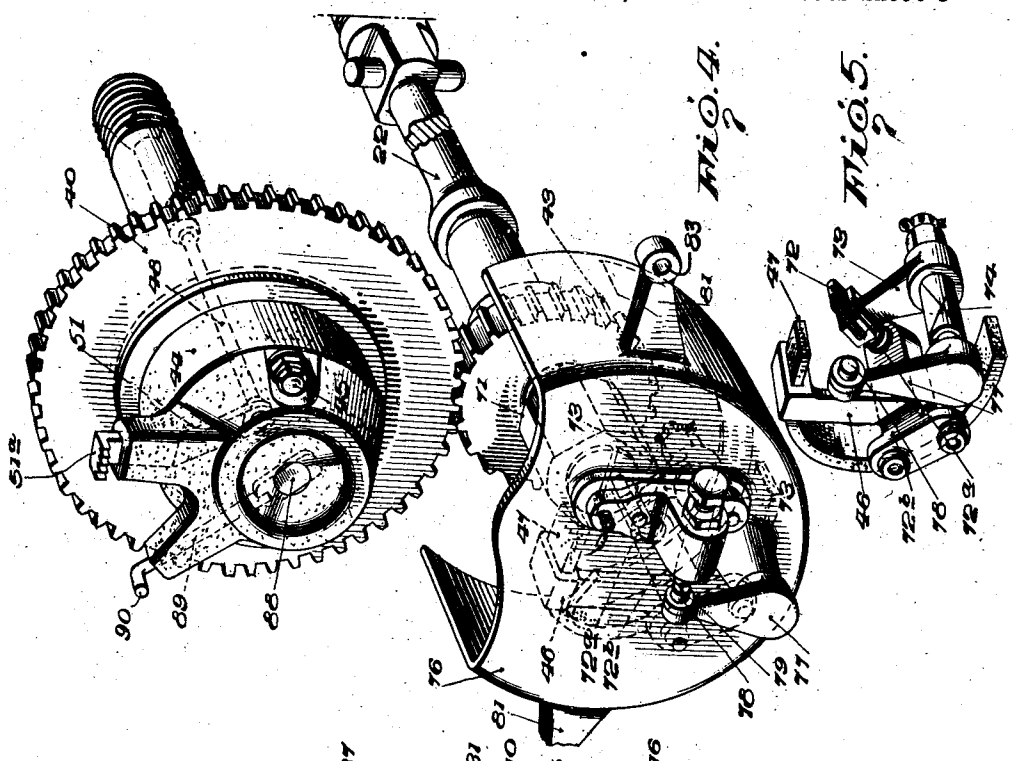


Fig. 4.

Fig. 5.

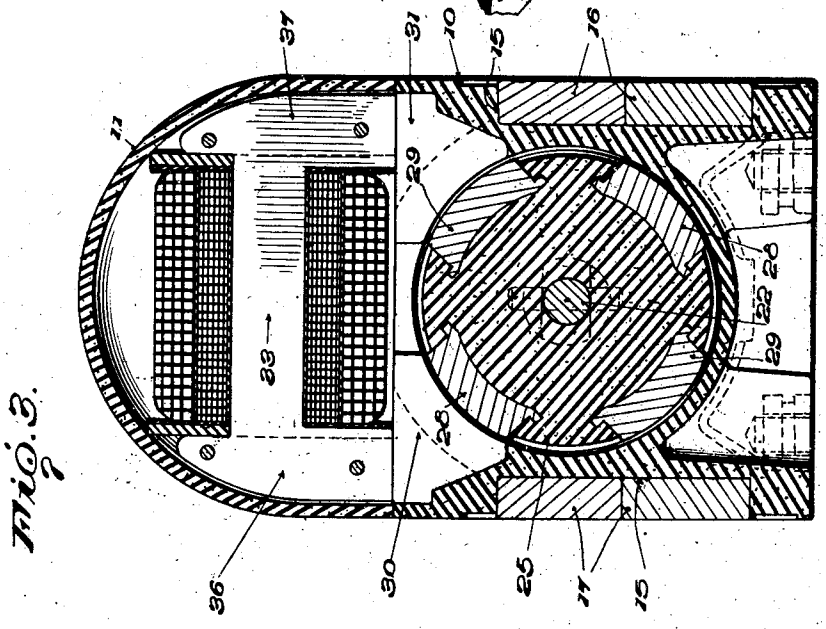


Fig. 3.

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2,301,571

ELECTRICAL APPARATUS

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Application June 26, 1929, Serial No. 373,833
Renewed July 13, 1932

37 Claims. (Cl. 123—149)

The present invention relates to magnetos, and more particularly to high tension magnetos adapted for ignition purposes in internal combustion engines.

One of the objects of the present invention is to provide a novel magneto structure which is small and light, but powerful and efficient.

Another object of the invention is the provision of a novel magneto which is completely enclosed and electrically shielded but readily accessible for service and adjustment.

A further object is the provision of such a magneto in which the timer is adjustable, the means for adjusting the timing extending outside the magneto casing for attachment to suitable operating means.

A still further object is to provide a magneto embodying novel means for securing the lead-in wires in operative position.

Another object is the provision of such a magneto in which the rotor is constructed and arranged to run at higher than engine speed, thus increasing its efficiency and adapting it for use in connection with engines having a large number of cylinders without complicating the structure of the magneto generator.

Various other objects and advantages will become apparent to those skilled in this art from the following description of one embodiment of the invention taken in connection with the accompanying drawings in which:

Fig. 1 is a perspective view of one embodiment of the present invention;

Fig. 2 is a vertical longitudinal section of the device shown in Fig. 1;

Fig. 3 is a vertical section taken substantially on the line 3—3 of Fig. 2, but with the rotor of the magneto turned through an angle of 45° from its position in Fig. 2;

Fig. 4 is a detail in perspective of one form of timer and distributor mechanism which may be employed;

Fig. 5 is a detail perspective of the timer contact mechanism shown in Fig. 4;

Fig. 6 is an axial section through a terminal block which is preferably employed in the structure of the present invention;

Fig. 7 is a front elevation of the terminal block; and

Figs. 8 and 9 are detail views illustrating one form of cable shielding sleeve that may be employed.

In the form shown, the magneto of the present invention comprises a main casing or frame 10 of suitable non-magnetic material such as aluminum, provided with an upper casing member 11 and an end casing member 12 suitably attached thereto as by means of the screws 13 and 14 respectively. The casing 10 is provided in its sides with rectangular outwardly opening pockets 15 (Fig. 3) adapted to receive a pair of permanent magnets which may be built up from a plurality of suitable magnetized steel bars 16 and 17 having their like poles at the same end of the casing 10. Annular and laminated pole pieces 18 and 19 of suitable magnetic material are seated in the ends of casing 10, and retained in position by any suitable method. Pole pieces 18 and 19 are formed with cylindrical internal surfaces and flat external surfaces adapted to contact with the ends of the magnets 16, 17 and be magnetized thereby.

One end of casing 10 and the casing member 12 support suitable anti-friction bearings 20 and 21 arranged coaxial with the internal cylindrical surfaces of the pole pieces 18 and 19, and a rotor shaft 22 is journaled therein with one end portion 23 projecting outside the casing 10 and provided with suitable attaching means whereby the shaft may be driven from a rotary part of the engine, and having an end portion 24 extending within the end casing member 12.

A composite armature or rotor member 25 of the type disclosed and claimed in my Patent No. 1,853,220 of April 12, 1932, is formed upon the shaft 22 to rotate therewith, and is composed of a core of non-magnetic material, such as aluminum, and a pair of inductors 26 and 27 adapted to rotate with slight clearance within the cylindrical surfaces of the annular pole pieces 18 and 19. The inductors include pairs of overlapping arms 28 and 29 (Figs. 2 and 3) arranged in quadrantal relation with each other, and extending substantially beyond the middle portion of the casing 10. Inductors 26, 28, 27, 29 are formed of suitable magnetic material such as soft iron, and the arms thereof are adapted to rotate in sequence past a pair of arcuate pole pieces 30 and 31 (Fig. 3) which are preferably constructed of laminated soft iron, and which are formed within the central upper portion of the casing 10. Pole pieces 30 and 31 receive an alternating magnetic flux as the oppositely magnetized arms of the inductors 26 and 27 rotate past said pole pieces.

A suitable induction coil having a laminated soft iron core 33 and primary and secondary windings 34 and 35 respectively is mounted crosswise upon the top of casing 10 within the upper casing 11, with the ends 36 and 37 (Fig. 3) of the core 33 brought downwardly to rest upon the arcuate pole pieces 30 and 31 respectively and thus complete the magnetic circuit. A suitable safety gap is preferably provided for the coil 34, 35 such as is shown at 32.

The end casing member 12 supports a suitable anti-friction bearing 38 (Fig. 2) opposite the side of the coil 34, 35, and a hollow sleeve 39 is journalled therein. A gear 40 is rigidly attached to an outturned flange 41 of said sleeve by suitable

means such as rivets 42, and is arranged to mesh and be driven by a pinion 43 suitably keyed upon the end 24 of the rotor shaft 22. A rotory distributor spool 44 having a body of suitable insulating material is mounted within the sleeve 39, being retained therein by suitable means such as the bolts 45 (Fig. 4) riveted to the flange 41 of sleeve 39 and passing through suitable openings in the spool. A conductor 48 extends centrally through the inner portion of spool 44, and is provided at its inner end with a spring pressed contact member 49 which is adapted to contact with the terminal 50 of the high tension winding of induction coil 32. A radially disposed conductor 51 is in engagement with conductor 48 at the end of the latter, the outer end of member 51 extending outwardly of rotary member 44 to form a distributor finger 51ª.

A stationary distributor block 52 is mounted in the upper portion of the end member 12 in proximity to spool 44, and is provided near its periphery with a plurality of terminal members 53 (Figs. 6 and 7) to which the high tension spark plug cables 54 (Figs. 1 and 2) of the engine are adapted to be attached by means of suitable eyes or clips 54''. As shown, each eye or clip 54'' comprises an annular ring of conducting material having a bore adapted to readily slip over the left hand end of terminal member or post 53, and a circumferential groove formed in its peripheral surface in which the conductors of cable 54 are secured, as by soldering. The terminal members 53 are provided with stationary distributor points 55 extending through the block 52 adjacent the path of rotation of the rotary distributor finger 51ª to successively receive the high tension current therefrom.

The stationary member 52 is provided with a plurality of radially extending grooves 52' for the reception of the ends of cables 54, and a ring 53' of suitable insulating material is adapted to be seated against the ends of cables 54 and retain eyes 54'' in place on terminal posts 5, said ring being held in assembled relation by means of an annular locking member 54' that is threaded within the periphery of block 52.

The distributor block 52 is preferably provided with a pilot notch 56 which is adapted to register with a rectangular lug 57 extending inwardly from the casing member 12, when the said block is oriented to its proper position. A detachable cap member 58 is adapted to retain block 52 in assembled position, being removably attached to the end member 12 by suitable means such as stud 59 and bolts 60.

In certain installations it is desirable to not only shield the high tension cables, but also to vary the angle at which said cables are led from the magneto. To this end, cap member 58 is provided with a lipped opening 61 for the entrance of cables 54, and a cable shield 62 is adapted to cover said opening and interlock with the lip 63 thereof. The member 62 is preferably formed in two halves 65 and 66 having complementary flanges or tongues 67 adapted to fit within the circumferential groove cut in the lip 63 and being held in assembled relation by suitable means such as a bolt 68 and an attaching flange 69, for a metallic sheath 64, said flange being fixed to the outer ends of members 65 and 66 by screws 70. It will thus be seen that the member 62 may be rotated on the opening 61 so as to lead the cables 54 as directly as possible toward the spark plugs of the engine, while the entire wiring is completely enclosed in a metallic grounded shield.

The end 24 of the rotor shaft 22 has rigidly mounted thereon, in any suitable manner, a cam 71, having a plurality of lobes corresponding in number to the inductor arms 28 and 29. A cam follower 72 (Figs. 4 and 5) of fiber or other suitable material is carried by an arm 73 in position to engage the cam 71, said arm being fixed on a shaft 74 journalled in the end wall 76ª of a cylindrical carrier member 76. Follower 72 is maintained in engagement with cam 71 in any suitable manner, as for example a coil spring 72ª carried by an arm 72ᵇ secured to member 76.

It will be noted that the end wall 76ª of carrier member 76 divides the space in the lower portion of cap member 58 and member 12 into two compartments, cam 71 and follower 72 being located in the right hand compartment as viewed in Fig. 2. Preferably, arm 72ᵇ carries a lug 46 in which is suitably mounted an oil wick 47 that engages cam 71 to maintain the latter lubricated at all times.

An arm 77 is fixed on the outer end of shaft 74, or is formed integral therewith, and carries at its free end a contact 78 adapted to cooperate with a contact 79 adjustably mounted on the member 76 which is electrically connected to the junction between the primary and secondary windings of the coil 34, 35. The arrangement of the arms 73 and 77 and the contacts 78 and 79 is such that the latter are normally in engagement, the engagement being broken by the swinging of said arms under the influence of the lobes of cam 71. Contacts 78 and 79 are housed in a compartment separate from that in which the cam 71 and follower 72 are mounted. Said contacts are thus carefully sealed against grease and foreign matter.

The primary circuit of coil 34, 35 is completed by grounding the inner terminal of the primary 34. A condenser 80 is shunted around the contacts 78 and 79, as is the customary practice.

The member 76 is rotatably mounted within a cylindrical portion of the end casing member 12 and cap member 58, and is provided with arms 81 extending through slots 82 formed in said cap member on opposite sides thereof, said arms being provided with suitable means such as eyes 83 for the attainment of any preferred form of operating mechanism. Angular movement of arms 81 enables the operator to advance or retard the spark. It will be noted that the cylindrical portion of member 76 to which the arms 81 are attached, extends on both sides of said arms, thereby closing the slots 82 at all times and shielding the magneto at these places.

An opening 84 (Fig. 2) is formed in the cap 58 to facilitate the inspection and adjustment of the contacts 78 and 79, this opening having a suitable closure such as the cover plate 85 which is retained in position by the spring member 86 centrally riveted thereto and having notched ends engaging in the grooved ends of studs 87 fixed in the cap member 58.

The central part of the distributor block 52 may be provided, if the magneto is to be associated with a booster magneto, with a socket connector 55' for connection with said booster magneto, the connection being completed through the spring-pressed contact 56' which engages the outer face of a contact disk 88 mounted centrally in the rotary distributor 44. As shown in Fig. 4, disk 88 is in electrical engagement with a conductor 89 which is carried by, and is radially dis-

placed relative to the distributor spool 44. The outer, free end of conductor 89 is bent forward to form a distributor finger 90 adapted to coact with contacts 55. Finger 90 is offset a suitable angular distance relative to finger 51a to provide for proper timing of the booster magneto. As will be understood by those skilled in the art, the direction of rotation of block 44 determines the side on which finger 90 is mounted relative to finger 51a.

Lubrication is provided at all necessary places by wick 47, and oil ducts 91 and 92.

If desired, the shielding sleeve for the high tension cables may be mounted for universal movement, relative to the magneto, to facilitate the connection of said cables. As shown in Figs. 8 and 9, the cap member 58a and sleeve 93 are provided with interengaging spherical portions whereby the angular position of the sleeve and hence the angle at which the cables 54 are led from the magneto may be varied. Any suitable locking means (not shown) may be provided, if desired, for retaining sleeve 93 in adjusted position.

There is thus provided a unitary structure embodying a magneto and distributor which is compact and rugged in construction and wherein the parts are readily accessible for adjustment or replacement. The terminal plate 52 facilitates the proper connection of the lead-in wires which are shielded by a member 62. The latter is quickly adjustable to any desired angular position in order to vary the direction in which cables 54 are led to and from the magneto. Contacts 53 may be molded in the terminal plate 52, while rapid and easy attachment of the cables to said contacts is facilitated by the provision of clips 54'' and cooperating ring 53' and locking member 54'. Since the magneto is so constructed as to be completely shielded, the same is adapted for use adjacent radio apparatus.

Although but one embodiment of the invention has been shown and described in detail, it is to be understood that this embodiment is not exclusive but various modifications may be made and certain features used without other features, without departing from the spirit of the invention. Reference is therefore to be had to the claims appended hereto for a definition of the scope of the invention.

The lubricating mechanism shown in Fig. 5 is also disclosed, and forms part of the claimed combination, in my Patent No. 1,921,427, issued August 8, 1933.

What is claimed is:

1. In apparatus of the class described, current generating means, a supporting frame therefor, a plurality of conductors, means for distributing the current generated to said conductors, and means for operatively associating said conductors with said distributing means including a sleeve-like shield rotatably secured to said frame, said conductors passing through said shield to said distributor.

2. In apparatus of the class described, current generating means including a supporting frame, a plurality of cables, means for distributing the current generated to said cables, a metallic enclosure for said distributing means, and means for retaining said cables in operative relation with said distributing means including a shield surrounding said cables, and cooperating spherical surfaces on said shield and enclosure.

3. In combination with a device having a shielding cap member provided with a spherical extension, a terminal block within said cap member, a plurality of conductors extending along said block, and a shield for said conductors removably secured to said cap extension.

4. In apparatus of the class described, a supporting frame, a plurality of conductors, means for distributing current to said conductors, means for retaining said conductors in operative relation with said distributing means including a shield having sections enclosing said conductors and distributing means respectively and a universal connection between said sections.

5. In apparatus of the class described, means including a supporting frame, a plurality of conductors, means for distributing current to said conductors, and means for retaining said conductors in operative relation with said distributing means including a grounded shield having sections enclosing said cables and distributing means respectively, and a tongue and groove connection between said sections.

6. In a device of the class described, in combination with a cup-shaped plate and a cup-shaped shield having abutting annular ends and aligned apertures, a plurality of shielded conductors extending through one of said apertures, and a current conductor extending through the other of said apertures to energize said shielded conductors in sequence.

7. The combination with a distributor, a cup-shaped shield enclosing said distributor, a terminal block fitting snugly within the upper portion of said shield, a plurality of shielded conductors mounted in said block so as to be in operative relation to said distributor, and a readily detachable cover plate fitting the apertured lower portion of said shield and removable to facilitate inspection and adjustment.

8. In a device of the class described, the combination with a circuit breaker and a cup-shaped end plate of a cup-shaped shield abutting said end plate and enclosing said circuit breaker, means for adjusting the position of said circuit breaker with respect to said end plate, said adjusting means including a cylindrical oil carrier fitting the inner cylindrical surfaces of both said shield and end plate, and a terminal block in registry with the inner surfaces of said shield and end plate.

9. In a device of the class described, in combination with a circuit breaker and a cup-shaped end plate, a cup-shaped shield abutting said end plate and cooperating therewith to enclose said circuit breaker, means for adjusting the position of said circuit breaker with respect to said end plate, said adjusting means including a cylindrical oil carrier fitting the inner surfaces of both said shield and end plate, and an extension on said carrier movable along the abutting edges of said shield and end plate to vary the setting of said circuit breaker.

10. In a device of the class described, in combination with a circuit breaker and a cup-shaped end plate, a cup-shaped shield abutting said end plate and enclosing said circuit breaker, means for adjusting the position of said circuit breaker with respect to said end plate, said adjusting means including a cylindrical oil carrier fitting the inner surfaces of both said shield and end plate, and means for conveying oil from said carrier to said circuit breaker.

11. In a device of the class described, in combination with a cup-shaped plate and a cup-shaped shield having abutting annular ends and aligned apertures, a plurality of shielded con-

ductors extending through one of said apertures, and a current conductor extending through the other of said apertures to energize said shielded conductors in sequence and a gear train enclosed within said shield and plate to rotate said last named conductor in a path adjacent said shielded conductors, to effect said sequential energization.

12. In a device of the class described, in combination with a cup-shaped plate and a cup-shaped shield having abutting annular ends and aligned apertures, a plurality of shielded conductors extending through one of said apertures, a current conductor extending through the other of said apertures to energize said shielded conductors in sequence and a gear train enclosed within said shield and plate to rotate said last named conductor in a path adjacent said shielded conductors, to effect said sequential energization, a casing of which said cup-shaped plate forms a part, a current generating coil in said casing, and means rotatable with said gear train for interrupting the current generated in said coil.

13. In a device of the class described, in combination with a cup-shaped plate and a cup-shaped shield having abutting annular ends and aligned apertures, a plurality of shielded conductors extending through one of said apertures, a current conductor extending through the other of said apertures to energize said shielded conductors in sequence and a gear train enclosed within said shield and plate to rotate said last named conductor in a path adjacent said shielded conductors, to effect said sequential energization, a casing of which said cup-shaped plate forms a part, an armature within said casing, and means extending through said cup-shaped plate to drivably connect said armature and gear train.

14. In a device of the class described, in combination with a pair of cup-shaped elements having abutting ends, current conductors extending through the non-abutting ends of said elements, and means for causing a spark to jump from one of said conductors to the other at regularly recurring intervals.

15. In a device of the class described, in combination with a pair of cup-shaped elements having abutting ends, current conductors extending through the non-abutting ends of said elements, means for causing a spark to jump from one of said conductors to the other at regularly recurring intervals, said means including a current generating coil for energizing one of said conductors, a radiation suppressing casing abutting one of said cup-shaped elements and surrounding said coil, and a radiation suppressing tubular shield surrounding the other of said conductors.

16. In a device of the class described, in combination with a pair of cup-shaped elements having abutting ends, current conductors extending through the non-abutting ends of said elements, means for causing a spark to jump from one of said conductors to the other at regularly recurring intervals, said means including a current generating coil for energizing one of said conductors, a radiation suppressing casing abutting one of said cup-shaped elements and surrounding said coil, and a radiation suppressing tubular shield surrounding the other of said conductors, said tubular shield having a tongue and groove connection with the other of said cup-shaped elements.

17. In a device of the class described, in combination with a pair of radiation suppressing closure elements having abutting ends, current conductors extending through the non-abutting ends of said elements, and means for causing current to pass from one of said conductors to the other at regularly recurring intervals.

18. In a device of the class described, in combination with a pair of radiation suppressing closure elements having registering ends, current conductors extending through the non-registering ends of said elements, and means for causing current to pass from one of said conductors to the other at regularly recurring intervals.

19. In a device of the class described, in combination with a pair of radiation suppressing closure elements, current conductors extending into said elements, and means for causing current to pass from one of said conductors to the other at regularly recurring intervals.

20. In a device of the class described, in combination with a pair of radiation suppressing closure elements, current conductors extending into said elements, means for causing current to pass from one of said conductors to the other at regularly recurring intervals, said means including a driving shaft extending into one of said closure elements, a distributor journaled therein, and carrying one of said conductors, and means drivably connecting said shaft and distributor.

21. In a device of the class described, in combination with a pair of radiation suppressing closure elements, current conductors extending into said elements, means for causing current to pass from one of said conductors to the other at regularly recurring intervals, said means including a driving shaft extending into one of said closure elements, an insulating spool journaled therein, and carrying one of said conductors, and means drivably connecting said shaft and insulating spool.

22. In a device of the class described, in combination with a pair of cup-shaped elements having abutting ends, current conductors extending through the non-abutting ends of said elements, means for causing a spark to jump from one of said conductors to the other at regularly recurring intervals, said means including a current generating coil for energizing one of said conductors, a radiation suppressing casing abutting one of said cup-shaped elements and surrounding said coil, and a radiation suppressing tubular shield surrounding the other of said conductors, said tubular shield having a universal connection with the other of said cup-shaped elements.

23. In a device of the class described, in combination with a pair of cup-shaped elements having abutting ends, current conductors extending through the non-abutting ends of said elements, means for causing a spark to jump from one of said conductors to the other at regularly recurring intervals, said means including a current generating coil for energizing one of said conductors, a radiation suppressing casing abutting one of said cup-shaped elements and surrounding said coil, and a radiation suppressing tubular shield surrounding the other of said conductors, said tubular shield having an adjustable connection with the other of said cup-shaped elements.

24. In a device of the class described, in combination with a pair of cup-shaped elements

having abutting ends, current conductors extending through the non-abutting ends of said elements, means for causing a spark to jump from one of said conductors to the other at regularly recurring intervals, said means including a current generating coil for energizing one of said conductors, a radiation suppressing casing abutting one of said cup-shaped elements and surrounding said coil, and a radiation suppressing tubular shield surrounding the other of said conductors, said tubular shield having a readily detachable connection with the other of said cup-shaped elements.

25. In a shielding device for use in an ignition system wherein a plurality of spark plugs are electrically connected with a current distributor by means of a series of current conducting cables, the combination with said distributor and cables of a cup-shaped metallic member enclosing said distributor, an apertured extension integral therewith, and a single tubular metallic container enclosing all of said cables, said tubular container having physical registry with said apertured extension.

26. In a shielding device for use in an ignition system wherein a plurality of spark plugs are electrically connected with a current distributor by means of a series of current conducting cables, the combination with said distributor and cables of a metallic member enclosing said distributor, an apertured fitting associated therewith, and a single tubular metallic container enclosing all of said cables, said tubular container having physical registry with said apertured fitting.

27. In a radio shielding means for the ignition system of an internal combustion engine, said ignition system including magnetos, a pair of complementary plates to cover the normally exposed distributor blocks of a magneto, the upper end of each plate being formed with a substantially semi-circular wall and means to hold the plates together and to a magneto.

28. In a radio shielding means for use with the ignition system of an internal combustion engine, said ignition system including a magneto, a shield therefor including a pair of complementary plates, the upper end of each plate being formed with an arcuate wall of substantially semi-circumferential extent, and means to hold the plates together and to the magneto.

29. In combination with a magneto having high tension cables extending therefrom, a radio shielding means comprising a metallic casing means to cover and enclose the normally exposed distributor blocks, said casing including a rotatable elbow formation through which said cables are directed.

30. In combination with a magneto having high tension cables extending therefrom, a radio shielding means comprising a pair of complementary plates to cover the normally exposed distributor blocks of a magneto, complementary portions of the plates being formed with curved walls to provide a single outlet for passage of the high tension cables.

31. In combination with a magneto having high tension cables extending therefrom, a radio shielding means comprising a pair of complementary plates to cover the normally exposed distributor blocks of a magneto, complementary portions of the plates being formed with curved walls to provide a single outlet for passage of the high tension cables and means to hold the plates together and to a magneto.

32. In a radio shielding means for the ignition system of an internal combustion engine, a metallic casing means to cover and enclose the high tension current cables, said casing including a metal fixture through which the high tension cables are directed, and means for enclosing and electrically shielding a plurality of said cables as they emerge from said metal fixture, said means including a metallic sheath having its end portion aligned with, and secured to, said metal fixture, the said fixture being positionable so as to lead said cables as directly as possible toward the spark plugs of the engine.

33. In a radio shielding means for the ignition system of an internal combustion engine, a metallic casing means to cover and enclose the high tension current cables, said casing including a rotatable formation through which the high tension cables are directed, and means for enclosing and electrically shielding a plurality of said cables as they emerge from said rotatable formation, said means including a metallic sheath having its end portion aligned with, and secured to, said formation.

34. In a radio shielding means for the ignition system of an internal combustion engine, a metallic casing means to cover and enclose the high tension current cables, said casing including a metal fixture through which the high tension cables are directed, and means for enclosing and electrically shielding a plurality of said cables as they emerge from said metal fixture, said means including a metallic sheath having its end portion aligned with, and secured to, said metal fixture.

35. In a radio shielding means for the ignition system of an internal combustion engine, means to enclose and electrically shield a plurality of ignition wires, said means including the housing of the ignition current distributor from which said wires receive their ignition current, a metallic sheath forming a radio shielding enclosure for said plurality of ignition wires, and means including a rigid metal member movably carried by said distributor housing and serving to hold said sheath in shielding relationship to said wires and to electrically connect said sheath to said distributor housing.

36. In a radio shielding means for the ignition system of an internal combustion engine, a metallic casing means to cover and enclose the high tension current distributor, said casing including a metal fixture through which the high tension cables are directed, and means for enclosing and electrically shielding a plurality of said cables as they emerge from said metal fixture, said means including a metallic sheath having its end portion aligned with, and secured to, said metal fixture, wherefore the entire wiring is completely enclosed in a metallic shield.

37. In a radio shielding means for the ignition system of an internal combustion engine, means to enclose and electrically shield a plurality of ignition wires, said means including the housing of the ignition current distributor from which said wires receive their ignition current, and a metallic sheath electrically connected to said distributor housing, and co-operating therewith to form a radio shielding enclosure for said plurality of ignition wires.

EDWARD B. NOWOSIELSKI.