

E. C. WILCOX.  
ELECTRICAL SPARK APPARATUS.  
APPLICATION FILED FEB. 13, 1908.

909,043.

Patented Jan. 5, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

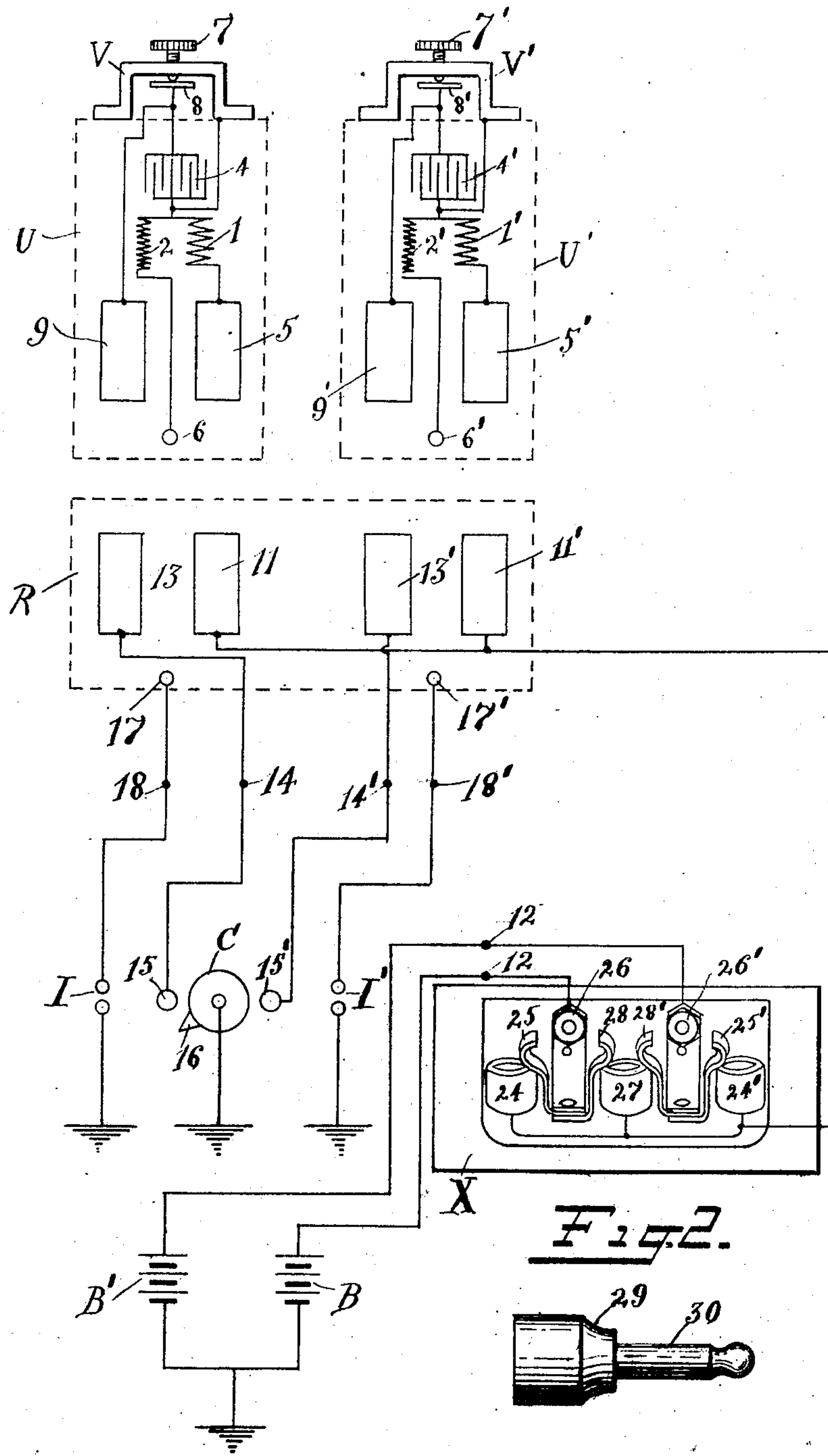
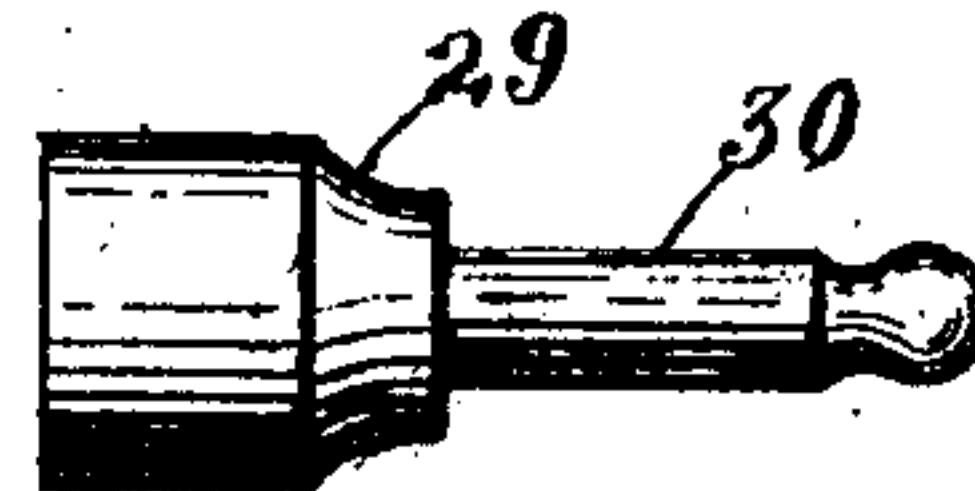


Fig. 2.



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2 SHEETS—SHEET 2.

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Fig. 3.

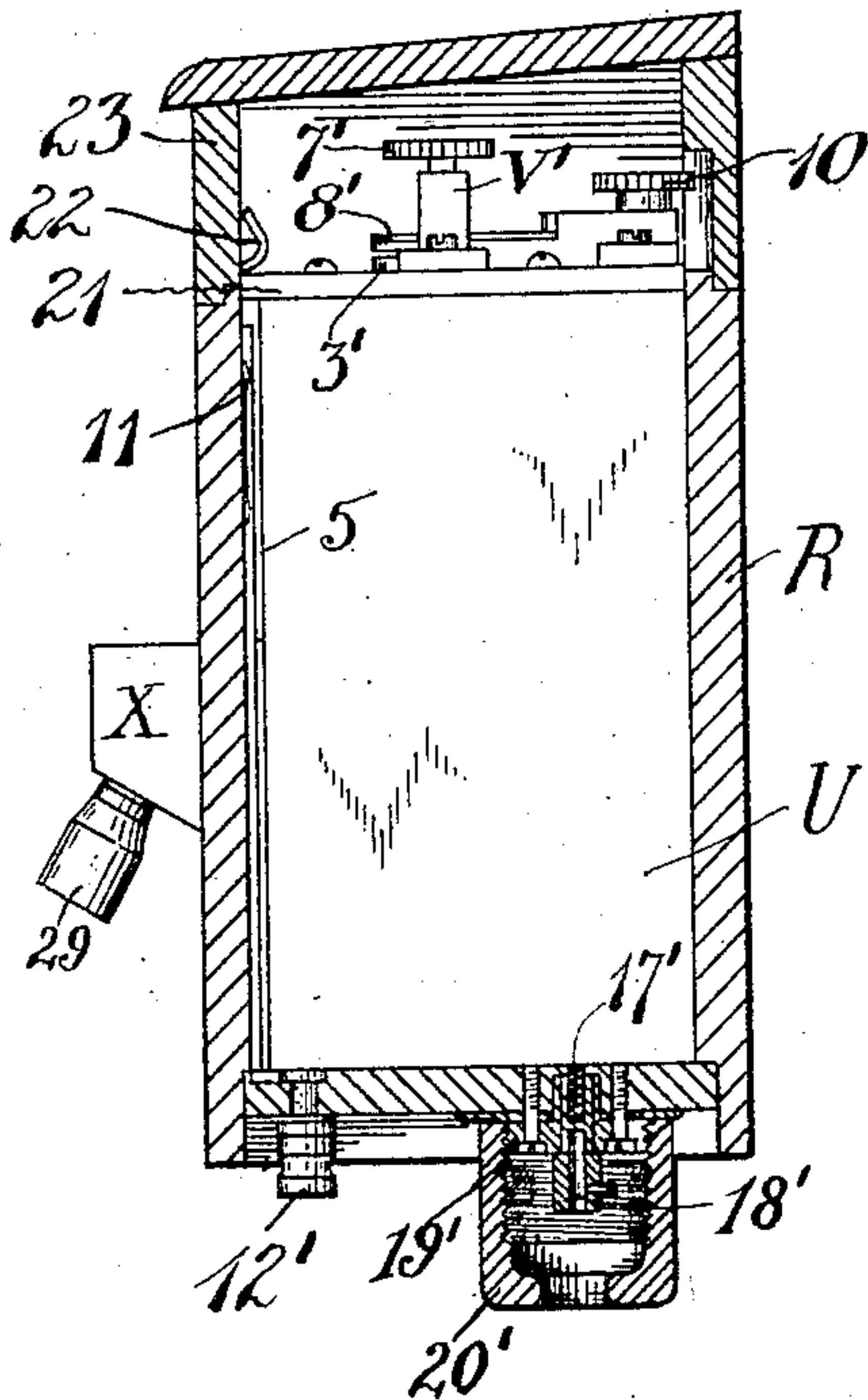


Fig. 4.

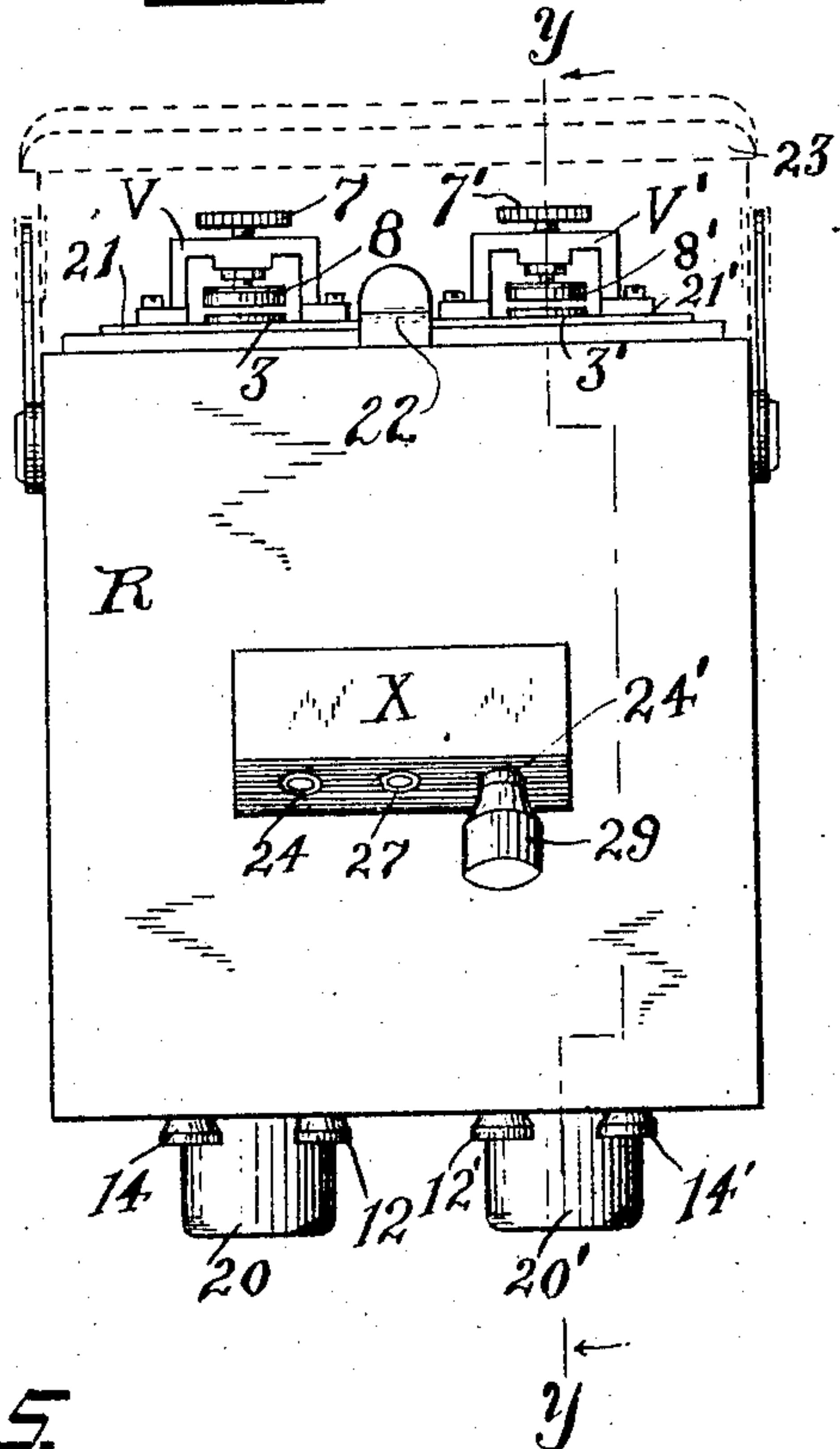
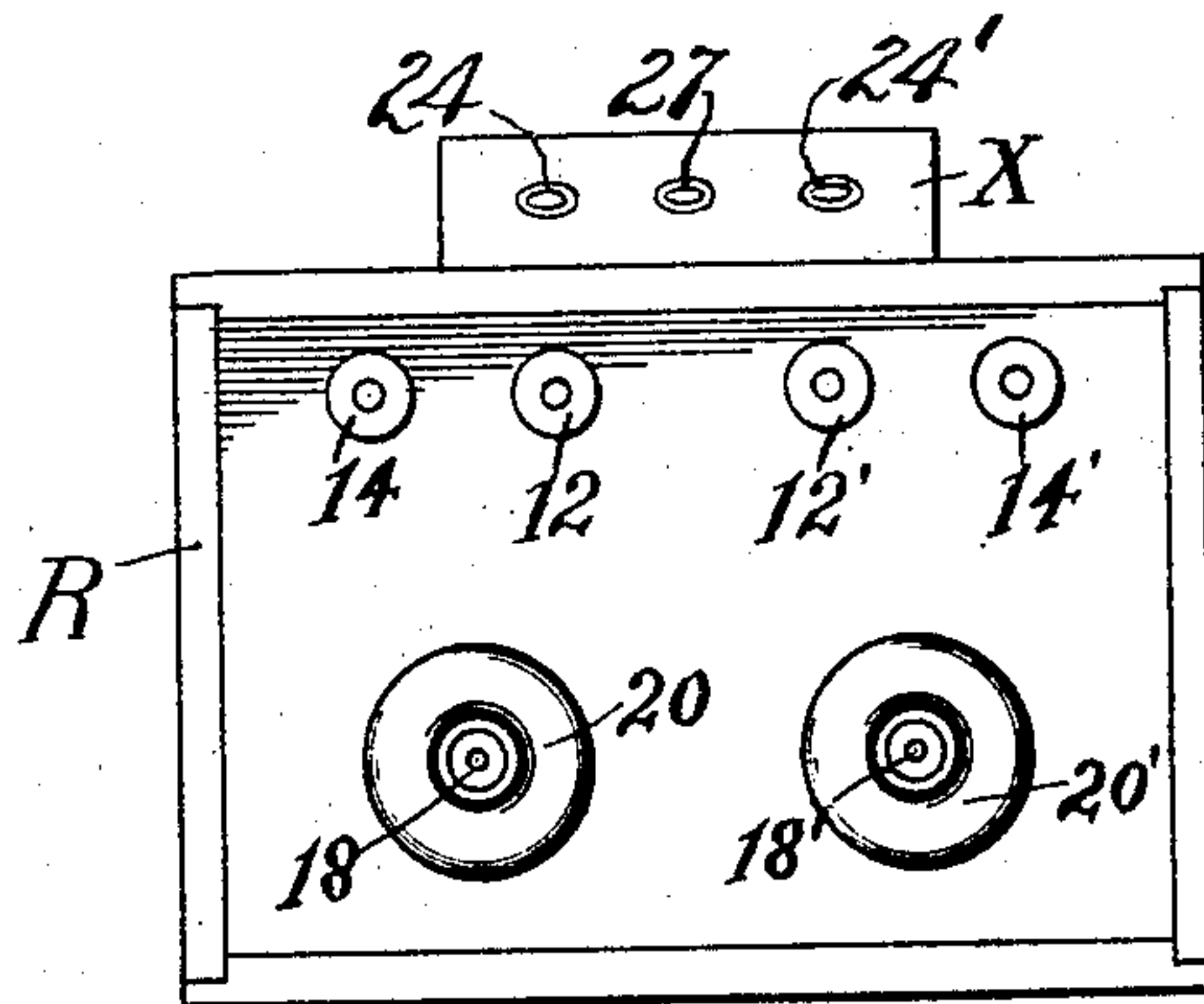


Fig. 5.



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# UNITED STATES PATENT OFFICE.

ERNEST C. WILCOX, OF MERIDEN, CONNECTICUT, ASSIGNOR TO THE CONNECTICUT TELEPHONE & ELECTRIC COMPANY, INCORPORATED, OF MERIDEN, CONNECTICUT, A CORPORATION OF CONNECTICUT.

## ELECTRICAL SPARK APPARATUS.

No. 909,043.

Specification of Letters Patent.

Patented Jan. 5, 1909.

Original application filed November 25, 1905, Serial No. 289,062. Divided and this application filed February 13, 1908. Serial No. 415,767.

*To all whom it may concern:*

Be it known that I, ERNEST C. WILCOX, a citizen of the United States, residing at Meriden, county of New Haven, Connecticut, have invented certain new and useful Improvements in Electrical Spark Apparatus, of which the following is a full, clear, and exact description.

My invention relates to improvements in electrical apparatus, and particularly to induction coils for sparking devices.

The object of the invention is to provide a simple compact apparatus, the parts of which may be readily assembled and disassembled, and which may be readily adjusted.

A further object is to provide for convenient and compact electrical connections within the casing of the apparatus.

Briefly described, the invention comprises the employment of apparatus arranged to be assembled in units, each unit having the usual primary and secondary coils, together with a vibrator.

This application is filed as a division of my copending application Serial No. 289,062, filed November 25, 1905.

The preferred embodiment of my invention is illustrated in the accompanying drawings, in which—

Figure 1 is a conventional view of an arrangement of the coils, casing and electrical connections. Fig. 2 illustrates an ordinary form of switch plug to be used with the apparatus. Fig. 3 is a vertical section on line Y—Y, Fig. 4 of the casing showing the contained coils. Fig. 4 is a front view of the casing, the cover being shown in dotted outline. Fig. 5 is a bottom plan view of the casing shown in Figs. 3 and 4.

In Fig. 1, the elements are represented in conventional diagram. R is a receptacle or casing for the coils. U—U' are the units or boxes containing the coils and condensers and carrying the vibrators V—V'. B—B' indicate the usual batteries. The circuits are shown for two batteries, but it is obvious that the invention could be applied to the use of one battery. C is a commutator or make-and-break device for interrupting the primary circuits. I—I' are the spark plugs or ignition devices.

The invention is illustrated as applied to a system employing two spark plugs for corresponding engine cylinders.

Reference numerals on the different figures of the drawings indicate corresponding parts. The numerals having indices indicate a second set of corresponding parts.

1 is the primary coil, 2 is the secondary coil, and 3 is a magnet core for the coil.

4 is a condenser which is shunted or bridged, as shown, with the contact device or vibrator.

5 is a lateral contact on one of the removable units, which is connected to its primary winding.

6 is a base contact carried by the unit and connected to the secondary winding.

While the invention herein does not relate to the vibrator, the parts thereof are indicated for the purpose of showing the complete construction.

7 is the adjustable member of the vibrator, which is connected to the two windings.

8 is the armature or vibrator member actuated by the electromagnet. This is connected to the lateral contact 9 on the unit U. 10 is a second adjusting screw for varying the tension on the armature.

The receptacle or casing R, which is adapted for installation in any convenient place, for instance on a power launch or motor vehicle, contains interior terminals and carries exterior terminals, through which the primary and secondary currents are carried. Of these terminals 11 is a lateral contact plate in the form of a spring mounted upon the interior of the casing and adapted to be engaged by the contact 5. This is connected through a switch hereinafter to be described, and exterior terminals 12 to the battery. 13 is a second lateral contact here shown as mounted upon the interior of the casing adapted to be engaged by the contact 9, and which is connected through the exterior terminal 14 to a contact 15 of the commutator or make-and-break device. The side spring contact between the box and each coil unit will not only provide an electrical connector, but also serves to steady each unit therein. It will also be seen that the slightest vibration of a coil unit in the container or box will be sufficient



to cause said spring contact to rub on its companion contact so as to wear away any corrosion and keep both of said contacts bright and clean and correspondingly effective. Heretofore in devices of this type each coil unit has been so positively held in place or clamped, as by some form of binding screw, so as to prevent vibration within the case. As distinguished therefrom, my coil unit, while held with sufficient firmness, is freely mounted in the case so that the slightest vibration may be availed of for the useful purpose of keeping the companion contacts bright. The point 16 on the commutator engages the contact 15 once in every revolution for interrupting the primary circuit.

17 is an interior contact on the base of the casing, in the form of a spring, which is connected to the exterior projecting post 18. The spring and base are mounted in the insulating block 19, which is secured to the bottom of the receptacle. The base 18 is surrounded exteriorly by the protecting sleeve 20, which is screwed to the block 19. The base contact 17 is adapted to be engaged by the contact 6 of the coil U, so that the secondary current flows through the spark or ignition device I. The batteries, commutator and ignition device are all grounded ordinarily on the frame of the machine. Each unit has a top plate 21 of insulating material, which carries the vibrator. These top plates fit snugly within the receptacle or casing R, and are held in place preferably by a snap spring 22, which overlies their adjacent corners.

23 is the cover of the receptacle, which houses the vibrator.

As shown in Fig. 1, the contact 11 for the primary winding of the coil, is connected to the battery. The corresponding contact 11' for the second coil is also connected to the battery by the same wire, this connection between the two contacts being preferably within the receptacle or casing, as shown. In the operation of the sparking apparatus, a switch may be used, the preferred form of which is illustrated at X, Fig. 1. This switch may be attached to the front of the casing R, as here shown, but it is obvious that the same may be placed in any other position convenient for operation. In the construction here shown, the switch comprises a tubular socket 24 inclined downward and outward slightly, so that it may be readily accessible but protected from the entry of dirt or moisture. 25 is a spring finger carried by the terminal 26, adjacent to the interior end of the socket 24. The socket 24 is connected to the contact 11 and thence to the primary winding. The terminal 26 is connected to the terminal 12 and thence to the battery B. The socket 24', spring 25', terminal 26', terminal 12'

and battery B' correspond to 24, 25, 26, 12 and B, and are connected in the same way. 27 is a socket also connected to the contact 11. 28—28' are springs connected to the terminals 26—26'.

For operation of the switch, any ordinary form of switch plug, as 29, Fig. 2, having a metallic portion 30, may be employed to connect the sockets 24 and 27, and the springs 25 and 28 upon the terminals 26. When the plug 29 is inserted in one of the sockets of the switch, for instance 24, with the circuit closed through the commutator C, current flows from the battery B through ground to the commutator C and from the opposite terminal of the battery through box terminal 12, switch terminal 26, spring 25, plug 29, socket 24, contacts 11 and 5, primary winding 1, vibrator terminals 7 and 8, contacts 9 and 13, and commutator terminal 15, with the condenser 4 switched around the breaking point in the vibrator. When the plug 29 is inserted in the socket 24', with the circuit closed through the commutator C, the current may be similarly traced from the battery B'. When the plug 29 is inserted in the socket 27, the apparatus is thrown in operation with both batteries in parallel. By this means it is possible to obtain the requisite current when both batteries have somewhat deteriorated, if such a condition should occur.

What I claim is:

1. In an ignition system, the combination of a box or casing, a plurality of induction coils mounted therein and independently removable therefrom, a source of electricity common to all of the primary windings of said induction coils, at least two electrical connections being established by the insertion of a coil in the box or casing to connect its primary coil in circuit with said source of electricity, and independent circuit connections whereby the removal of a coil from the box or frame will not affect the electrical connections to the other coils.

2. In an ignition system, the combination of a box or frame, a plurality of induction coils mounted therein and independently removable therefrom, a source of electricity common to all the primary windings of said induction coils, firing devices external to said box or frame, at least two electrical connections being established by the act of inserting a coil in the box or frame to connect its primary coil in circuit with said source of electricity and its secondary coil in circuit with said firing devices, and independent circuit connections whereby the removal of a coil from the box or frame will not affect the electrical connections to the other coils.

3. In an ignition system, the combination of a case or frame, a plurality of induction coils mounted therein, and independently re-



movable therefrom, a source of electricity common to all the primary windings of said induction coils, at least two electrical connections being established by the act of mounting a coil in the box or frame to automatically connect its primary coil in circuit with said source of electricity, the electrical connections to each coil being independent of the connections to the other coils.

4. In an ignition system, the combination of a box or frame, a plurality of induction coils mounted therein and independently removable therefrom, a source of electricity common to all the primary windings of said induction coils, firing devices external to said box or frame, at least two electrical connections being established by the mounting of a coil in the box or frame to automatically connect its primary coil in circuit with said source of electricity and its secondary coil in circuit with said firing devices, the electrical connections to each coil being independent of the connections to the other coils.

5. In an ignition system, the combination of a case or frame, a plurality of induction coils mounted therein and independently removable therefrom, two electrical contacts permanently fixed in the case or frame for each induction coil, means for connecting the terminals of the primary windings of each coil by the act of inserting said coil within said case or frame with two of said contacts, one each of said contacts being electrically connected together and to one pole of a source of electricity, and a commutator adapted to connect the other contacts successively with the other pole of said source of electricity.

6. In an ignition system, the combination of a case or frame, a plurality of induction coils mounted therein and independently removable therefrom, two electrical contacts permanently fixed in the case or frame for each induction coil, means for connecting the terminals of the primary windings of each coil by the insertion of said coil within said case or frame with two of said contacts, one each of said contacts being electrically connected together and to one pole of a source of electricity, a commutator adapted to connect the other contacts successively with the other pole of said source of electricity, and means whereby the secondary winding of each coil is connected in circuit automatically when the terminals of the primary are connected.

7. In an ignition system, the combination of a case or frame, a plurality of induction coils mounted therein and independently removable therefrom, a pair of electrical contacts permanently fixed in the box or frame for each induction coil, means for connecting one terminal of the primary winding of each coil by the insertion thereof within said

box or frame with one member of each pair of contacts, a conductor connecting said members of each pair of contacts to each other and to one pole of a common source of electricity, and a commutator adapted to connect the other contacts of each pair successively with the other pole of said source of electricity.

8. In an ignition system, the combination of a box or frame, a plurality of induction coils mounted therein and independently removable therefrom, a pair of electrical contacts permanently fixed in the box or frame for each induction coil, means for connecting one terminal of the primary winding of each coil by the insertion thereof within the case or frame with one member of each pair of contacts, a conductor connecting said members of each pair of contacts to each other and to one pole of a common source of electricity, a commutator adapted to connect the other contacts of each pair successively with the other pole of said source of electricity, and means whereby the secondary winding of each coil is connected in circuit automatically when the terminals of the primary are connected.

9. In an ignition system, the combination of a box or casing, a plurality of induction coils mounted therein, a contact for the primary winding of each coil mounted in the box or casing, an electrical connector between said contacts within the box, a source of electricity, a connection between said source and said connector, an electrical connection established by the act of inserting a coil in the box or casing to automatically connect its primary windings in circuit with said source of electricity, and independent circuit connections whereby the removal of a coil from the box or frame will not affect the electrical connections to the other coils.

10. In an ignition system, the combination of a box or casing, a plurality of induction coils mounted therein, a contact for the primary winding of each coil mounted in the box or casing, an electrical connector between said contacts, a source of electricity, a connection between said source and said connector, firing devices external to said box or frame, an electrical connection established by the act of inserting a coil in the box or casing to automatically connect its primary windings in circuit with said source of electricity and its secondary winding in circuit with said firing device, and independent circuit connections whereby the removal of a coil from the box or frame will not affect the electrical connections to the other coils.

11. In an induction coil apparatus, the combination of a casing having three terminals arranged on the inner wall thereof, three terminals for external connection on the exterior thereof, with an induction coil unit comprising a box, a vibrator carried



thereby, three contact terminals carried by and arranged on the exterior of said box and adapted to engage with the interior terminals in the casing by the act of inserting the coil box in the casing, and means for removably holding the box securely in position in the casing with the proper terminals in engagement with one another.

12. In an induction coil apparatus, the combination of a casing having three terminals arranged on the inner wall thereof, three terminals for external connection on the exterior thereof, with an induction coil unit comprising a box, a vibrator carried thereby, three contact terminals carried by and arranged on the exterior of said box one of said terminals being at the side of said box, all of said terminals being adapted to yieldingly engage the interior terminals in the casing by the act of inserting the coil box in the casing.

13. In an induction coil apparatus, the combination of a casing having three terminals arranged on the inner wall thereof, three terminals for external connection on the exterior thereof, with an induction coil unit comprising a box, a vibrator carried thereby, and three contact terminals carried by and arranged on the exterior of said box and adapted to make electrical connection with the interior terminals in the casing by the act of inserting the coil box in the casing, provision being made for removably holding the box in position in the casing with the proper terminals in engagement with one another.

14. In an ignition system, the combination of a box or casing, a plurality of induction coils mounted therein and independently removable therefrom, a source of electricity common to all of the primary windings of said induction coils, electrical connections established by the act of inserting a coil in the box or casing to simultaneously connect its primary coil in circuit with said source of electricity, independent circuit connections whereby the removal of a coil from the box or frame will not affect the electrical connections to the other coil, and means for removably holding the box in position in the casing with the proper terminals in engagement with one another.

15. In an ignition system, the combination of a box or frame, a plurality of induction coils mounted therein and independently removable therefrom, a source of electricity common to all the primary windings of said induction coils; firing devices external to said box or frame, electrical connections established by the act of inserting a coil in the box or frame to simultaneously connect its primary coil in circuit with said source of electricity and its secondary coil in circuit with said firing devices, independent circuit connections whereby the removal of a coil

from the box or frame will not affect the electrical connections to the other coils, and means for removably holding the box in position in the casing with the proper terminals in engagement with one another.

16. In an ignition system, the combination of a box or casing, a plurality of induction coils mounted therein, a contact for the primary winding of each coil mounted in the box or casing, an electrical connector between said contacts, a source of electricity, a connection between said source and said connector, an electrical connection established by the act of inserting a coil in the box or casing to simultaneously and automatically connect its primary windings in circuit with said source of electricity, independent circuit connections whereby the removal of a coil from the box or frame will not affect the electrical connections to the other coils, and means for removably holding the box in position in the casing with the proper terminals in engagement with one another.

17. In an ignition system, the combination of a box or casing, a plurality of induction coils mounted therein, a contact for the primary winding of each coil mounted in the box or casing, an electrical connector between said contacts, a source of electricity, a connection between said source and said connector, firing devices external to said box or frame, an electrical connection established by the act of inserting a coil in the box or casing to simultaneously and automatically connect its primary windings in circuit with said source of electricity and its secondary winding in circuit with said firing device, independent circuit connections whereby the removal of a coil from the box or frame will not affect the electrical connections to the other coils, and means for removably holding the box in position in the casing with the proper terminals in engagement with one another.

18. In an induction coil apparatus, the combination of a casing having exposed terminals arranged on the inner wall thereof, and terminals for external connection on the exterior thereof with an induction coil unit comprising a box, spring contact arms carried by said casing adapted to engage with said terminals on said box, and means for removably securing said box in said casing.

19. In an ignition system, the combination of a case or frame adapted to contain a plurality of induction coils, a common electrical connection carried by said case for the contained coils, and means for automatically establishing the primary and secondary circuits of each coil upon inserting the same within the case.

20. In an ignition system, the combination of a case or frame adapted to contain



a plurality of induction coils, a common electrical connection carried by said case for the contained coils, and means for automatically and independently establishing the primary and secondary circuits of said coils upon inserting the same within the case.

21. In an ignition system, the combination of a case or frame adapted to contain a plurality of induction coils, a common electrical connection carried by said case for the contained coils, and means for automatically establishing the primary and secondary circuits of each coil upon inserting the same within the case, and means for removably securing said coils within the case.

22. In an ignition system, the combination of a case or frame adapted to contain a plurality of induction coils, a common electrical connection carried by said case for the contained coils, and means for automatically and independently establishing the primary and secondary circuits of each coil upon inserting the same within the case, and means for removably securing said coils within the case.

23. In an ignition system, a case or frame, a plurality of induction coils mounted therein, individual electrical connections for each coil and a common electrical connection for all coils whereby any one of said coils may be removed without disturbing the connections of the others, said connections being constructed and arranged to be established by the act of inserting a coil within said case or frame.

24. In an ignition system, a case or frame, a plurality of induction coils mounted therein, individual connections for the primary winding of each coil, a common connection for said primary windings, whereby any coil can be removed from the case or frame without disturbing the primary connections of the other coils, said connections being constructed and arranged to be established by the act of inserting a coil within said case or frame.

25. In an ignition system, a plurality of induction coils, and means for receiving and supporting the individual coils, said means having an electrical connection common to all of the coils, independently completed for each coil by the act of inserting said coil within said means.

26. In an ignition system, a plurality of induction coils, a container therefor, and connections between the side of each of said coils and said container, adapted to be automatically established by the act of inserting the coils within said container.

27. In an ignition system, a plurality of induction coils, a container therefor, and spring connections between the side of each of said coils and said container adapted to

be automatically established by the act of inserting the coils within said container.

28. In an ignition system, a plurality of induction coils, a container therefor, connections between each of said coils and said container adapted to be automatically established upon insertion of a coil, and independent means to hold said coils in position to maintain said connections.

29. In an ignition system, a plurality of induction coils, a container therefor, and connections between the side and bottom of each of said coils and said container adapted to be automatically established by the act of inserting a coil in said container.

30. In an ignition system, a plurality of induction coils, a container therefor, connections between the side and bottom of each of said coils and said container adapted to be automatically established by the act of inserting a coil in said container, and means to hold said coils in position to maintain said connections.

31. In a spark coil for engines of the class herein described, an outer case containing removable coil units, each with a vibrator and separate primary and secondary wire connections, and a common or ground return consisting of a metallic strip extending across the interior of the case, with suitable spring connections to each unit, said connection adapted to be established by the act of inserting a unit within the case.

32. In an ignition system, a plurality of induction coils, a container therefor, an electrical connector in said container common to all of said coils, spring connections between the side of each of said coils and said connector adapted to be automatically established by the act of inserting a coil in said container.

33. In an ignition system, a plurality of induction coils, a container therefor, spring connections between the side of each of said coils and said container at or near the top thereof adapted to be automatically established by the act of inserting a coil in said container.

34. In an induction coil apparatus, a case or container, a coil unit having terminals projecting therefrom, one of said terminals being at the side, and a spring contact for said side terminal located between the coil unit and the container, all the terminals of said coil being automatically connected by the mere act of inserting said unit in said case.

35. In an induction coil apparatus, a case or container, an induction coil adapted to be freely mounted therein, and an electrical connection between the side of said case and said coil adapted to be established by the act of inserting the coil within the case.

36. In an induction coil apparatus, a case



or container, an induction coil adapted to be freely mounted therein, and a spring electrical connection between the side of said case and said coil adapted to be established by the act of inserting the coil within the case.

37. In an induction coil apparatus, a case or container, an induction coil adapted to be freely mounted therein, and a spring terminal on the side of said case, and a terminal on the side of the coil adapted to be automatically connected by the act of inserting the coil within the case.

38. In an induction coil apparatus, a case or container, a removable coil unit mounted therein, and a spring circuit connection carried by the side of one part and arranged to bear freely against a companion contact on the other part, circuits, and means automatically to connect the same electrically by the act of inserting said coil within the case.

39. In an ignition system, the combination of a box or frame, a plurality of induction coils mounted therein and independently removable therefrom, a source of electricity common to all the primary windings of said induction coils, electrical connections established by the mounting of a coil in the box or frame to automatically connect its primary coil in circuit with said source of elec-

tricity, the electrical connections to each coil being independent of the connections to the other coils.

40. In an ignition system, the combination of a box or frame, a plurality of induction coils mounted therein and independently removable therefrom, a source of electricity common to all the primary windings of said induction coils, firing device external to said box or frame, electrical connections established by the mounting of a coil in the box or frame to automatically connect its primary coil in circuit with said source of electricity and its secondary coil in circuit with said firing devices, the electrical connections to each coil being independent of the connections to the other coils.

41. In a spark coil for gas, vapor or hydrocarbon engines, an outer case containing separate insertible sparking elements, each having a suitable vibrator upon one end, one contact carried by one end of each element, and two contacts carried by the side of each element, the case having all external electrical connections at or near the end opposite the vibrators.

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