E. C. WILCOX.

MULTIPLE UNIT COIL.

APPLICATION FILED JAN. 10, 1910.

999,534.

Patented Aug. 1, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

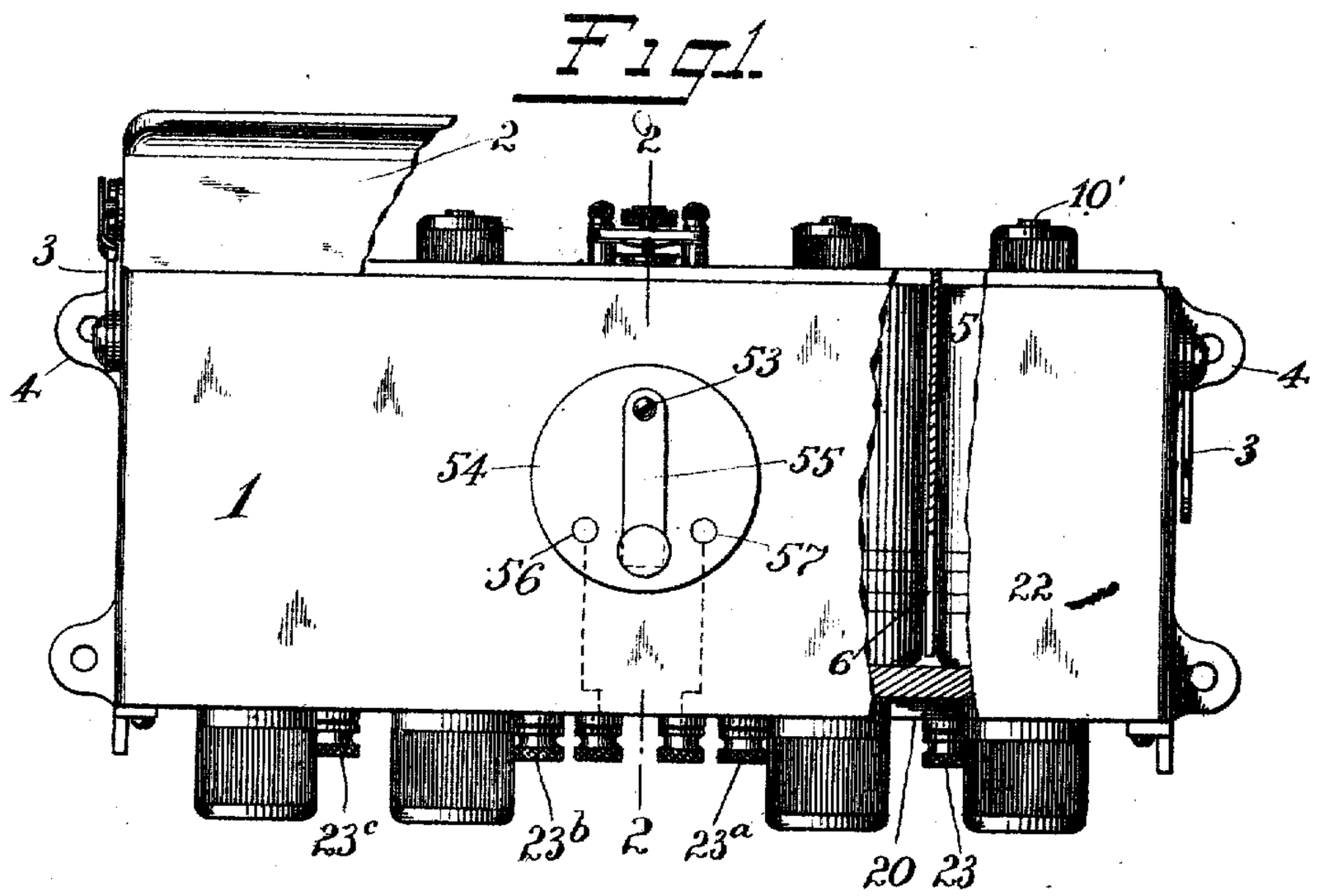


Fig. 2.

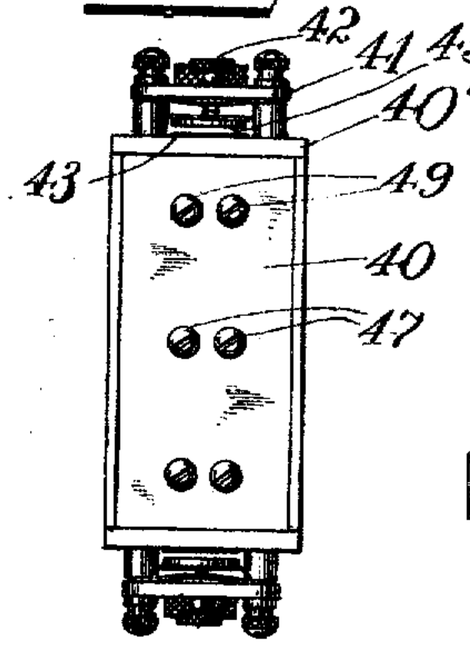


Fig. 3.

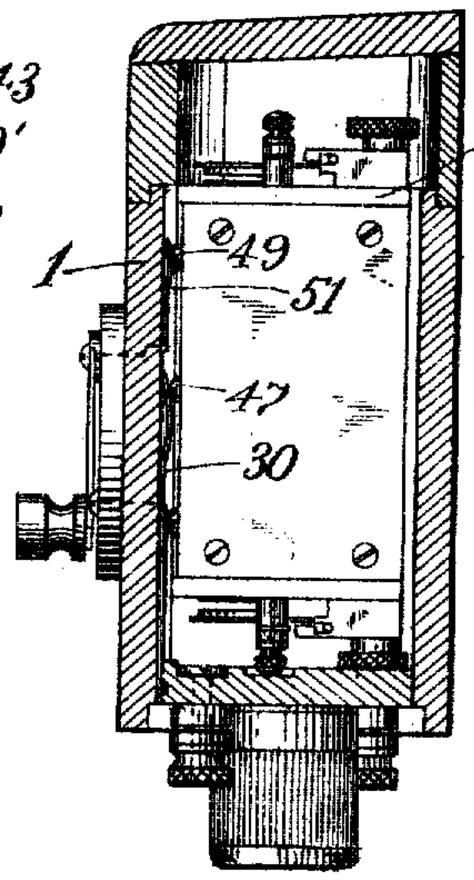
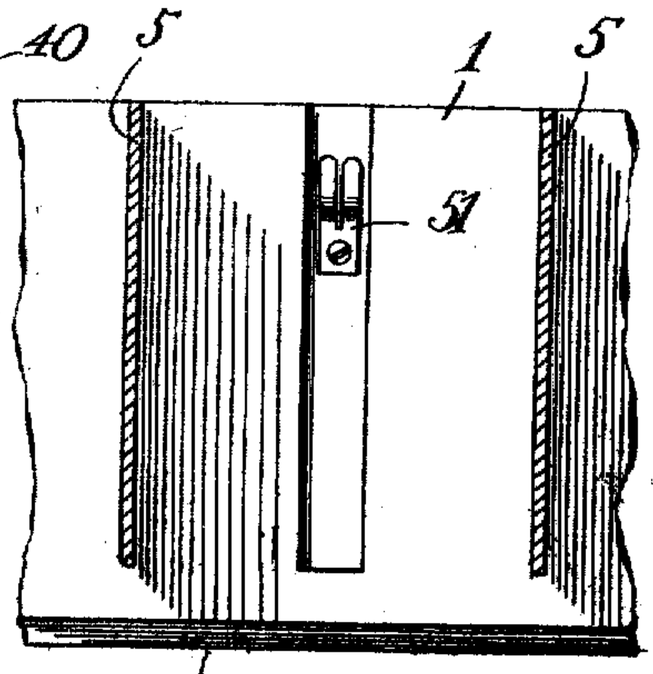


Fig. 4.



Witnesses:
Fred'k. Dannenfelser
Chas. A. Peard

Inventor
E. C. WILCOX
By his Attorneys
Dawson Cowan & Dawson

E. C. WILCOX.

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3 SHEETS—SHEET 2.

Fig. 5.

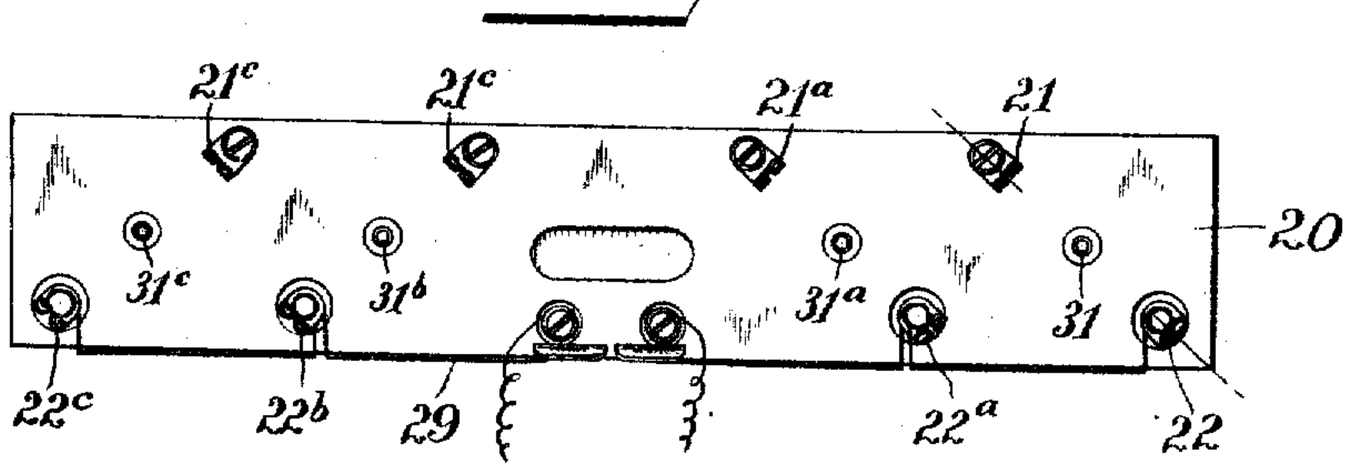


Fig. 6.

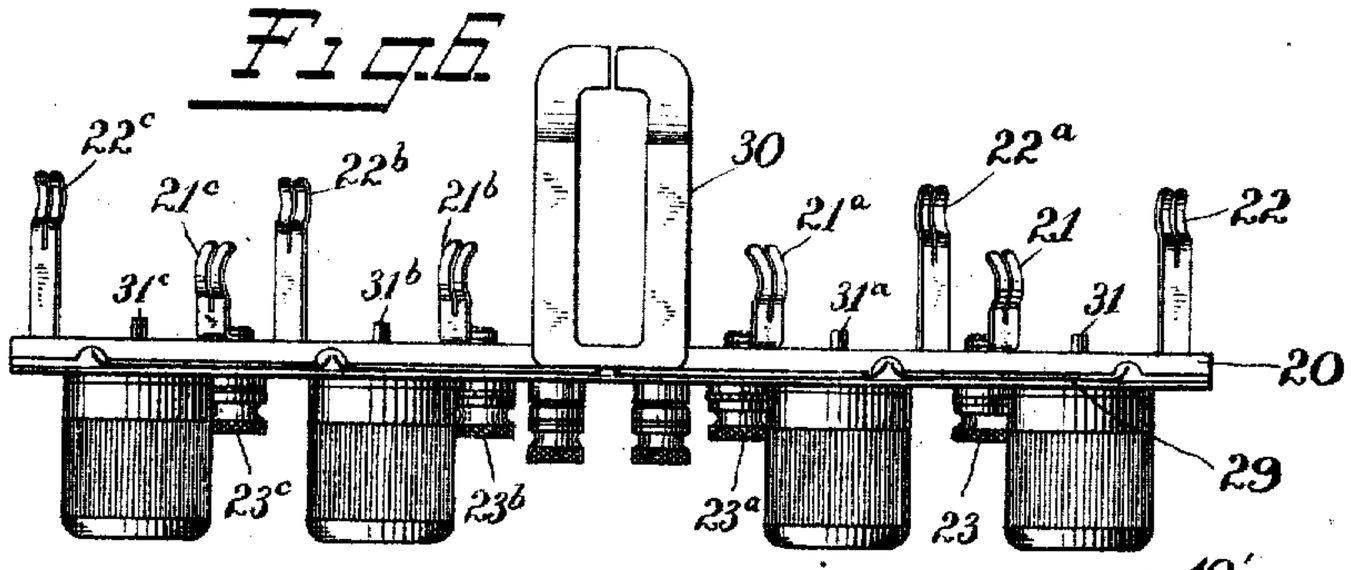


Fig. 8.

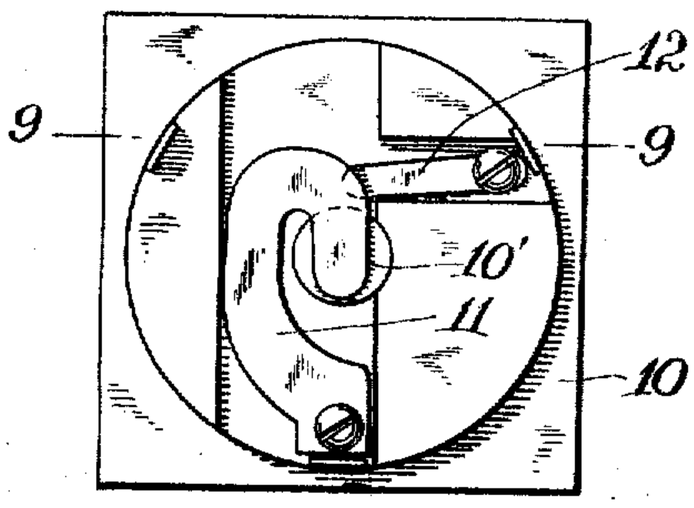


Fig. 9.

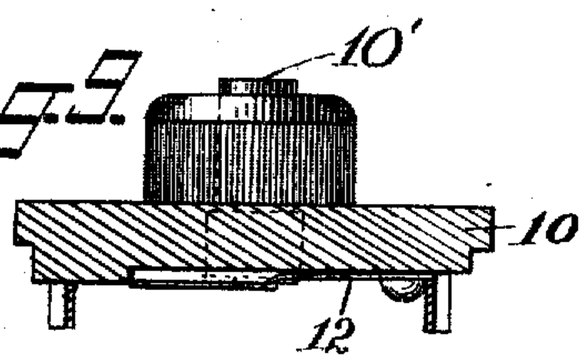
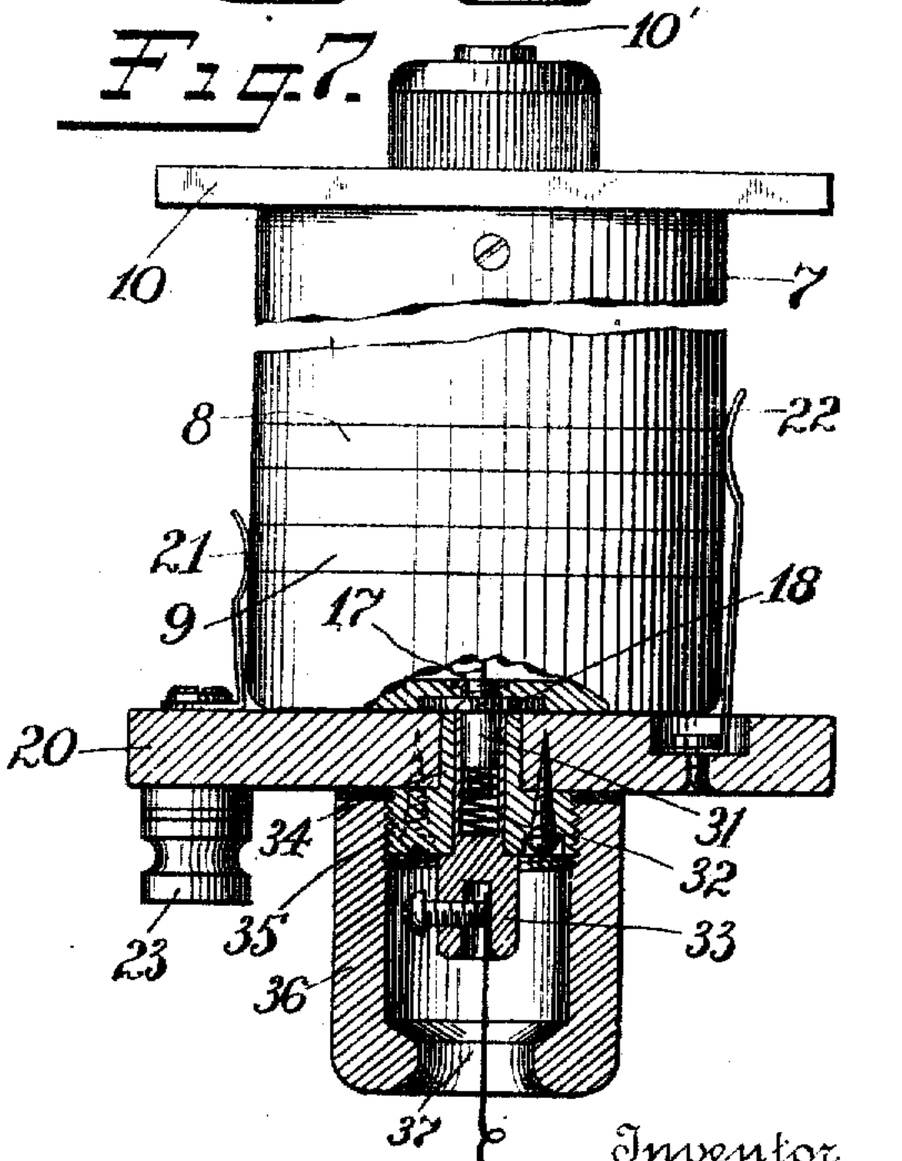


Fig. 7.



Witnesses:

Fred In. Dannenfelser

Chas. A. Low

Inventor

E. C. WILCOX

By his Attorneys

Dawson Bruce & Mitchell

E. C. WILCOX.

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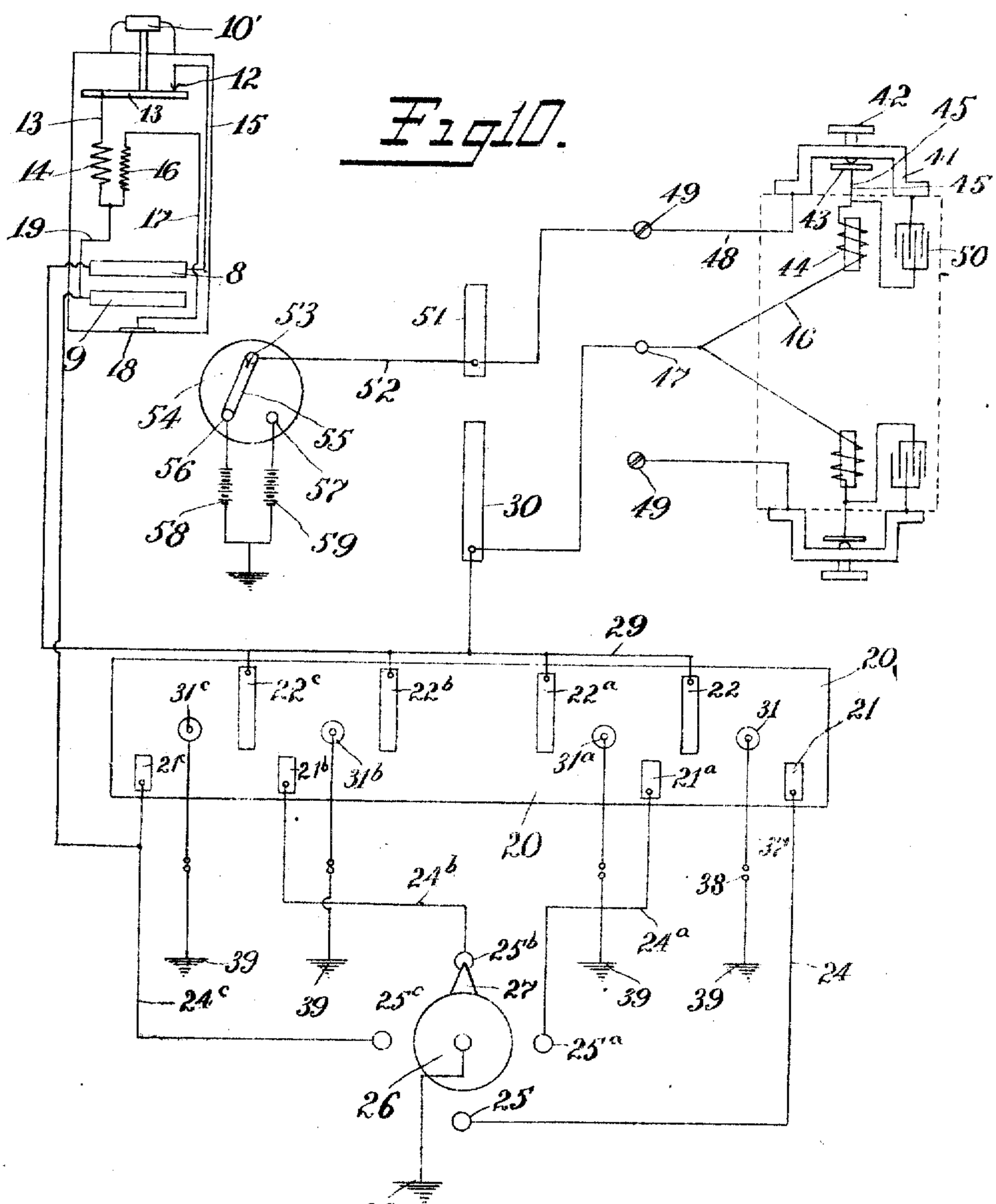
3 SHEETS—SHEET 3.

Fig 10.



Witnesses:
Fred W. Dannenfelser.
Chas. A. Peard.

Inventor
E. C. WILCOX.
By his Attorneys
Church Brown & Thurlow.

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.

MULTIPLE-UNIT COIL.

999,534. Specification of Letters Patent. Patented Aug. 1, 1911.

Application filed January 10, 1910. Serial No. 537,185.

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, State of Connecticut, have invented certain new and useful Improvements in Multiple-Unit Coils, of which the following is a full, clear, and exact description.

My invention relates to improvements in electrical apparatus and is particularly concerned with improvements in the construction and assembling of spark coils and cooperative parts for ignition mechanism.

The object of the invention is to provide a construction in which a single vibrator may control all of the units of a group of such coils, and in which the vibrator mechanism is made reversible and interchangeable, whereby it may be so arranged relatively to the coils as to bring one or another of its vibrator devices into operation therewith.

A further object is to so construct said vibrator mechanism that it may be readily reversed or interchanged without disturbing the coils of the group.

A further object is to provide an improved casing or frame in which the coils and the vibrator may be removably mounted, said casing or frame having the connections so arranged that any coil may be removed therefrom independently of the others and without disturbing the electrical connections of the latter.

A further object is to so construct each of the coil units that it may be inserted within the casing in a plurality of positions and simultaneously and invariably make proper connection automatically with the electric circuits in any of said positions and whereby the relative position of the contacts may be varied to vary the points of contact.

A further object is to provide means whereby each coil, while in the casing or frame, may be cut out of circuit for the purpose of testing without removal from the casing and without disturbance of the connections of other coils of the group, and a further object is to provide an improved means for preventing inductive action between the several coils of the group.

With these and other objects in view, as will appear from the following detailed description, the invention consists in the construction and relative arrangement of parts, a preferred embodiment of which is illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of a casing or frame containing the coils and duplex vibrator, parts being broken away for a clear illustration; Fig. 2 is a vertical section on the line 2—2 Fig. 1 through the casing, showing the vibrator mounted therein and in circuit with the electric connections; Fig. 3 is a view of the vibrator removed from the casing; Fig. 4 is a fragmentary view of the casing in vertical and longitudinal section, showing the arrangement of the partitions for holding the several coils and vibrator therein; Fig. 5 is a plan view of the bottom of the casing detached therefrom, illustrating the arrangement of the contact pieces for effecting the automatic connections with the coil units and vibrator; Fig. 6 is a front elevation of the parts shown in Fig. 5; Fig. 7 is an elevation of one of the coil units, including a view of the bottom of the casing in transverse section; Fig. 8 is an under side view of the cap or top of one of the coil units, showing the cut-out device of said coil. Fig. 9 is a sectional view on the line 9—9, Fig. 8, looking in the direction of the arrow. Fig. 10 is a diagrammatic view showing the arrangement of the electric circuits for the coils and vibrator and the arrangement of the several contact members for effecting the electrical connections of said parts and including diagrammatic arrangement of the several elements of the vibrator and of one of the coil units.

In the embodiment of the invention herein selected for illustration 1 indicates a casing or frame adapted to receive several coil units of a group and the vibrator mechanism operating in conjunction therewith. The casing may be provided with a suitable cover 2 which may be locked thereto by suitable latch members 3—3.

4—4 indicate brackets attached to the casing, by which the same may be mounted, for example, on the dashboard of a motor vehicle.

The interior of the casing is divided into

several compartments, as indicated in Figs. 1 and 4, by partitions 5—5. In the arrangement here shown, the vibrator member is mounted in the central compartment and the several coils of the group are symmetrically arranged at either side thereof. Any other relative arrangement of the coils and vibrator, however, may be effected as desired.

In order to prevent inductive action between the several coil units, the partitions 5—5 of the casing between the units are constructed in the form of metal plates, whereby any inductive influence emanating from the coils is intercepted. As indicated in Fig. 1, these partition walls are cut away, as at 6, in order that they may not interfere with the electrical contact pieces on the base of the casing and on the coils as hereinafter referred to.

Referring to Fig. 7, each of the coil units comprises preferably a cylindrical body portion 7 having a pair of contact members in the form of bands 8 and 9 respectively, secured to the exterior surface thereof, which contact members are suitably connected to the several coil elements within the unit, as will be hereinafter described, and are so located upon the coil body as to effect automatic contact with the proper contact members of the casing when the coil is inserted therein. These contact bands extend preferably continuously entirely around the coil body, whereby such electric connection will be established irrespective of the particular position in which the coil is inserted in the casing. Each of the coil units is provided with a cap or top 10, which is illustrated in Figs. 8 and 9, and is here shown as rectangular in outline to fit within the rectangular compartments of the casing, but it is to be understood that the compartments of the casing may be circular in form and that the cap or cover of each unit may be correspondingly circular to fit within the same. By the latter construction, furthermore, and by means of the circular contact bands 8 and 9 described, the unit may be inserted within the compartment in the casing in any position and still make effective connection with the several electric circuits of the system.

On the under side of the cap 10 is mounted a spring contact member 11, Fig. 8, which normally lies in contact with a second contact member 12, also secured to the cap. The contact member 11, as indicated diagrammatically in Fig. 10, is connected by a wire 13 in circuit with the primary winding 14 of the unit and the contact member 12 is connected by wire 15 with the contact band 8 on the exterior of the coil unit. The cap also is provided with a push button 10′, engaging the end of the spring contact member 11, whereby the connection between the members 11 and 12 may be broken at will. The secondary winding 16 of the unit is connected with the primary in the usual manner and is also connected by a wire 17 with a contact plate 18, Figs. 7 and 10 on the base of the unit. The primary and secondary are also connected by wire 19 with the lower contact band 9 on the exterior of the unit. As indicated in Figs. 5 and 6 and diagrammatically in Fig. 10, the base 20 of the coil casing or frame is provided with a series of spring contact arms 21, 21^a, 21^b and 21^c and with a second series of spring contact arms 22—22^a—22^b 22^c; each arm of the series 21, &c., being paired with an arm of the series 22, &c., and the arms of each pair being so arranged within the respective compartments of the casing as to effect contact automatically with the contact bands 9 and 8 respectively when the coil units are inserted within each compartment. Each of the arms 21, &c., is connected with a suitable binding post 23, 23^a, 23^b, 23^c, respectively, which in turn are connected by wires 24, 24^a, 24^b, 24^c, Fig. 10, with the terminals 25, 25^a, 25^b, 25^c, respectively, of the commutator 26, said commutator having the usual rotatable contact arm 27 to effect connection with each of said terminals successively, said arm being grounded at 28. Each of the arms 22, &c., is connected with a common connecting member or bus bar 29, likewise mounted upon the base of the casing, to which is also connected a split contact piece 30 for making contact with the vibrator element, as hereinafter described.

In order to effect electrical connection with the secondary terminal plate 18 of each of the coil units, the base 20 of the casing 1 is provided with a plurality of spring contact pins 31, 31^a, 31^b, 31^c, one opposite each of the coil compartments of said casing. Each of said pins 31, &c., is mounted in a socket 32, Fig. 7, of a contact stud 33 which in turn is carried within an insulating sleeve 34 having a screw threaded head 35 adapted to receive the screw-threaded cap 36 by which the contact stud 33 and the connections therewith may be protected from dirt and moisture. Each of the contact studs 33 is connected by a wire 37 with the spark plugs 38 of, for example, an internal combustion engine, one side of said spark plugs being grounded in the usual manner as at 39.

The vibrator, which may be termed for convenience a duplicate vibrator, as shown in Fig. 3, consists of a casing 40, having separate and independently operable vibrator elements mounted upon and within each end thereof. As these vibrator elements are duplicates, a description of one will suffice for both.

Referring to Figs. 3 and 10, the vibrator element at each end of the duplicate vibrator comprises a bridge 41 secured to a cap 40′ of the casing 40 carrying a contact screw

42, with which the spring armature 43 coöperates in the usual manner. One end of the vibrator coil 44 is connected at 45 with the armature 43 and the opposite end of the coil leads by wire 46 to a contact screw 47 extending to the exterior of the casing 40, as indicated in Fig. 3, and located midway thereof. The contact screw 42 is connected through the bridge 41 by means of a wire 48 to a contact screw 49 located at the corresponding end of the casing. The common contact 47 and the separate contacts 49 for each of the oppositely arranged vibrators, each consist of a pair of screws for better engagement with the coöperating contact strips respectively. The contacts 49 at each end of the vibrator casing are each connected only with the bridge 41 adjacent the same end. The usual condenser 50 is connected across the terminals of the vibrator.

The contact strip 30, Figs. 6 and 10, connected with the bus bar 29 is arranged to project within the compartment of the casing provided for the duplicate vibrator and to connect with the contact screws 47 midway of said duplicate vibrator when the same is in operative position. Mounted upon the wall of the vibrator compartment is a second contact member 51 arranged to engage the contact screw 49 at one end of the vibrator element when properly positioned in said compartment. From the contact 51 a wire 52 leads to a terminal 53 of a switch 54 preferably mounted upon the outside of the casing and provided with a switch arm 55 arranged to make contact with battery terminals 56 or 57, as desired. Preferably two batteries 58 and 59 are provided, either one of which may be brought into operation by the switch, as desired.

From the above description it will be seen that the coil units may be readily mounted within the casing by simply slipping the same into their respective compartments, which action at the same time effects automatic connection through the contact members fixed to the bottom of the casing 20 and the contacts on the coil casing with the vibrator member, battery and spark plugs respectively, and by reason of the presence of the common connection 29 for the coils with the vibrator and battery any one of the coils may be removed without disturbing the electrical connections of the others. Furthermore, the vibrator element may be likewise mounted in the casing and at the same time automatically make electrical connection with the switch contact 51 and the common coil contact 30. By reason of the duplicate form of the vibrator member, the same may be reversed at will, bringing either of the vibrator elements into operation, in case the other becomes ineffective for any reason. It will be seen furthermore that all of the contact members for the coil units and the vibrator are mounted upon the base of the casing, whereby these parts may be readily assembled thereon before the base is attached to the casing, thus greatly facilitating manufacture of the apparatus.

In practical operation of apparatus of this character it frequently happens through a defect in a coil unit or otherwise proper sparking action at one of the spark plugs fails to take place, with consequent irregular operation of the engine. In order to locate the defective part, it is desirable to provide means for throwing any one of the coil units out of operation without removing the same from the casing. For this purpose I provide the manually operable cut-out comprising the spring contact member 11 and push button 10′ upon each coil. By simply pressing upon the button 10′ the circuit will be broken between the contact members 11 and 12 without disturbing the connection of the other units, whereby a defective part of the system may be readily detected in a manner well known to those skilled in this art.

The operation of the apparatus is clearly apparent from the above description.

While I have herein shown a particular embodiment of my invention, it is to be understood the same may be varied in detail and arrangement of parts within the scope of the appended claims.

What I claim is:

1. In electric apparatus, a source of current, a duplicate vibrator comprising independent vibrator elements, an induction coil, a casing for said vibrator and coil, contact members on said casing adapted to effect electrical connection automatically with one of said vibrator elements upon the insertion of said duplicate vibrator in said casing, and contacts on said casing arranged to effect electrical connection automatically with the primary and secondary windings on said coil upon insertion of the same within the casing to connect said coil and vibrator in series with said source of current.

2. In electric apparatus, a source of current, a duplicate vibrator comprising independent vibrator elements and having contact members connected therewith, an induction coil, contact members on the exterior of said coil connected with the primary and secondary windings thereof respectively, a casing for said vibrator and coil, contact members on said casing adapted to effect electrical connection automatically with the contact members of one of said vibrator elements upon the insertion of said duplicate vibrator in said casing in one position, and with the contact members of the other vibrator element on said duplicate vibrator when the latter is inserted in said casing in reverse position, and contact members on said casing adapted to effect electrical connection automatically with the contact mem-

bers of said coil when the latter is inserted in the casing to connect the coil and vibrator in series with said source of current.

3. In electric apparatus, the combination, a source of current, a circuit breaker, a sparking device, a duplicate vibrator, comprising a casing having vibrator elements mounted upon either end thereof, a casing, electrical connections established by the insertion of said duplicate vibrator in said casing in one position to connect one of its vibrator elements automatically with said source of current, and similarly to connect the other vibrator element of said duplicate vibrator when the latter is inserted in said casing in another position, and electrical connections established by the insertion of the coil in said casing to connect the primary thereof automatically with the vibrator element connected to said source, and also to connect the primary of said coil automatically with said circuit breaker and to automatically connect the secondary of said coil with said sparking device.

4. In electric apparatus, a source of current, a duplicate vibrator comprising a casing having independent vibrator elements mounted upon either end thereof, an induction coil, a casing, electrical connections established by the insertion of said duplicate vibrator in said casing in one position to connect one of its vibrator elements with said source of current, and to connect the other of said vibrator elements with said source when said duplicate vibrator is inserted in said casing in a reverse position, electrical connections established by the insertion of the coil within said casing to connect its primary automatically with that element of the duplicate vibrator connected with the source of current.

5. In electric apparatus, a source of current, a duplicate vibrator comprising a casing having independent vibrator elements mounted upon either end thereof, a plurality of induction coils, a casing, a common connection on said casing for the primary windings on said coils, electrical connections established by the insertion of said duplicate vibrator in said casing in one position to connect one of its vibrator elements automatically with said source of current and with said common connection respectively, and to similarly connect the other of the vibrator elements of said duplicate vibrator when the latter is inserted in said casing in the reverse position, and electrical connections established by the insertion of said coils in said casing to automatically connect the primaries thereof respectively with said common connection.

6. In electric apparatus, a source of current, a duplicate vibrator comprising a casing having independent vibrator elements mounted upon either end thereof, a plurality of induction coils, a sparking device and a circuit breaker for each coil respectively, a casing for said duplicate vibrator and coils, electrical connections established by the insertion of said duplicate vibrator in one position in said casing to connect one of the vibrator elements thereof with the said source and the primaries of said coils and to similarly connect the other vibrator element of said duplicate vibrator when inserted in said casing in a reverse position, electrical connections established by the insertion of said coils in said casing to automatically connect the primaries thereof respectively with said vibrator element connected to said source, and also to connect the primary of each coil automatically with said circuit breaker, and to connect the secondary of each coil with its sparking device.

7. In electric apparatus, the combination of a source of current, a duplicate vibrator comprising a casing having independent vibrator elements mounted upon either end thereof, a plurality of induction coils, a circuit breaker and a sparking device for each of said coils respectively, a casing for said duplicate vibrator and coils having a common connection for the primaries of said coils and said duplicate vibrator, electrical connections established by the insertion of said duplicate vibrator in said casing in one position to connect one of its vibrator elements automatically with said source and said common connection, and to similarly connect the other of its vibrator elements automatically when inserted in said casing in reverse position, electrical connections established by the insertion of said coils in said casing to connect the primary of each coil respectively automatically with the common connection and with its circuit breaker, and to connect the secondary of each coil with its sparking device.

8. In electric apparatus, the combination of a source of current, a duplicate vibrator comprising a casing having independent vibrator elements mounted upon either end thereof, a plurality of induction coils, a circuit breaker and a sparking device for each coil, a casing having a common connection for the primaries of each coil and said duplicate vibrator, and having separate connections for the primaries of each coil to connect the same with said circuit breakers respectively, and having separate connections to connect the secondary of each coil with its sparking device, said duplicate vibrator having contact members, adapted when said vibrator is inserted in one position in said casing to automatically connect one of its vibrator elements with said source and said common connection respectively, and to similarly connect the other vibrator element when said duplicate vibrator is inserted in reverse position, each of said coils

having contact members to automatically connect its primary with said common connection and with its circuit breaker, and to connect the secondary automatically with the sparking device upon insertion of the coils in said casing.

9. In electric apparatus, a duplicate vibrator comprising a casing having independent vibrator elements mounted upon either end thereof, a plurality of induction coils, a casing for said duplicate vibrator and coils and means to connect one of the vibrator elements automatically with the primaries of said coils upon insertion of said vibrator in said casing in one position, and to similarly connect the other vibrator element when said duplicate vibrator is inserted in reverse position.

10. In electric apparatus, a source of current, a duplicate vibrator comprising a casing having independent vibrator elements mounted upon either end thereof, a plurality of induction coils, a casing, a common connection on said casing for the primaries of each coil, contact members on said duplicate vibrator and said casing to connect one of the vibrator elements automatically with said common connection upon insertion of said duplicate vibrator in said casing in one position and to similarly connect the other of said vibrator elements upon insertion of said duplicate vibrator in reverse position.

11. A duplicate vibrator for ignition apparatus, comprising a casing having independent vibrator elements mounted upon either end thereof, contact members on the exterior of said casing connected with the coöperating parts of each vibrator element.

12. A duplicate vibrator for ignition apparatus, comprising a casing having independent vibrator elements mounted upon either end thereof, separate contact members on the exterior of said casing connected with similar members of each vibrator element respectively, and a common contact on said casing connected with the corresponding members of said vibrator elements.

13. A duplicate vibrator for ignition systems, comprising a casing having independent vibrator elements mounted upon either end thereof, separate contact members on the exterior of said casing connected respectively with the fixed contact member of each of said vibrator elements, and a common contact on the exterior of said casing connected with the coils of each of said vibrator elements.

14. In electric apparatus, an induction coil comprising a casing containing the primary and secondary winding of said coil respectively, contact bands extending around the exterior of said coil casing, one of said bands being connected with the primary and the other connected to the primary and secondary of said coil, a holder for said coil, contact members on said holder to effect connections automatically with said contact bands upon insertion of the coil in any of a plurality of positions in said casing.

15. In electric apparatus, an induction coil, a casing therefor, contact members extending around the exterior of said casing, one of said members being connected to one terminal of the coil primary, the other of said strips being connected to the opposite terminal of the coil primary, and one terminal of the secondary, a third contact member on the exterior of the casing of the coil connected with the opposite terminal of the secondary, a coil holder having contact members adapted to effect connections automatically with said coil contacts upon insertion of the coil in any of a plurality of positions in said casing.

16. In electric apparatus, an induction coil, a cylindrical casing therefor, contact members extending around the circumference of said casing, one of said members being connected with one terminal of the primary and the second of said members being connected with the opposite terminal of the primary and with one terminal of the secondary, a third contact member on the exterior of said casing connected with the opposite terminal of the secondary, a coil holder having a compartment adapted to receive said coil, said holder carrying contact members adapted to effect connections automatically with said contact members on said coil upon insertion of the latter within said holder.

17. In electric apparatus, a plurality of induction coils, each coil comprising a casing having contact members extending around the exterior thereof, one of said members being connected with one terminal of the primary and the other member being connected with the opposite terminal of the primary and with one terminal of the secondary, a third contact member on said casing connected with the opposite terminal of the secondary, a holder for said coils having a plurality of separate compartments therefor, contact members on said holder extending into each compartment and adapted to effect connections automatically with the contact members on each coil casing when said coils are inserted in said holder irrespective of the position of said coil in said holder.

18. In electric apparatus, a plurality of induction coils, a common vibrator for said coils, a casing having a plurality of compartments to receive said coils and vibrator respectively, contact members mounted in each compartment, the partition of said compartments between said coils being constructed of material to prevent inductive action between adjacent coils, and being cut

away adjacent said contact members to prevent contact therewith.

19. In electric apparatus, a vibrator comprising a single mounting, two independent vibrator elements in common thereto, each vibrator element having at least one independent circuit terminal in combination with an induction coil, a holder in common to said induction coil and vibrator, a circuit, and contact means for automatically electrically connecting either of said vibrator elements in said circuit depending upon the position of said vibrator in said holder.

20. In electric apparatus, a frame, an induction coil carried thereby, a vibrator also carried thereby, said vibrator including a mounting and a plurality of separately operable vibrator elements carried thereby, a circuit for said coil and vibrator, with means for automatically electrically connecting any one of said vibrator elements dependent on the position of its mounting relative to said frame, in said circuit when said coil and mounting are placed in said frame.

21. In electric apparatus, a frame, a plurality of induction coils carried thereby, a vibrator also carried thereby, said vibrator including a mounting and a plurality of separately operable vibrator elements carried thereby, a circuit for each coil with means for automatically electrically connecting any one of said vibrator elements in circuit with all of said coils when said coils and mounting are placed in said frame dependent upon the position of said mounting in said frame.

ERNEST C. WILCOX.

Witnesses:
CHAS. A. PEARDY,
M. E. GARRETT.