

C. F. KETTERING & W. A. CHRYST.
SYSTEM OF SELECTIVE ELECTRICAL DISTRIBUTION.
APPLICATION FILED NOV. 20, 1912.

1,211,378.

Patented Jan. 2, 1917.
4 SHEETS—SHEET 1.

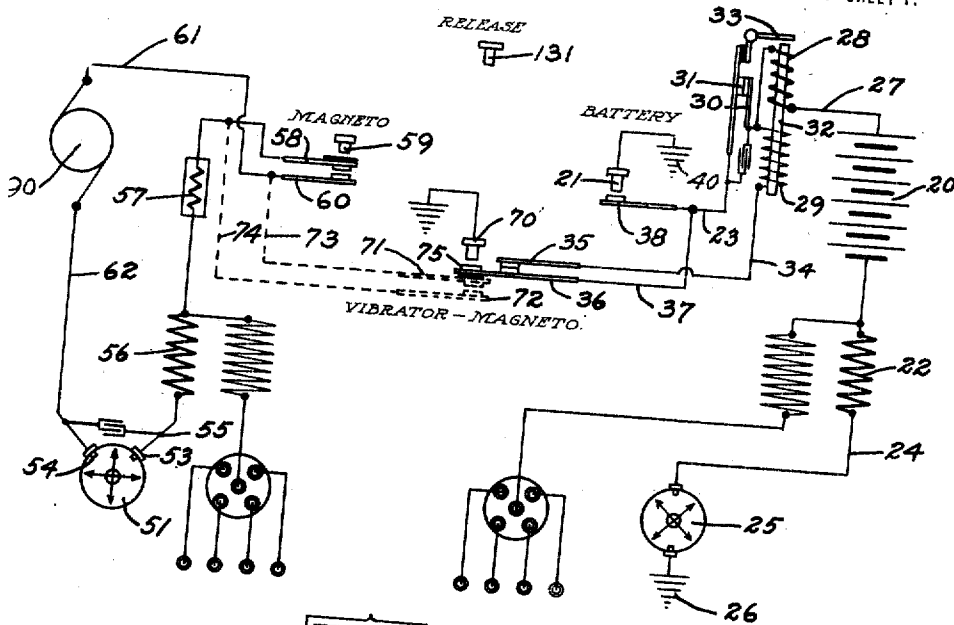


Fig. 1

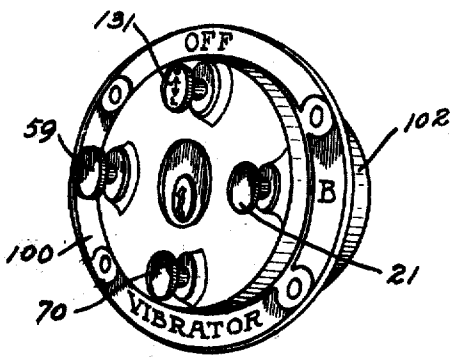


Fig 2

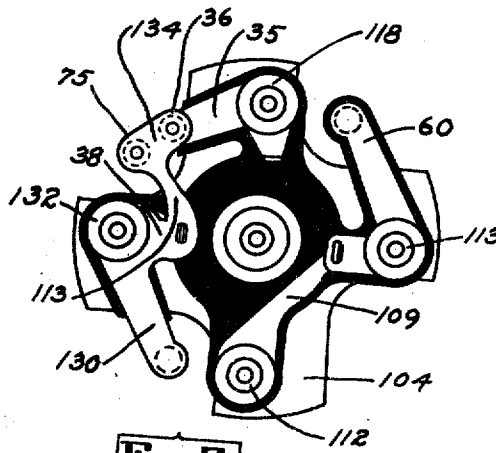


Fig 3

Witnesses
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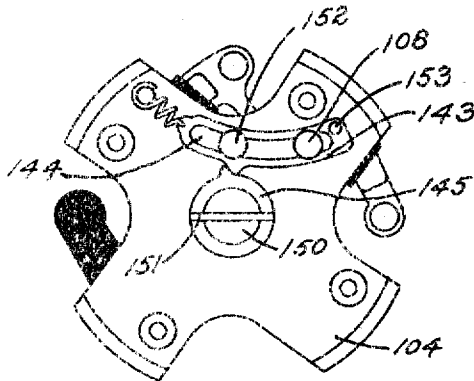


Fig. 4

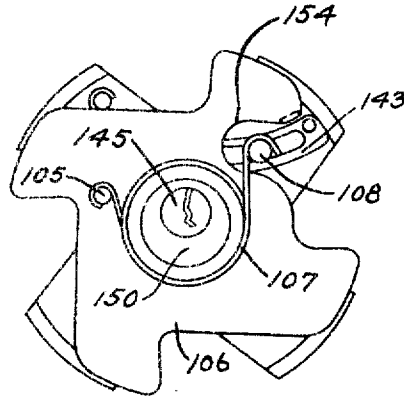


Fig. 5

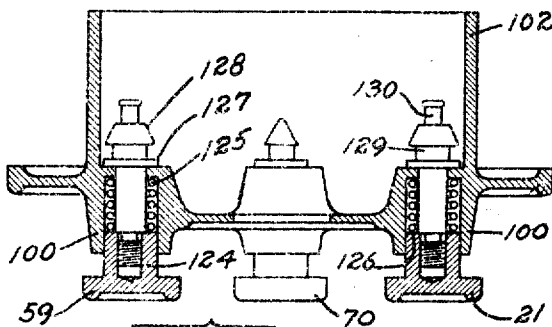


Fig. 6

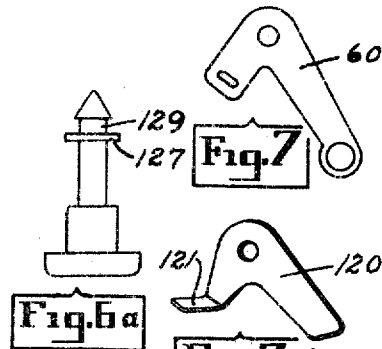


Fig. 6a

Fig. 7a

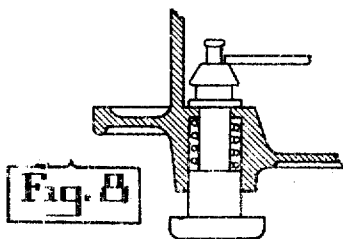


Fig. 8

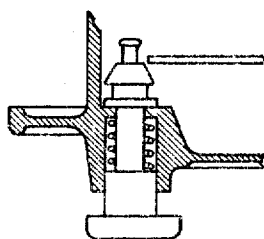


Fig. 8a

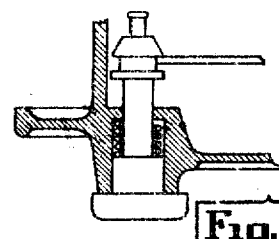


Fig. 8b

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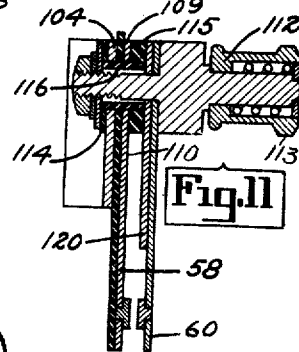
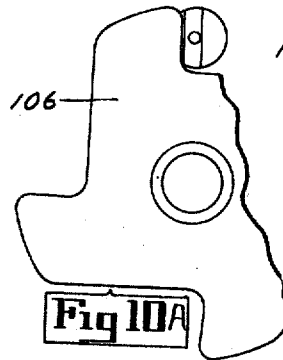
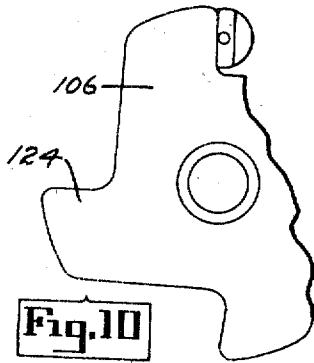
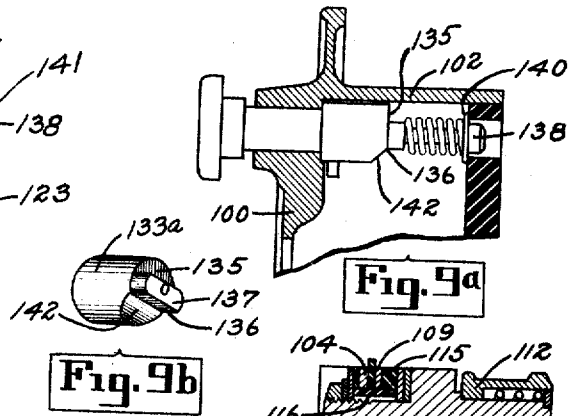
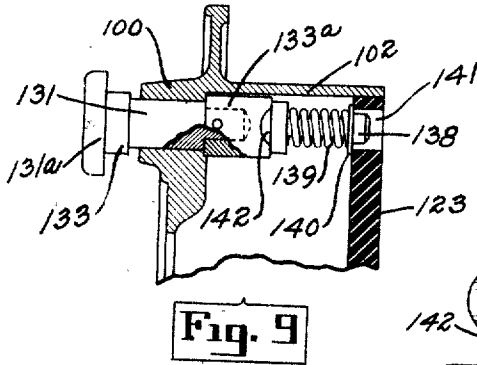
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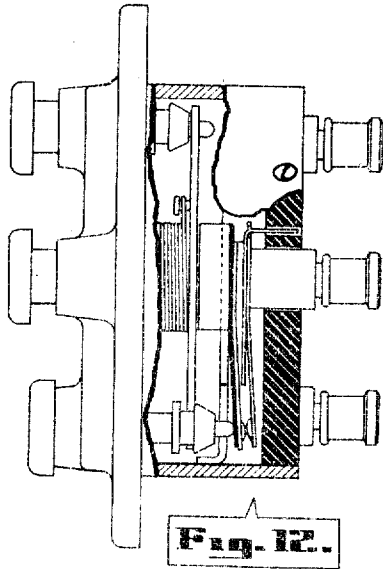


Fig. 12.

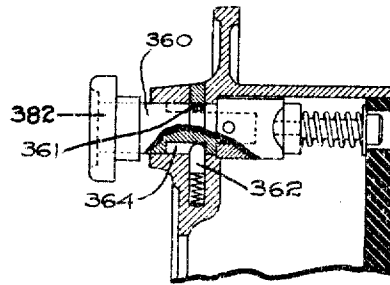


Fig. 13.

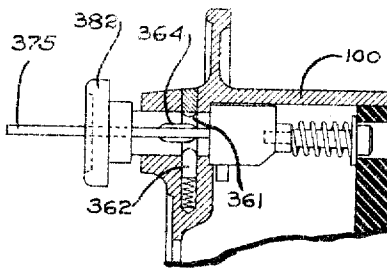


Fig. 13a.

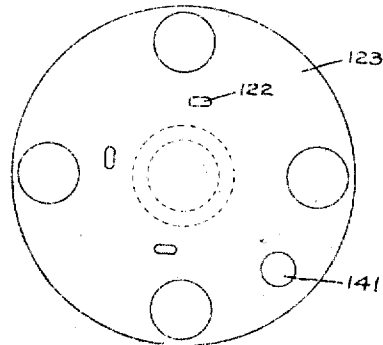


Fig. 14.

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UNITED STATES PATENT OFFICE.

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SYSTEM OF SELECTIVE ELECTRICAL DISTRIBUTION.

1,211,378.

Specification of Letters Patent.

Patented Jan. 2, 1917.

Application filed November 20, 1912. Serial No. 732,423.

To all whom it may concern:

Be it known that we, CHARLES F. KETTERING and WILLIAM A. CHRYST, citizens of the United States, residing at Dayton, county of Montgomery, and State of Ohio, have invented certain new and useful Improvements in Systems of Selective Electrical Distribution, of which the following is a full, clear, and exact description.

This invention relates to an improvement in electrical systems and especially to that type of systems employed in conjunction with combustion engines, for furnishing ignition thereto, and for various other purposes.

One of the primary objects of the present invention is to provide a plurality of electrical sources and circuits, having controlling elements operable to accomplish certain predetermined functions, and which are adapted to be brought into operative condition, either singly or in various combinations, whereby the desired functions will be accomplished in the most advantageous manner.

Another object of the present invention, is to provide a switch, embodying the controlling elements, and to provide in combination therewith, latching mechanism, whereby said controlling elements may be maintained, either independently or in combination, in operative position.

A still further object of the invention is to provide releasing and locking means, operable relative to the above named latching mechanism and controlling elements, to effect the release of the controlling elements, from their latched position and to lock the same in their inoperative position.

A further object of the present invention resides in the novel construction of the elements comprising the cooperating elements of the switch and the combinations thereof.

Further objects and advantages of the present invention will be apparent from the following description, with reference to the accompanying drawings, wherein a preferred form of embodiment of the present invention is clearly illustrated.

In the drawings: Figure 1 is a diagrammatic view of the electrical circuits and connections embodied in one convenient

form of the present invention. Fig. 2 is a front perspective view of the switch casing assembly preferably embodied in systems similar to those diagrammatically shown in Fig. 1. Fig. 3 is a view in rear elevation of the switch unit, comprising the contact elements and supporting plate embodied in the form of the present invention shown in Fig. 1. Fig. 4 is a view of the opposite side of the unit shown in Fig. 3. Fig. 5 is a view similar to Fig. 4, with the latching detent applied and the locking element shown in position to lock the detent. Fig. 6 is a cross sectional view of the switch casing and the push button or controlling elements. This view is taken substantially on the line 6-6 of Fig. 2. Fig. 6^a illustrates a modified form of the controlling element for the vibrating spark system. Figs. 7 and 7^a are detail views of one of the contact fingers and of the reinforcing element respectively. Figs. 8, 8^a and 8^b illustrate one of the controlling elements in various positions. Figs. 9 and 9^a are fragmentary views of the switch casing showing the releasing and latching element in different positions. Fig. 9^b is a perspective view of the operating cam element of the releasing and latching button. Figs. 10 and 10^a illustrate, in partly diagrammatic views, the position of the releasing and latching button, relative to the latching and locking detent when said button is in its normally open and latched positions, respectively. Fig. 11 is a detail view of the contact elements included in the magneto circuit, and the cooperating binding post connected therewith. Fig. 12 is a view in elevation of the switch assembled, with a portion of the switch casing being broken away, so as to clearly show the operation and construction of certain of the push button or controlling elements, and their relation to the latching detent, when in operative and inoperative positions. It will be understood, of course, in this view that certain of the elements have been omitted for the sake of clearness. Figs. 13 and 13^a are fragmentary views of the switch casing, similar to Figs. 9 and 9^a, disclosing the latching and releasing buttons, illustrated in Figs. 9 and 9^a, constituted as a releasing, latching and locking button in the present

modification. Fig. 13 shows the button in operable position, while Fig. 13^a shows the same with the locking key applied thereto and turned to a releasing position. Fig. 14 is a view in end elevation of the rear cover for the switch casing; the dotted lines shown therein, indicating additional openings which are made necessary for certain embodiments of the switch unit which comprise additional terminals or binding posts.

Referring to the drawings, the present invention will be seen to embody a system of electrical distribution for ignition systems, wherein the source of current may be supplied by an electrical machine, such as a magneto or generator, of either the high or low tension type, or by a constant source of current, such as a battery of any suitable type.

In combination with the circuit connections hereinafter described, a selective switch is arranged, which comprises novel structure for permitting the selection of various circuit connections, to effect certain functions, either singly or in various combinations. Thus, the magneto type of ignition which is furnished by the dynamo-electric machine, and the single spark relay type of battery ignition, may be brought into operation to furnish ignition for the engine, independently of each other, by the operation of independent elements, or concurrently by the substantially simultaneous operation of the independent elements. A still further combined ignition of the magneto type, and of the vibrating spark battery type, may be brought into use by the operation of a single controlling element, when the arrangement shown in dotted lines in Fig. 1, is employed.

Certain of the systems originally included in the present application have been divided out and form the subject matter of the following co-pending divisional applications; Serial No. 94,664, filed May 1, 1916; Serial No. 82,127, filed March 4, 1916; and Serial No. 82,416, filed March 6, 1916.

The above description of certain of the combinations, which it is possible to secure by the employment of the present invention, is not intended in any sense as a limitation, inasmuch as various other combinations may be effected, by certain minor changes in the circuit connections and the mechanical structure and arrangement of the switch elements.

In the embodiment of the invention shown in Fig. 1, there is disclosed a system of ignition which is of a type known to the trade as "double ignition," that is, wherein separate sources of current, such as a generator or magneto, and a battery of either dry or storage cells, are employed in conjunction with two separate and distinct sec-

ondary circuits and sets of spark plugs. In the following description, however, it will be seen that under certain circumstances, it is advisable to bring each source of current into use, concurrently, and because of this fact, the present system embodies a modified structure such as is shown in dotted lines in Fig. 1. It will be further seen that the system in Fig. 1, makes it possible to employ either the magneto ignition independently or in combination with the relay single spark type of battery ignition, or to employ the above type of battery ignition independently; or to bring into use, concurrently, the magneto type of ignition in combination with the vibrating spark type of battery ignition, by the operation of a single controlling button or element, providing the dotted line circuit connections shown in Fig. 1, are employed; or to simply employ the vibrating spark type of ignition independently, if these connections are omitted.

In Fig. 1, the numeral 20 indicates a battery of any suitable type, connected with the timing mechanism 25, by means of the wire 24; said timer being grounded at 26. This side of the battery circuit also embodies the induction coil 22, having the usual primary and secondary windings. The secondary winding of this induction coil is connected with any suitable distributing mechanism preferably of that type shown and described in the patents of Charles F. Kettering, Nos. 1,040,349 and 1,163,092, dated October 8, 1912 and December 7, 1915 respectively. The opposite side of the battery from that just described, has a wire 27 extending to a current interrupter, such as is shown in the co-pending application of Charles F. Kettering, Serial No. 548,921, filed March 12, 1910, and which comprises a heavy winding 28 and the fine winding 29, wound about the core 32. As has been described in the above mentioned patents and applications, the employment of this current interrupter within the battery circuit, permits but a single sparking impulse to be delivered for each period that the battery circuit is closed, through the operation of the timer 25. This is made possible by shunting the fine wire winding 29, around the contacts 30 and 31, which are included in the main circuit.

When the single spark system is brought into operation, by depressing the button 21, the current will flow as follows, upon the timer contacts being closed by the operation of the engine: from the battery 20, through wire 27, heavy winding 28, contacts 30 and 31, wire 23, contact 38, and button 21, which has ground connection 40.

It will be understood that as soon as the core 32 becomes energized, by the passage of current through the heavy winding 28, the armature 33 is operated in such a man-

ner that the contact devices 31 and 30 are forced apart. This will, of course, break the main circuit and thus give the sparking impulse which is induced in the usual manner into the secondary winding of the induction coil. Now, as soon as the main circuit is broken, there will still be a small portion of the current which will pass through the winding 28 and thence through high resistance winding 29, through the wire 34, contact elements 35 and 36, wire 37, the contact element 38 and button 21, to ground connection 40, which causes the armature 33 to be maintained in such position that the contact elements 31 and 30 are held apart until such a time as the main circuit is broken by the operation of the timer.

The above description clearly sets forth the battery circuit and connections, for supplying what may be termed, single spark relay type battery ignition.

Under certain circumstance, it is particularly desirable that exceedingly strong and effective ignition be produced temporarily, to meet certain conditions of the engine to which the system is applied. For instance, it is well known in the starting of internal combustion engines, that it is advantageous to use ignition of what is known as the vibrating coil type, inasmuch as this type of ignition generates or produces a plurality of successive sparks, during each interval that the main circuit is closed by the operation of the engine timer. The present invention provides means, whereby this type of ignition, that is, the vibrating coil type may be brought into operation, so that the engine to which the ignition is applied, may receive the benefit of the vibrating coil effect, for starting purposes. As soon as the engine assumes its normal running condition, the vibrating spark system may be cut out of operation and one of the other types of ignition brought into operation, as is set forth hereinafter. It has heretofore been explained that the contact plates 35 and 36 are normally closed and are, in reality, part of the holding coil circuit 34. In order to secure the vibrating coil effect from the battery type of ignition, as is shown in one embodiment of the present invention, it is only necessary that the holding coil 29 be cut out, and the coil 28 employed to intermittently energize the core 32, which will, of course, cause the successive opening and closing of the battery circuit, throughout each interval that this circuit is closed by the engine timer, whereby successive spark impulses will be created in the induction coil, heretofore mentioned.

The operation of the selective switch, to secure the cutting out of the holding coil and the establishing of the buzzer spark or vibrating coil spark circuit, is as follows:

The contact plate 36 has an extended portion, so that upon the depression of the button 70, the contact between the plates 35 and 36 will be broken, and the contact between the point 75, carried by the plate 36, and the button 70, will be established; the said button 70 being so arranged that it establishes a ground connection with the timer casing 25. Now, as the engine assumes its normal running condition, it is no longer advisable to use ignition of the vibrating spark type, but it will be of great advantage if some type of ignition is employed, whereby the intensity of the spark may be increased, in accordance with the acceleration of the engine. This function, that is, the increasing of the intensity of the spark, in accordance with the acceleration, is one common to the magneto or generator type of ignition, inasmuch as the electric machine for creating the current, is generally operated directly by the engine, so that as the engine picks up in speed, the electric machine will correspondingly accelerate.

The magneto circuit and the controlling elements will now be described.

In the present instance, there is shown a low tension dynamo-electric-machine 90, having the timing mechanism 51, which tends to open and close the circuit through the contacts 53 and 54. The contact 53 has a wire connection 55, with the primary winding 56, of a suitable induction coil, and is also connected with the resistance element 57, preferably of iron wire. The wire 55 extends to and connects with the contact plate 58, which when actuated by depression of the button 59, engages with the contact plate 60. The rest of this circuit is completed by means of the wires 61 and 62. It will now be seen that the magneto system may be brought into operation by simply closing the contacts 58 and 60, and as will be explained hereinafter, these contacts may be held in operative position, by the depression of the button 59.

In the phase of the invention just explained above, it may be desirable to automatically bring the magneto into operation, concurrently with the establishing of the vibrating coil circuit, so that as soon as the engine assumes its normal running condition, the magneto system will become effective, automatically, without further operation of the independent magneto button 59. In Fig. 1, there is shown in dotted lines, a modified form for accomplishing just this purpose. By connecting the wires 73 and 74 to the contact plates 71 and 72 respectively, and to the wires 61 and 55 respectively, it will be possible, upon the operation of the button 70 to open the contacts 35 and 36, and close the contacts 70 and 75, and to also close the contacts 71 and 72, thus

establishing the magneto circuit and main battery circuit, as well as to concurrently open the holding coil circuit, so as to secure the vibrating coil effect.

Under certain circumstances, it may be desirable to so construct the button 70, that it is necessary for the operator to hold the button in depressed position, throughout the period it is desired to secure the vibrating spark effect. As will be explained hereinafter, this action is necessary where the button 70 is constructed as shown in Fig. 8, but it will be obvious that a latching effect may be obtained if the button is constructed as shown in detail in Fig. 9.

In order to carry out the above mentioned and various other functions, which will appear hereinafter, it is advisable to employ a selective switch of improved and novel mechanical construction. One of the preferred embodiments of this selective switch capable of carrying out certain of the functions above set forth, will now be described.

Referring particularly to Figs. 2 to 11, the numeral 100 represents an outer casing of any suitable contour, having an extended shell portion 102, wherein certain of the operating elements are contained. These operating elements comprise a unit structure which is assembled previous to being placed within the switch casing. This unit includes a main supporting plate 104, having a latching detent element 106, mounted thereon, but capable of oscillatory movement. The detent is resiliently maintained in a certain predetermined position, by means of the spring 107, one end of which is secured to the detent element itself, as at 105, and the other end thereof, secured to a projecting pin 108, rigidly fastened to the main supporting plate 104. On the opposite face of the main supporting plate 104, a common contact plate 109 is arranged, which is provided with an arm 110, which terminates in the resilient contact finger 58, (see Fig. 11), so that the free end thereof may be actuated by the push button plunger element, hereinafter described. This contact plate is provided with a spring binding post 112, of the type shown in the patent of Charles F. Kettering, No. 1,089,771, dated March 10, 1914, and which forms a terminal, for one side of the magneto circuit. The stud of this spring post extends through the contact plate 109 and the supporting plate 104, being insulated therefrom, by the insulating washers 114 and the insulating plate 115, which forms a mounting for the contact plate 109, and the finger 58, so as to insulate same from the operating button.

Referring to the detail sectional view in Fig. 11, it will be seen that the portion of the stud which passes through the plate 104, is surrounded by a short tubular portion of

insulation 116, so that while electrical connection is established between the binding post and the common contact plate 109, the binding post will be completely insulated from the supporting plate 104. At an intermediate point on said plate 109, an additional terminal post 113 is mounted, to which is secured the wire 61, (see Fig. 1), which forms the opposite side of the magneto circuit, said binding post being insulated from the supporting plate 104, in a manner similar to that in which the binding post 112 is insulated. This spring terminal post 113 forms a securing means for the independent contact element 60, which, when actuated as explained hereinafter, cooperates with the finger 58, of the contact plate 109. The free end of this independent contact element 60 extends parallel with the finger 58, of the contact plate 109, and is provided with a contact point which is normally adjacent to but spaced from a contact point carried by the finger 58. In order to prevent the displacement of this independent contact element 60, and to also stiffen or reinforce the same, a supporting strip 120 is mounted on the face of said element, adjacent to the finger 58, (see Figs. 7^a and 11). One end of the reinforcing strip 120 is bent at an angle, as at 121, and passes through an aperture formed in the end of the individual contact element and also through slots 122, formed in the rear end cover 123, of the switch (see Fig. 14). This strip not only reinforces the contact plate to which it is attached, but by passing through the rear end switch cover 123, it also prevents the contact plate from turning, relative to its normal position.

The above description applies to the mechanical construction of the contact elements of the magneto system, and, as will be explained hereinafter, a suitable operating button or element is provided for effecting the closing and opening of the magneto circuit by actuating the finger 58, into and out of contact with the individual contact element 60.

The battery system of ignition is controlled in somewhat similar manner to the magneto system, but differs in certain respects in the mechanical construction of the various elements.

As will be seen by referring to Fig. 1, the button 21, which manually controls the single spark system of the battery ignition, is provided with a ground connection 40. By referring to Fig. 3, the contact plate 38 is shown as having the extending arm 130, the free end of which will directly underlie the contact end of the button 21. This contact plate is secured to a common supporting element 104, by means of the binding post 132, which has substantially the same connection with said plate or element 104, as the bind-

ing posts 112 and 113 have, which has been fully explained heretofore. However, in actual practice, this contact plate has an oppositely extending arm 118, which in the diagrammatic figure, is represented by the contact plate 36, said arm terminating in the enlarged head 134. Two contact points are secured to this head portion, one of which is normally in closed position, with a contact point carried by the contact plate 35. The other contact element directly underlies the push button 70, so that upon the depression thereof, the main circuit of the battery system will be established while the holding coil circuit will be opened, this operation producing the vibrating spark effect.

In the present type of switch, it should be understood that the same is preferably applied to the dash board of the vehicle, which in the type of car known as the Cadillac, is composed of non-conductive material, such as wood. This makes it possible to employ the switch casing and buttons 21 and 70, as a part of the circuit, and therefore, to provide the unit structure with a common connection. This common connection in the present instance, comprises a terminal post of substantially the same construction as the terminal posts 112 and 113, heretofore referred to and which is preferably located in the center of the switch and projects outwardly therefrom. This binding or terminal post 118 is electrically connected with the supporting plate 104, which in turn is connected in a similar manner to the frame of the switch.

When the above described unit structure is in its normal position and is assembled in the switch casing, the spring controlled detent plate 106 is positioned so that one of its extending lobes or projections 124 will extend slightly over the contact ends of the finger 58. When in this position, this lobe of the detent will also be in such position that a portion of the periphery will underlie the flanged head of the button 59, while the other lobes of the detent will be similarly positioned, relative to the other push buttons 21 and 70. These push buttons are mounted within housings, formed in the switch casing, which contain a spring arrangement 125, for normally maintaining the plungers or buttons in their outward or inoperative position.

The construction of the push buttons which control the magneto and battery circuits, and which are of substantially the same construction, will now be described. These plunger or button elements are slidably mounted in the switch casing 100, so that the enlarged head 124, which is detachable from the remainder of the button, projects out from the casing. The body of the switch is constructed so that the

spring 125, may be mounted on the shank of the plunger or button, said spring having the wall of the recessed portion or housing of the switch casing, as one abutment, and the shoulder 120, formed by the head portion 124, as its opposite abutment. This spring element 125 normally tends to maintain the push button in an outward or inoperative position, relative to the contacts heretofore described. The operative end of each of these buttons comprises a flange 127, separated from the beveled flange or projection 128, by means of a groove 129. The extreme end portion of the plunger or button is reduced, as at 130. It will be apparent, in view of the previous description, that if these buttons are depressed against the pressure of the coil spring 125, the beveled face of the projection 128 will strike against the spring controlled detent 106 and force the detent out of its path, until such a time as the beveled flange has passed by the spring detent. As soon as the beveled flange has passed the detent, the spring 107 returns the detent to its normal position and will consequently engage in the groove 129, formed between the flange 127 and the beveled flange of the push button. When the button is in depressed or operative position, the extreme end thereof, presses against one of the contact fingers and moves the same into engagement with its cooperating independent contact plate. Thus, it will be seen that the circuit which embodies this contact finger and the independent contact element, will be maintained in closed position until such a time as some means is actuated to release the detent from latched engagement with the push button or plunger. The peculiar construction of this detent element and the cooperating push buttons, makes it possible, by concurrently pressing in the independent plungers or buttons, for controlling the magneto and battery circuits, to latch, simultaneously, both of said buttons in depressed position. This action will, of course, close the battery and magneto circuits, whereby the engine to which the ignition system is attached, will be supplied with both the magneto and battery type of ignition, concurrently. It will also appear that when one of the push buttons, as for instance, the button designated by the numeral 21, is latched in depressed position, and the other button 59 is depressed, the detent 106 will be so actuated by depressing the button 59, that the button 21 will be released from its latched position and also instantly returned to its normal position, by means of the spring 125. This action is caused by the beveled flange on the button 59, engaging with the adjacent lobe of the detent 106, and forcing the same out of latched position with the button 21. It will

therefore be seen that when either the buttons 21 or 59 are actuated, the detent element 106 will first be forced into a releasing position, and will then return to a latching position, relative to the button which has just been completely depressed.

In Fig. 6, one embodiment of the button 70, which controls the opening and closing of the contact plates 35, 36, 71, 72, 75 and 70, is shown, wherein it is necessary for the operator to force the button into depressed position and to maintain the same therein, by continued pressure, for such a time as it is desired to procure the vibrating spark effect. In this instance, the shank of this button is not provided with any beveled flange, but simply comprises a straight shank which will operate the above mentioned contact plates, in the manner described heretofore, when the button is depressed. However, it will be obvious that by constructing this button with the beveled flange, similar to the structure of button 21 and 59, it will not be necessary for the operator to continue pressure on the button, after the same has once been completely depressed, inasmuch as the detent element will operate relative thereto, to latch the same in depressed position. Such a structure as this is shown in Fig. 6^a. However, even in the structure shown in Fig. 6^a, there is a slight difference from that embodied in buttons 21 and 59, for the simple reason that it is practically never desirable to effect the release of any of the buttons which happen to be in latched position, by the depression of the button 70. The reason for this is that when it is desired to bring the vibrating spark effect into action to supplement any of the other types of ignition, it is generally only advisable to employ the vibrating spark effect a short period, that is, until the special conditions which make the use of it necessary or desirable, have been overcome. One reason for not keeping the vibrating spark effect in action, longer than is necessary, is because of the excessive amount of current which a system of this type consumes. For this reason, the beveled flange on the button shown in Fig. 6^a, is made of such diameter that while it will be of such conformation that it may be readily engaged by the detent, to hold the button in latched position, it will not actuate the detent during its depression, sufficiently to release the engagement of the detent with any of the other buttons which happen to be held in latched position.

The operative end of the push button 70 is so constructed and arranged, relative to the detent, that when the locking elements of the switch are operated, as described hereinafter, it will be impossible to depress the detent into operative position. In other words, the locking elements will effect a

locking of the button 70, in a manner substantially the same as they effect the locking of the other push button elements.

Under certain conditions, it may be desirable to release all of the push buttons which may be in depressed position, so as to completely cut out the ignition system, as when it is desired to stop the engine. In order to permit this action and also in order to provide a locking element for the entire switch, so that all of the various circuits which have connection with said switch may be permanently locked in open position, there is provided a supplemental push button element which is constructed differently from the push buttons heretofore described. This element 131 comprises a head portion 131^a, reduced as at 133, to form a shoulder which will limit the inward movement of the button. The reduced portion 133 forms the shank of the button and is connected with a cylindrical part 133^a, having segments thereof, cut away, as at 135, and 136, so as to leave the projecting lug 137. On one side adjacent to one of the segmental cuts, there is a beveled face 142, the function of which will be clearly described herein-after.

In order to have some means, whereby the push button element 131, above described, may be maintained in its normal outward position, the element has an extended portion 138, upon which is mounted the coil spring 139 and the washer 140, the washer 140 forming one abutment for said spring, while the rear end cover 123, of the switch, forms the other abutment. In assembling this button, the rear end cover 123 is provided with an opening 141, which is in alignment with the extended portion 138, so that upon the depression of this push button, the extreme end of this element will project through a short distance.

By constructing the push button element 131, in the form above described, it will be seen that when it is depressed, the beveled face 142, will engage with one of the lobes of the spring controlled detent and force the same out of operative or latching position and thereby release any of the push buttons which have been previously maintained in latched position, by the detent.

The above description relates to the releasing effect of the button 131, when pressure is applied thereto, to effect a movement thereof, in the direction of its axis. However, by referring to Figs. 9 and 9^a, it will be seen that if this button is oscillated when in its normal position, it will also effect the releasing of any of the buttons which are in depressed position.

Fig. 9 illustrates the button in its inoperative position, that is, in such position that any of the other push buttons may be oper-

ated in the usual manner and will be held in depressed position, by operation of the detent 106, in the manner heretofore described. However, when this button element is turned to the position shown in Fig. 9^a, it will be seen that the detent will be forced back against the normal tendency of the spring 107, by the lug 137, of the cylindrical part 133^a of the button. The extent to which the detent will be moved, will be sufficient to release any of the buttons which have been previously held in latched position by the detent. This releasing effect is secured by turning the button one fourth of a revolution, and it will be understood that if the button is turned completely around, that is, a full one half revolution, the detent will be permitted to return to such position that a portion of the detent will underlie the longitudinal axis of each of the controlling elements or buttons, and thus prevent further operation thereof, until this releasing button has been turned back, so that it rests in such position that the arrow shown on the face of the button in Fig. 2, will point downwardly toward the center of the switch, at which time, the button will be in the position shown in Fig. 9. This function of the element 131 is employed in the present instance, in combination with a key locking device which will lock the element 131 in its latching position and thus effect a continued and positive locking of the detent element, in such position that it will be impossible to operate the circuit controlling buttons to close the circuit, until such time as this key locking device has been so operated that the button element 131 may be turned around to open position and thus release the locking detent and permit the same to be actuated in the usual manner, by the operation of the controlling elements 21, 59 and 70.

In the present instance, it is necessary that the element 131 be turned into latching or locked position, before it is possible to operate the key locking device, but, as will hereinafter appear, certain modified arrangements of these elements and combinations of elements may be devised, which will obviate this necessity.

By referring to Figs. 4 and 5, certain parts of the key locking device are shown in locked and unlocked position. This device embodies a lock 150, preferably of the Yale type, which is located, in the present instance, in the center of the switch. The key 151, which is illustrated in Fig. 4, when actuated to lock the switch, operates a cylinder element 145, in such a manner that the sliding arm 143, which is mounted on the supporting plate 104, is forced outwardly, so that the projection 153, carried thereby, is brought into the path of one of the lobes

of the locking detent. The arm 143 is provided with a central slot 144, which fits over the studs 152 and 108, rigidly mounted on the plate 104, and which operate as guides for the arm 143.

In order that the assembling and operation of various parts of the switch unit may be facilitated, the detent element is cut away as at 154.

In the embodiment of the switch heretofore described, it will be understood that the button 131 constitutes what may be termed a releasing and latching element, that is, by operating this button in the direction of its axis, or by depressing the same, the latching detent 106 will be moved into releasing position, relative to the various controlling elements or push buttons of the switch. By turning this element 131 on its axis, however, there will first be secured the same releasing effect as was secured by the movement in alinement with its axis, but upon a continued turning of the button, the latching detent will be brought into such position that further operation of the push buttons or controlling elements, will be prevented, until such time as the button 131 is returned to its normal position. When this releasing and latching element is in unlocked position, it will be possible for any one familiar with the operation of a switch of the kind embodied in the present system, to defeat the entire object of the switch, that is, of a safety locking device to prevent the unauthorized use of the ignition system, by simply turning this element to its normal position. In the present instance, therefore, a positive key locking element is arranged, which is effective to maintain the latching detent element 106 in the position into which it is brought by the operation of the releasing and locking element 131. It will therefore be seen that the releasing and latching elements permit the detent to assume such a position that the switch will be inoperative and that a portion of the key locking device is simply to prevent the return of the locking detent to its normal position, without first unlocking the switch by means of the proper key.

By referring to Figs. 13 and 14, a modified form of the locking arrangement disclosed in Figs. 2, 4 and 5 is clearly illustrated. In this modified form, the central locking device, described and illustrated with respect to Figs. 2, 4 and 5, is eliminated and the releasing button 382, which controls the latching detent, is provided with mechanism whereby the locking effect of the switch may be effected by means of a key actuated mechanism combined with the button 382. That is, in the present modification, the release button 382 is constructed identically the same as the release button described in con-

nection with Figs. 9 and 9^a, except that the shank portion 360 is provided with an annular groove 361, within which is normally positioned a spring pressed plunger element 362. A cut-away portion 364 leads from said annular groove and is of greater depth than the depth of said groove and normally is arranged to lie directly in alinement with the plunger 362, so that while the button may be depressed or pushed in, by exerting pressure against the button 382, it will be impossible to turn said button on its axis, without first inserting the key element 375, which upon being inserted within the opening formed in the center of the button element, will depress the plunger element 362, to such an extent that it will be possible to turn the entire button or controlling element 382, in order to effect, first, a release of all buttons which are in depressed position, and second, to lock or prevent from operation, any of these buttons until the controlling element is returned to its normal or open position.

While the form of mechanism herein shown and described constitutes a preferred form of embodiment of the invention, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What we claim is as follows:

1. In a system for supplying ignition to combustion or explosion engines, the combination with a plurality of independent ignition systems; of controlling elements operable independently to bring the said ignition systems into operation and means having provisions for maintaining the established systems in operative condition upon the actuation of certain of the controlling elements, regardless of the previous position of the unactuated controlling elements.
2. In a system for supplying ignition to combustion or explosion engines, the combination with a plurality of independent ignition systems; of controlling elements operable independently to bring the various ignition systems into operation; and latching means actuated by the controlling elements and adapted to maintain the controlling elements in position to establish the ignition systems in operative position.
3. In a system for supplying ignition to combustion or explosion engines, the combination with a plurality of ignition systems; of controlling elements operable independently and concurrently to establish any of the ignition systems independently, and certain of the systems concurrently; and means operable by each of the controlling elements for maintaining the ignition system in operative condition when once established by the controlling element.
4. In a system for supplying ignition to

combustion or explosion engines, the combination with a plurality of ignition systems; of controlling elements for establishing and dis-establishing said systems; and means for maintaining said systems in established position when the controlling elements are operated concurrently, said means being operable to release any established system, when actuated by a controlling element operated to independently establish a different system.

5. In a system for supplying ignition to combustion or explosion engines, the combination with a plurality of ignition systems; independent controlling elements for said systems; and means operable by said controlling elements for maintaining all of said circuits in operative condition, when the controlling elements are actuated concurrently.

6. In a system for supplying ignition to combustion or explosion engines, the combination with a plurality of independent ignition systems; of controlling elements operable independently to bring the various ignition systems into operation; means actuated by the controlling elements to maintain the systems in established condition; and a common means operable to release any of the established systems.

7. In a system for supplying ignition to combustion or explosion engines, the combination with magneto and battery ignition systems; of a selective switch having independent controlling elements for closing said battery system and for establishing the magneto system; means for maintaining said controlling elements in their closing or establishing positions; and a common means for releasing any of said controlling elements from their operative position.

8. In a system for supplying combustion and explosion engines with ignition, the combination with a plurality of ignition systems; of means for controlling each of said systems; and means capable of movement in one direction to release all established systems and in another direction to maintain all of said systems in inoperative position.

9. In a system for supplying combustion and explosion engines with ignition, the combination with a plurality of ignition systems; of means for controlling each of said systems; and means capable of movement in one direction to release all established systems from operative position and of a further movement in a different direction to maintain said systems in inoperative position.

10. In a system for supplying combustion and explosion engines with ignition, the combination with a plurality of ignition systems; of means for controlling each of said systems; and means capable of reciprocating

movement to release all established systems and of an oscillatory movement to maintain said systems in their released position.

11. In a system for supplying combustion and explosion engines with ignition, the combination with a plurality of ignition systems; of means for controlling each of said systems; and means capable of an initial oscillatory movement to release all established systems and of a further oscillatory movement to maintain said systems in their released position.

12. In a system for supplying combustion and explosion engines with ignition, the combination with a plurality of ignition systems; of means for controlling each of said systems; and means capable of movement in one direction to release all established systems from their operative position and of a further movement to latch said systems in inoperative position; and locking means operable to prevent the operation of the controlling means.

13. In a system for supplying combustion and explosion engines with ignition, the combination with a plurality of ignition systems; of independent means for controlling each of said systems; and means capable of an oscillatory movement to release all established systems; and key actuated locking means operable only subsequent to the oscillatory movement of the means for latching said systems in their inoperative position to lock the systems in this position.

14. In a system for supplying ignition to combustion or explosion engines, the combination with a plurality of independent ignition systems; of push buttons operable independently to bring the said ignition systems into operation; and detent means co-operating with said push buttons to maintain the established systems in operative condition, regardless of the previous position of the other controlling elements.

15. In a system for supplying ignition to combustion or explosion engines, the combination with a plurality of ignition systems; of a series of cooperating contact plates included in the different ignition systems; a plurality of push button elements controlling said series of contact plates; and spring pressed detent means normally underlying said push buttons and operable to maintain said push buttons in position to close the contact plates.

16. In a system for supplying ignition to combustion or explosion engines, the combination with a plurality of ignition systems; of a series of cooperating contact plates included in said ignition systems; push button elements having a beveled flange and a shank portion of less diameter than said beveled flange; and spring pressed detents underlying the beveled flange of said

push buttons, whereby the detents will be actuated when the push buttons are forced inwardly, by the beveled flange of said push buttons and are returned to a latching position relative to said flange, when the same has passed the detent, thus latching the push buttons in position to close the contacts of the ignition systems.

17. In a system of electrical distribution, the combination with a plurality of circuits; of a series of push buttons operable to establish and dis-establish the various circuits; means operable to release all of the push buttons which are in position to establish circuits, said means having provisions for latching said push buttons in released position; and key actuated means for locking said last named means and said provisions in latching position, whereby said push buttons will be maintained in position to dis-establish said circuits.

18. In a system of electrical distribution, the combination with a plurality of circuits; of a series of push buttons operable to establish and dis-establish the various circuits; means operable to release all of the push buttons which are in position to establish circuits, said means having provisions for latching said push buttons in released position; and independent key actuated means for locking said last named means and said provisions in latching position, whereby said push buttons will be maintained in position to dis-establish said circuits.

19. In a push button switch, the combination with a circuit controlling push buttons having a normal position and a circuit-making position; means for latching said push buttons in circuit-making position; and a releasing button for releasing the circuit controlling buttons from latched-in position, said releasing button having provisions brought into effect by a further movement of the releasing button for locking the circuit controlling buttons in unlatched position.

20. In an ignition system, the combination with an ignition circuit; of a controlling button for said circuit; and a locking button rotatable on its axis to release the controlling button from circuit closing position, and then to lock said controlling button in its circuit breaking position.

21. In an ignition system, the combination with an ignition circuit, of a controlling button of said circuit, having a circuit opening and a circuit closing position; a locking button rotatable on its axis to release the controlling button from circuit closing position and to lock said button in circuit opening position; and an auxiliary lock operable to lock the controlling button in circuit opening position only when said locking button has been rotated.

22. In an ignition system, the combination with an ignition circuit; of a controlling button therefor, having a circuit opening and a circuit closing position; and a locking button operable either by depression or by rotation to release the controlling button from circuit closing position.

23. In an ignition system, the combination with an ignition circuit, of a controlling button therefor having a circuit opening and a circuit closing position; and a locking button operable by depression to release the

controlling button from circuit closing position and rotatable on its axis to lock the controlling button in its circuit opening position. 15

In testimony whereof we affix our signatures in the presence of two subscribing witnesses.

CHARLES F. KETTERING.
WILLIAM A. CHRYST.

Witnesses:

JOSEPH W. McDONALD,
WALTER W. RIEDEL.