

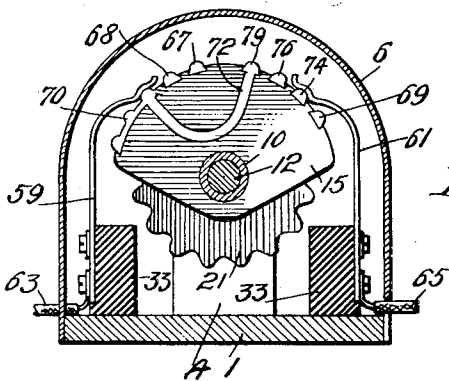
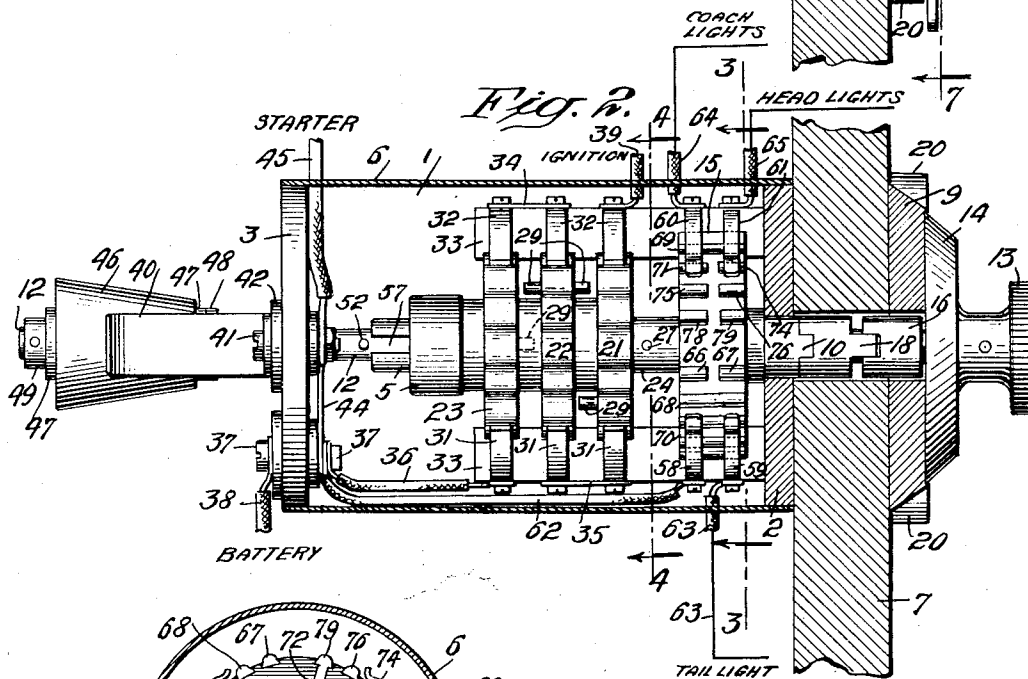
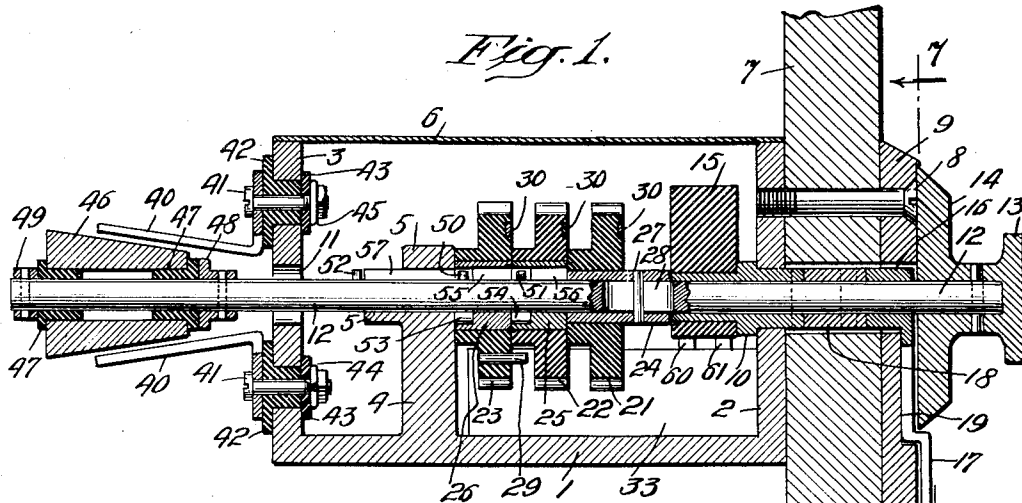
June 12, 1928.

1,673,607

D. M. TULLOCH
ELECTRIC SWITCH DEVICE

Filed March 31, 1926

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 6.

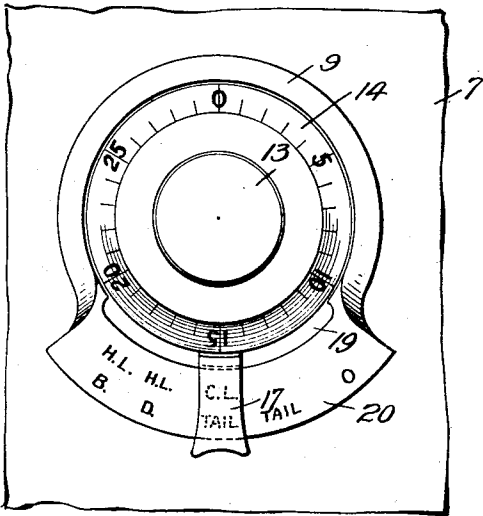


Fig. 4.

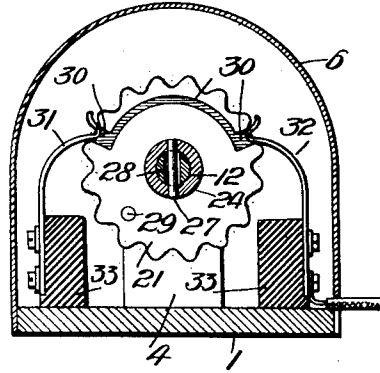


Fig. 5.

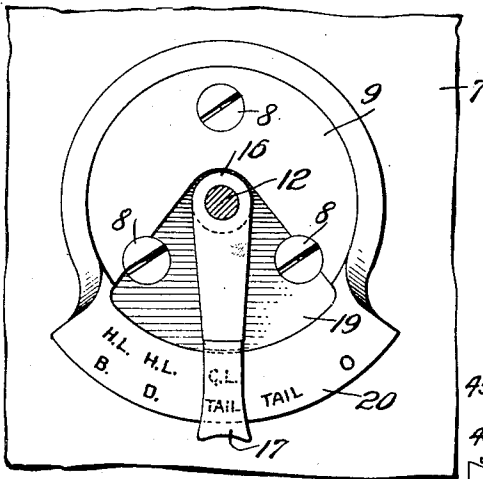
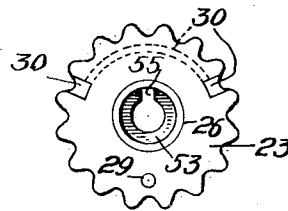


Fig. 7.

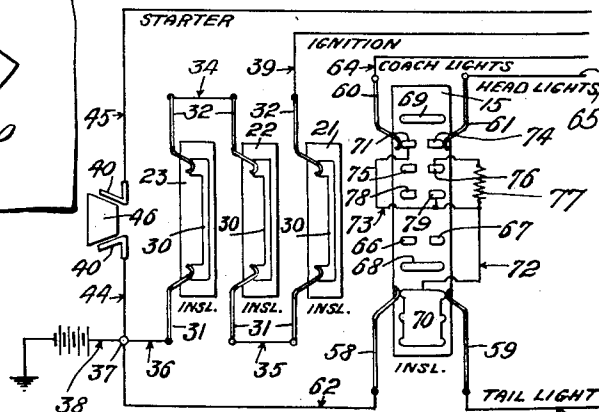


Fig. 8.

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ELECTRIC SWITCH DEVICE.

Application filed March 31, 1926. Serial No. 98,849.

Commonly heretofore on vehicles driven by internal combustion engines electric lighting circuits or illuminating circuits and the ignition or sparking circuits for the engine have been controlled as to their operative condition by means of hand operated switches mounted on an instrument board or dashboard, and the circuit for the electric engine starter has been controlled by means of a pedal, thereby necessitating two separate and distinct operations for effecting control of the ignition circuit and the starter circuit, one operation with the hand and the other operation with the foot. For example, in starting the engine it is necessary first to close the hand switch to put the ignition circuit into operative condition, to depress the pedal to close the starter switch and then to remove the foot from the starter pedal after the engine has started.

An object of the invention is to simplify these operations so as to render them more convenient, including the doing away altogether with the foot operation, and, by a simple manipulation, to provide for successively closing a switch in the ignition circuit, closing a switch in the engine starting circuit and for subsequently opening the latter switch. Another object of the invention is to provide a unitary switch device for effecting control of the ignition supply circuit, the engine starting circuit, and the lighting circuits. Other objects of the invention are simplicity and compactness of construction, reliability and economy. Ancillary objects of the invention are to prevent the closing of the switch in the starter circuit before the switch in the ignition supply circuit has been closed, to prevent the opening of the switch in the ignition supply circuit while the starter switch is closed, and to prevent the unauthorized closing of the switch in the ignition supply circuit. Other objects and advantages of the invention will hereinafter appear.

According to this invention the operating mechanism of the switch device is so organized that a single handle member may be manipulated to establish the ignition supply circuit to the usual distributor, to close the engine starting circuit, to open the latter circuit, and, finally, to open the supply circuit to the distributor whenever desired, in the consecutive order named. The invention further includes means to prevent any other

sequence of operation, but provides for the unhampered repeated closing and opening of the ignition supply circuit independently of the other circuits when the engine starting circuit is open and then only. More particularly according to the invention a manually operable rotatable and longitudinally slidable shaft by its rotative movements controls the condition of the ignition supply circuit to the distributor and by its longitudinal movements controls the condition of the engine starting circuit, interlocking means being provided for this shaft to prevent its being moved longitudinally to close the starter circuit excepting only when it is in a correct rotative position to establish the ignition circuit to the distributor, such means also being effective to prevent the opening of the circuit to the distributor while the starter circuit is closed. Yet more particularly according to the present invention the means for assuring the proper sequence of operation of the ignition supply switch and the starter switch also prevents the unauthorized operation of these switches, such means including a permutation device forming a combination lock and which is settable by the single switch operating handle concomitantly to open the ignition switch and to lock the starter switch at its open circuit position, and concomitantly to close the ignition switch and unlock the starter switch. Also in accordance with the invention an independently manually operable switch in control of the electric lighting circuits is carried by the rotatable and slidable shaft and has an operating handle projecting from this shaft adjacent the handle on the latter. The invention further includes features of construction and combinations of parts as will appear from the following description.

The switch device illustrated in the accompanying drawings as one embodiment of the invention will now be described and thereafter the invention will be pointed out in claims, reference now being had to the drawings, in which:

Fig. 1 is a central vertical longitudinal section of a complete switch device embodying the invention, shown as mounted upon an instrument board;

Fig. 2 is a plan view with some parts in central horizontal section, the circuit connections being shown partly in diagram;

Fig. 3 and Fig. 4 are vertical sections respectively on the lines 3—3 and 4—4 of Fig. 2;

Fig. 5 is a rear elevation of the permutation locking disc which appears at the left in Fig. 1;

Fig. 6 is a front elevation as viewed from the right in Fig. 1;

Fig. 7 is a vertical section on the zig-zag line 7—7 of Fig. 1; and

Fig. 8 is a diagram of the electrical circuits of the device.

The embodiment of the invention shown in the drawings will now be described. In the particular construction shown, a rigid metallic frame has a bottom plate 1, front and rear end walls 2 and 3, and an intermediate post 4 rising from the bottom plate 1 inwardly from the rear end wall 3 at a middle point transversely and providing at its top a bearing 5. The end walls 2 and 3 are rounded at the top and the frame is provided with an enclosing cover 6 which may be secured thereto by any suitable means and may be formed of any suitable material, such as sheet metal. This frame is shown as secured to an instrument board 7 by means of flathead countersunk screws 8 passing inwardly through a face plate 9 on the front of the instrument board and through the latter into the front end wall 2. The front wall 2 has an opening therein providing a bearing for a sleeve 10 hereinafter more particularly referred to. This sleeve forms a bearing in longitudinal alignment with the bearing 5, and the rear end wall 3 has therein a hole 11 in alignment with the bearings 5 and 10.

A manually operable shaft 12 is both rotatable and longitudinally slidable in the bearings 5 and 10. At its rear end this shaft projects through the hole 11 some distance to the rear of the rear wall 3, and at its front end this shaft projects beyond the face plate 9 and has fixed thereon a knurled handle knob 13 which carries and is shown as formed in one piece with a graduated or calibrated dial 14 which is at the front of the face plate 9. The face plate 9 is shown as provided at its top with an index mark to cooperate with the numbered calibration on the dial 14. By means of the single handle knob 13 the shaft 12 may be either rotated or slid longitudinally, the rotative movement of this shaft being effective to operate an ignition switch and the longitudinal sliding movement thereof being effective to operate an engine starting switch, as will presently appear.

The bearing sleeve 10 is independently rotatable and upon its inner reduced end portion has fixed a rocking segmental or sector-shaped switch member 15 of suitable insulating material, this element forming the movable part of a switch in control of

the lighting system of the automobile. The boss or hub portion 16 of a downwardly extending switch handle 17 is pivoted on the shaft 12 at the rear of the dial 14 and is coupled to the segment-carrying sleeve 10 by means of an interposed loose coupling sleeve 18, the sleeves 10 and 18 and the hub 16 all being provided with interengaging abrupt-faced grooves and teeth, as shown most clearly in Fig. 2. The switch handle 17 extends downward in a recessed portion 19 of the face plate 9 to the lower edge of the dial 14 and then outwardly and then downwardly over the front face of an arcuate downward extension or skirt 20 on the face plate 9, which may be provided with symbols as shown in Figs. 6 and 7 to indicate the circuit conditions in the lighting system. The insulating segment 15 upon its arcuate or segmental periphery carries contact members to be moved thereby for making and breaking the various circuits in the lighting system, the arrangement of which may be anything desired and that shown in the drawings will be hereinafter described. However, it may be noted at this point that by reason of the lighting switch handle 17 being in immediate proximity to the handle knob 13 the hand of the driver may always conveniently and habitually seek the same location for effecting the control of substantially the entire electrical equipment of the automobile, which may be accomplished without removing his hand from the handle knob 13.

In carrying out the present invention, the switch in control of the ignition circuit includes in its construction a permutation device which operates similarly to a combination lock for thereby preventing the unauthorized closing of this switch. This permutation device in so far as its control of the ignition circuit per se is concerned may be similar to or substantially the same as that disclosed in the patent to George W. Lawrence, No. 1,185,690 of June 6, 1916. However, according to the present invention the permutation device embodied therein includes features of construction by reason of which it cooperates with other parts of the switch device of the present invention to form a lock therefor, as will presently appear. The permutation device shown in the drawings will first be described with reference to its operation as a switch in the ignition supply circuit.

In the construction shown three rotatable circuit-controlling discs 21, 22 and 23 are coaxially mounted on the shaft 12, although any number of such discs desired may be employed. These discs are provided with hub portions, as shown, by which the peripheral portions of adjacent discs are spaced from one another. These discs are formed of suitable insulating material and

are fixed respectively upon metallic bushing sleeves 24, 25 and 26. The hub and bushing of the rearmost disc 23 abuts against the adjacent face of the shaft bearing 5 while the bushing sleeve 24 of the first or forward disc 21 extends forward to the rear end of the segment-carrying bearing sleeve 10 so that thereby any sliding movement of these discs is prevented. The first disc 21 is coupled to the shaft 12 to be directly rotated thereby by means shown as a pin 27 in the bushing sleeve 24 passing through a longitudinal slot 28 in the shaft 12, thereby providing for longitudinal sliding movement of this shaft. The bushings 25 and 26 for the discs 22 and 23 are normally loose upon the shaft 12, the second disc 22 being rotated from the first disc 21 and, in turn, the third disc 23 being rotated from the middle disc 22, in each instance by means of interposed pick-up devices shown as usual circumferentially aligned pins or studs 29 which project from the adjacent sides of the discs. Means presently to be described are provided for yieldingly retaining the circuit-controlling permutation discs 21, 22 and 23 in rotatively adjusted positions.

When the first disc 21 is rotated by means of the shaft 12 and handle knob 13, in due course of its rotation it will pick up the second or middle disc 22 which will then rotate therewith, and, in turn, this middle disc 22 will pick up the third or last disc 23 in a similar manner so that then all of the discs will rotate with the shaft 12. This rotation is continued in the same direction until the third disc 23 is brought to the desired correct position then the direction of rotation of the shaft is reversed and this rotation continued until the first disc 21 picks up the second disc 22 and brings it to the desired correct position, whereupon the direction of rotation of the shaft is again reversed and rotated in the original direction until the first disc 21 is brought to the desired correct position. The correct positions of these discs may be determined by means of the numbered graduations on the dial 14 in their relation to an indication, such as the above noted index line or mark on the face plate 9, and this correct positioning of the permutation discs can be accomplished only by some one who knows the combination.

Each of the discs 21, 22 and 23 is provided on its periphery with a continuous series of equidistantly spaced sloping and rounded teeth shown as sixteen in number. The bottoms of the rounded notches formed between two pairs of these teeth, in peripherally spaced relation, are formed by the opposite ends of an electrically conductive bar 30 forming a movable contact member carried by the disc and shown as imbedded in the insulating disc, there being a similar contact member 30 carried by each of the

discs 21, 22 and 23. In the construction shown in the drawings the movable contact member or switch member 30 forms a conductive bridge past six of the teeth on the insulating disc by which it is carried. A pair of similar upstanding spring contact strips 31 and 32 is provided for each of the discs 21, 22 and 23. These contact springs at their lower ends are secured by means of screws, as shown, to longitudinally extending insulating blocks 33 and these blocks are secured by suitable means, such as screws (not shown), to the bottom plate 1 of the frame. Each of the spring contact strips 31 and 32 is turned inwardly towards its disc and adjacent its free end is turned outwardly to form a rounded contact point to engage between the teeth on the disc. These contact springs 31 and 32 are so positioned that when the corresponding disc is brought to the correct position its contact member 30 will bridge and form an electrical connection between the contact springs 31 and 32, as shown most clearly in Fig. 4, for the disc 21. In the construction shown the contact points of the spring strips 31 are in alignment and the contact points of the spring strips 32 are likewise in alignment, these aligned contact points of the strips 31 and 32 being respectively at opposite sides of the tops of the permutation discs. The spring contact strips 31 and 32 by reason of the engagement of their rounded contact points between the sloping teeth of the discs also are effective yieldingly to retain each of the discs 21, 22 and 23 at any one of its sixteen different rotative positions, these contact springs yielding to permit manual rotation of the discs as will be readily understood. When all of the discs 21, 22 and 23 are correctly rotatively positioned then each of the movable contact members 30 will form a conductive bridge between its associated contact springs 31 and 32.

The contact spring 32 for the disc 23 is connected to the contact spring 32 for the disc 22 by means of a conductive strip 34 and similarly the contact spring 31 for the second disc 22 is connected to the contact spring 31 for the first disc 21 by means of a similar conductive strip 35, so that thereby when all of the discs are correctly positioned, as above noted, all of the contact springs and all of the bridging contact members 30 will then be electrically connected in series from the contact spring 31 for the third disc 23 to the contact spring 32 for the first disc 21, thereby to establish or close the ignition supply circuit through the switch. The contact spring 31 for the third disc 23 is supplied with battery current through a wire 36 connected to a terminal 37, which may be an ordinary binding post, to which is connected a battery lead 38, and in Fig. 2 this terminal is shown as a binding post mounted

upon and insulated from the end wall 3 of the frame. A wire 39 for supplying the ignition circuit is connected to the contact spring 32 for the first disc 21, as is shown in Figs. 2 and 8. In Fig. 8 the complete series connection through the switch, including the movable contact members 30, may be readily traced, this condition occurring only when the contact carrying discs 21, 22 and 23 have been set to the correct combination. Obviously there are a great number of possible combinations, and the particular combination which is effective to establish a circuit through the switch may be changed by varying the circumferential positions of the pick-up studs 29 relatively to the contact members 30 on the respective discs.

The operation of the permutation device as so far described as a switch in control of the ignition supply circuit is substantially the same as that of the electric switch disclosed in the above noted patent, however, in the present invention the permutation device has further features of construction by reason of which it becomes also a combination or permutation lock, thereby at the same time operating to accomplish two results.

The means provided according to the present invention for operating a switch in the engine starting circuit in co-ordinated interlocking relation with the operation of the above described ignition supply switch, including the permutation feature thereof, and by means of the same manually operable shaft 12 through the manipulation of its handle knob 13 will now be described. The rear end wall 3 of the frame supports at the rear or outer side thereof a pair of suitably spaced rearwardly projecting and flaring contact members 40 which at their forward ends are turned outwardly and secured to the end wall 3 by means of bolts 41 which form binding posts, the contact members 40 and bolts 41 being insulated from the end wall 3 of the frame by means of interposed flanged insulating bushings 42 and insulating washers 43. One of the binding posts 41 is connected by means of a wire 44 to the terminal binding post 37 to which the battery lead 38 is connected and the other binding post 41 has connected thereto a wire 45 which goes to the usual engine starting motor. The insulation for the binding post 37 is similar to that for the binding posts 41. The contact members 40 are located diametrically on opposite sides of the shaft 12 and should be resilient and of rather heavy material. A forwardly tapering contact member 46, shown as a conically tapered block or plug, is carried by the rearwardly projecting end portion of the manually operable shaft 12, being insulated therefrom by means of flanged insulating bushings 47 and being held firmly upon the shaft by means

of collars 48 and 49 which engage the outer flanged ends of the insulating bushings 47 and are fixed upon the shaft 12, for example, by pinning them thereto as shown in the drawings.

When the manually operable shaft 12 has sliding movement imparted thereto in a forward direction, it will carry with it the movable contact member or block 46 which will then conductively bridge the spaced contact member 40 and close the engine starting circuit. Normally, that is to say, excepting when it is desired to close the engine starting circuit, the shaft 12 will be at the rearward position of its sliding movement with the engine starting circuit broken, as shown in Figs. 1 and 2 of the drawings. The ignition supply circuit may then be repeatedly opened and closed as desired, either the open circuit condition or the closed circuit condition of the ignition supply switch being brought about through rotative movement of the shaft 12, as hereinbefore described. In accordance with the invention interlocking means are provided for locking the manually operable shaft 12 against forward sliding circuit closing movement away from its normal position when the ignition supply circuit through the ignition switch is open, and to permit such forward sliding movement of the shaft 12 for closing the starter circuit when the ignition switch is closed. In the illustrated embodiment of the invention, an interlocking device for thus locking or releasing the shaft 12 is combined with the switch discs 21, 22 and 23 so as to be controlled by these discs according to their rotative positions.

The shaft 12 is provided with a longitudinal series of three radially projecting locking studs 50, 51 and 52 which are shown as arranged in alignment along the shaft. The forward movement of the middle locking stud 50 is controlled and determined by the rotative position of the third permutation disc 23, the forward movement of the forwardly located locking stud 51 is controlled and determined by the rotative position of the second permutation disc 22 and similarly the forward movement of the rearmost locking stud 52 is controlled and determined by the rotative position of the first permutation disc 21 which it will be remembered always rotates with the shaft 12. It will be noted, therefore, that forward sliding movement of the shaft 12 is conjointly controlled by the three permutation discs 21, 22 and 23 as determined by their rotative positions. The middle locking stud 50 normally projects into an annular shoulder-forming internal notch 53 provided in the rear end of the bushing 26 of the third permutation disc 23, the forwardly located locking stud 51 similarly normally projects into a similar annular notch 54 pro-

vided in the rear end of the bushing 25 of the middle permutation disc 22 and the rear-most locking stud 52 normally projects just at the rear end face of the shaft bearing 5 thereby normally to permit free rotation of the shaft 12 for setting the permutation discs 21, 22 and 23, or for destroying the combination thereof, as desired. When the combination is destroyed the shoulders 10 formed by the annular notches 53 and 54 and by the rear end face of the bearing 5 cooperate respectively, either one or all, with the respective locking studs 50, 51 and 52 to lock the shaft 12 against forward sliding movement. The bushing 26 is provided 15 with an internal longitudinal slot 55 for the reception of the locking stud 50, the bushing 25 is provided with a similar slot 56 for the reception of the locking stud 51 and the bearing 5 is provided, in its upper side, 20 with a longitudinal slot 57 for the reception of the locking stud 52. The slot 57 is in a radial plane passing midway between the spaced ends of the contact springs 31 and 32, the aligned locking studs 50, 51 and 52 are in a radial plane passing midway between the ends of the contact member 30 on the first permutation disc 21, and the slots 56 and 55 have a similar relation respectively to the contact members 30 on the second 30 and third permutation discs 22 and 23, so that, in the construction shown in the drawings, all of the locking studs and slots will be in alignment when the ignition supply 35 circuit is closed. First the slot 55 is brought into alignment with the slot 57 by positioning of the third permutation disc 23, then the slot 56 is brought into alignment with the slot 55 by the positioning of the second permutation disc 22, and finally 40 the locking stud 52 is brought into alignment with the slot 57 in the bearing 5 by the positioning of the first permutation disc 21, which then closes the ignition supply circuit through all of the movable contact 45 members 30. The shaft 12 is then free to be slid forwardly or outwardly by means of its handle knob 13 thereby to draw the movable contact member 46 into contact with 50 the flaring contact members 40 for closing the engine starting circuit.

It will be evident from the foregoing description that the engine starting switch cannot be closed until after the ignition 55 switch has been first closed, thereby preventing the possibility of exhausting the battery through efforts to start the engine with the ignition switch open. Also it will be noted, by reason of the engagement of the 60 locking stud 52 on the shaft 12 in the slot 57 in the bearing 5, that the shaft 12 cannot be rotated to open the ignition switch during the time that the starter switch is closed. After the engine has started, the 65 shaft 12 is pushed inward to its original or

normal position where it will be stopped by the inner face of the dial 14 abutting against the outer face of the face plate 9. The shaft 12 is left at this latter position for running 70 the engine and when it is desired to stop the engine, the shaft may be rotated in either direction to open the switch in the ignition supply circuit and, if desired, the shaft may be rotated sufficiently to break or 75 destroy the combination. It is to be noted that the permutation discs 21, 22 and 23 perform two different but correlated functions, first, in that these discs control the ignition supply circuit to render it opera- 80 tive or non-operative, in the particular construction shown these discs carrying and directly operating the movable contact members 30 which open and close this circuit, and second, in that these discs control the 85 operation of the above described interlocking device which locks the switch in the engine starting circuit against being closed while the switch in the ignition supply circuit is open, and which also locks the latter 90 switch against being opened while the starter switch is closed. It may be noted in this connection that the above described permutation locking device or combination lock could be employed for locking a single 95 switch independently of any other, such, for example, as the above described engine starting switch independently of the switch in control of the ignition supply circuit.

The control of the lighting circuits of the car through rocking movements imparted to 100 the segmental switch member 15 by means of its handle lever 17 will now be described. In the construction shown four spring contact strips 58, 59, 60 and 61, two at each side of 105 the insulating sector 15, are secured at their lower ends to the insulating blocks 33, from which they project upwardly and are turned inwardly toward the sector 15, the free ends of these contact springs being bent in 110 crimped form, as shown most clearly in Fig. 3, thereby to form contact points which will be effective for yieldingly holding the sector 15 in adjusted position, as will presently appear. The contact spring 58 has a wire 62 115 connected thereto and to the battery terminal 37. The contact spring 59 has a wire 63 connected thereto for supplying current to the tail light, the contact spring 60 has a wire 64 connected thereto for supplying current to the coach lights and the contact 120 spring 61 has a wire 65 connected thereto for supplying current to the head lights.

The insulating rocking segmental switch member 15 on its arcuate periphery carries 125 a plurality of radially projecting rounded metallic holding teeth which cooperate with the spring contacts 58, 59, 60 and 61 for holding the sector 15 in adjusted position and for making and breaking the several 130 lighting connections, some of these teeth

having electrical connections and others having none, and these toothed contact making and breaking members will now be described in connection with the circuits which are controlled thereby. When the switch operating handle 17 is at the extreme right or off position indicated by the symbol "O" in Figs. 6 and 7, the battery-connected spring contact 58 is then in engagement with a short holding tooth 66 which has no electrical connection and therefore all of the lights are out, and at the same time the spring contact 59 for the tail light is in engagement with another short holding tooth 67. When the handle 17 is shifted to the next position, indicated by the word "Tail", the battery-connected spring contact 58 will be in engagement with a long tooth 68 with which the spring contact 59 for the tail light is also in engagement, so that the tail light will then be lighted, but no other lamps will be lighted, by reason of the fact that the tooth 68 has no other electrical connection. Also at this time the coach light and head light spring contacts 60 and 61 will be in engagement with a long tooth 69 which is merely a holding tooth having no connection to the battery. When the handle 17 is shifted to its next position, indicated by the symbol "CL" for coach lights and the word "Tail", that being the position shown in the drawings, the spring contacts 58 and 59 will be connected together by a long tooth on the upper end of a three-toothed contact member 70 for lighting the tail light, and at this time the spring contact 60 for the coach lights will be in engagement with a short tooth 71 which is in electrical connection through conductors 72 and 73 with the contact member 70, so that the coach lights will also be lighted, the spring contact 61 for the head lights being in engagement with a short holding tooth 74 which has no electrical connection and accordingly the head lights are out, these being the circuit connections illustrated in the drawings, of which see Figs. 2, 3 and 8. When the switch lever 17 is moved to its next position, indicated by the symbol "H. L.—D.", the spring contacts 58 and 59 will engage the middle tooth on the three-toothed contact member 70 so that the tail light will remain lighted, the spring contact 60 for the coach lights will engage a short holding tooth 75 so that the coach lights will be extinguished, and at the same time the spring contact 61 for the head lights will engage a short contact tooth 76 which is electrically connected through a resistance 77 with the conductor 72 so that the head lights will be lighted but will be dim, as is indicated by the symbol. When the switch lever 17 is shifted to the left to its final position, as indicated by the symbol "H. L.—B.", the spring contacts 58 and 59 will engage the third or last tooth on the contact member 70

to light the tail light while at the same time the spring contact 60 for the coach lights will engage a short holding tooth 78 so that the coach lights will remain unlighted and the spring contact 61 for the head lights engages a short contact tooth 79 to which the contact member 70 is directly connected by the conductor 72 so that the lighted head lights will now be bright, as indicated by the symbol. The contact-carrying switch member 15 will be stopped at each of its extreme positions by abutting against the insulating blocks 33, as is clear from Fig. 3.

It is to be understood that the lighting system and the manner of effecting the control thereof by means of the rocking contact-carrying member 15 may be anything desired. The above described system is shown only as one example of lighting circuits which are commonly employed upon automobiles, and the above described sequence of operation thereof is one that is commonly desirable. Substantially any number of circuits can be controlled in substantially any manner desired, depending upon the number and arrangement of the movable contact members carried by the rocking switch member 15, and of the contact springs which cooperate therewith. For example, instrument lights are commonly employed upon the instrument board, and the circuits of these lights also may be controlled by the switch member 15 and its handle 17, if so desired.

In accordance with the present invention, it is to be noted that the usual engine starting pedal has been entirely done away with. In operating the switch device of the present invention, the driver may manipulate the single handle knob 13 without removing his hand therefrom, thereby successively to close the ignition supply circuit, to close the engine starting circuit and then open the latter, and these operations can not be performed in any other than this proper sequence. Also he may open or close the ignition supply circuit at any time desired independently, and, if desired, he may disarrange the combination so as to prevent unauthorized use of the automobile. Furthermore, he may effect any desired control of the lighting system while his hand is still upon the same handle knob 13.

It is obvious that various modifications may be made in the construction shown in the drawings and above particularly described, within the principle and scope of the invention as defined in the appended claims.

I claim:

1. An electric switch device comprising a frame, a manually operable rotatable and longitudinally slidable operating shaft mounted on the frame and provided with an operating handle, a series of switch-operating permutation members coaxial with the

shaft and one of which is rotative therewith, lost motion pick-up driving connection between the adjacent members whereby all of said members may be rotatively driven from said shaft, a switch operable conjointly by said members when the latter are in a predetermined rotative position relatively to each other and to the said frame, a second switch operable by the sliding movement of said shaft, and interlocking means between said shaft and said frame and between said shaft and at least one of said members effective to prevent the sliding of said shaft to operate said second switch until after said members have been brought to said relative rotative position in which they operate said first-named switch.

2. An electric switch device comprising a frame, a manually operable rotatable and longitudinally slidable operating shaft mounted on the frame and provided with an operating handle, a series of switch-operating permutation members coaxial with the shaft and one of which is rotative therewith, lost motion pick-up driving connection between the adjacent members whereby all of said members may be rotatively driven from said shaft, a switch operable conjointly by said members when the latter are in a predetermined rotative position relatively to each other and to the said frame, a second switch operable by the sliding movement of said shaft, and interlocking means between said shaft and said frame and between said shaft and at least one of said members effective to prevent the sliding of said shaft to operate said second switch until after said members have been brought to said relative rotative position in which they operate said first-named switch, and after sliding switch-operating movement has been imparted to said shaft then effective to prevent rotative movement of said members until said shaft has been slid back to restore said second switch to its original condition, whereupon said members may be repeatedly rotated by means of said shaft for thereby repeatedly changing the circuit controlling condition of said first-named switch as desired.

3. An electric switch device comprising a manually operable shaft mounted to have rotative movement and sliding movement and provided with a handle for imparting such movements thereto, a permutation device settable by the rotative movements of said shaft and forming a switch to be closed and opened, a switch to be closed by the sliding movement of said shaft in one direction and opened by the sliding movement of said shaft in the opposite direction, and an interlocking device cooperating with said shaft and with the permutation device to lock the shaft against sliding switch closing movement when the said first-named switch is open.

4. An electric switch device comprising a manually operable shaft mounted to have rotative movement and sliding movement and provided with a handle for imparting such movements thereto, a permutation device settable by the rotative movements of said shaft and forming a switch to be closed and opened, a switch to be closed by the sliding movement of said shaft in one direction and opened by the sliding movement of said shaft in the opposite direction, and an interlocking device cooperating with said shaft and with the permutation device to lock the shaft against sliding switch closing movement when the said first-named switch is open and to lock said shaft against rotative switch opening movement when the said last named switch is closed.

5. In a system of electric circuits for automobiles including an ignition supply circuit and an engine starting circuit, a switch device comprising a manually operable shaft mounted to have rotative movement and sliding movement and provided with a handle for imparting such movements thereto, a permutation device settable by the rotative movements of said shaft and forming a switch for closing and opening the ignition supply circuit, a switch for the engine starting circuit closed by the sliding movement of said shaft in one direction and opened by the sliding movement of said shaft in the opposite direction, and an interlocking device cooperating with said shaft and with the permutation device to lock the shaft against sliding circuit closing movement when the said switch for the ignition supply circuit is open and to lock said shaft against rotative switch opening movement when the engine starting switch is closed.

6. An electric switch device comprising a manually operable shaft mounted to have rotative movement and to have sliding movement and provided with an operating handle for imparting such movements thereto, a circuit-controlling switch to be closed by the sliding movement of said shaft in one direction and to be opened by the sliding movement of said shaft in the opposite direction, a permutation device having rotatable permutation member coaxial with said shaft and one of which is rotatable therewith for setting the combination of the permutation device by rotative movements imparted to the shaft, a circuit-controlling switch to be closed by said members only when they are set to a predetermined correct combination and to be opened by said members, and an interlocking device cooperating with said shaft and said permutation device to lock said shaft against sliding switch closing movement when the said last named switch is open and to lock said shaft against rotative switch opening movement when the said first named switch is closed.

7. An electric switch device comprising a manually operable shaft mounted to have rotative movement and to have sliding movement and provided with an operating handle for imparting such movements thereto, a circuit-controlling switch to be operated by the sliding movement of said shaft in one direction and to be reversely operated by the sliding movement of said shaft in the opposite direction, a permutation device having rotatable permutation members coaxial with said shaft and one of which is rotatable therewith for setting the combination of the permutation device by rotative movements imparted to said shaft, a switch to be operated by rotative movements of said members, and an interlocking device co-operating with said shaft and said permutation device to lock said shaft against one of its said sliding switch operating movements excepting only when said permutation device has been set to the correct combination by proper rotative

movements of said shaft, and after sliding switch-operating movement has been imparted to said shaft then effective to lock said shaft against rotative switch-operating movement.

8. An electric switch device comprising a manually operable rotatable and longitudinally slidable shaft, a permutation device having permutation members settable by rotative movements of said shaft, a switch to be operated by said members only when they are set to a predetermined correct combination by proper rotative movements of said shaft, a second switch to be operated by the sliding movements of said shaft, and an interlocking device cooperating with said shaft and with said members to compel the operation of said switches first in one sequence and then in a reversed sequence.

In witness whereof, I hereunto subscribe my signature.

DAVID M. TULLOCH.