S. P. HULL.

CIRCUIT CONTROLLER.

APPLICATION FILED JULY 25, 1912.

1,047,415.

Patented Dec. 17, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

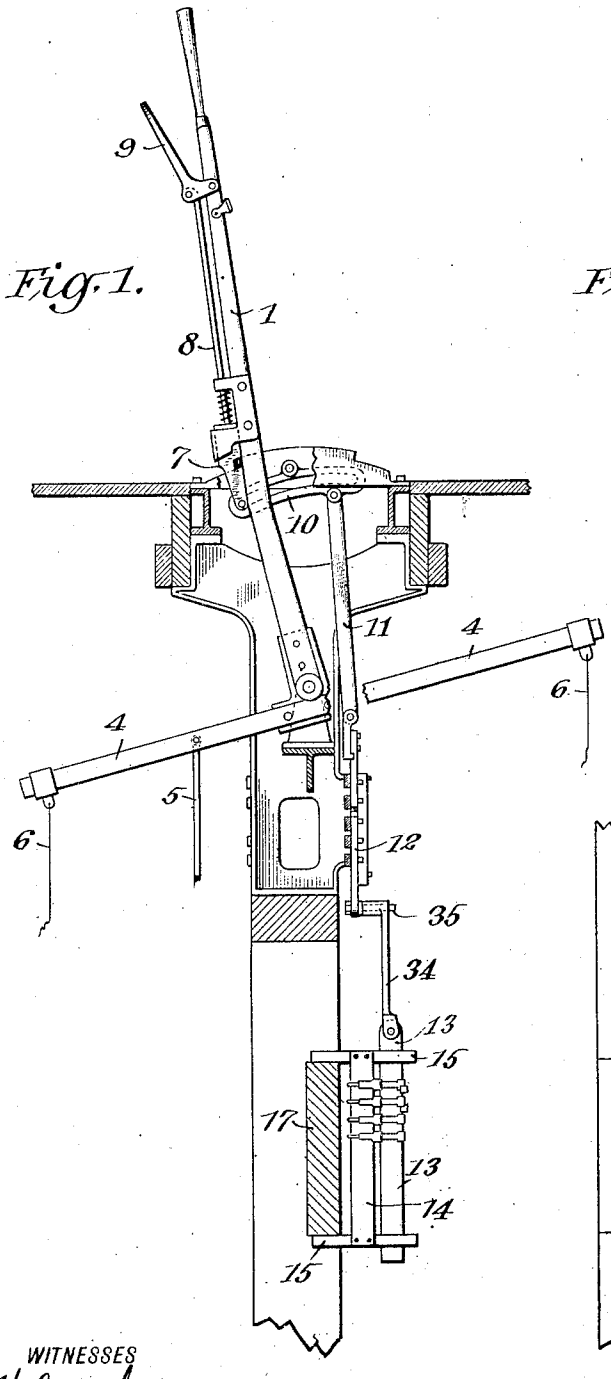
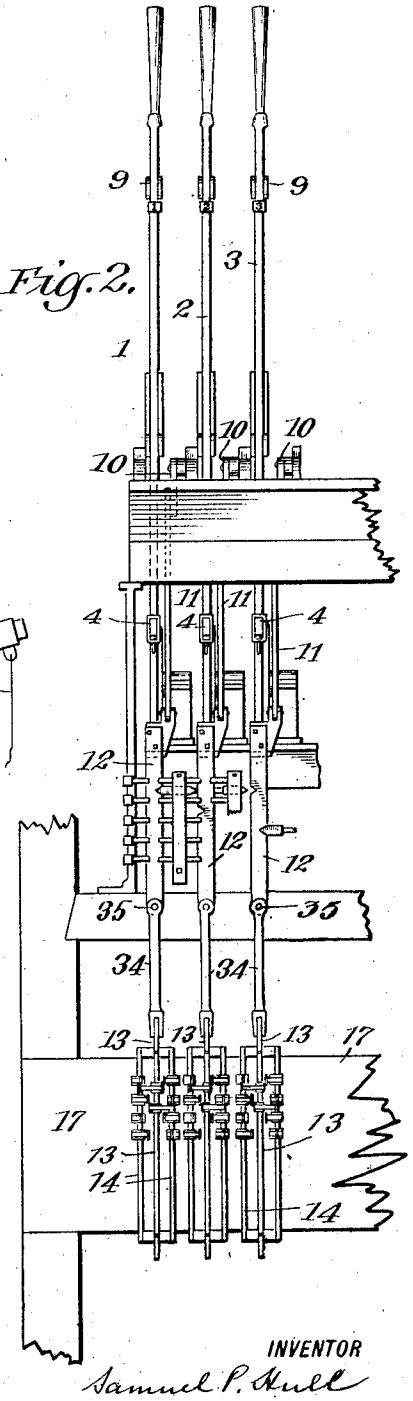


Fig. 2.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 3

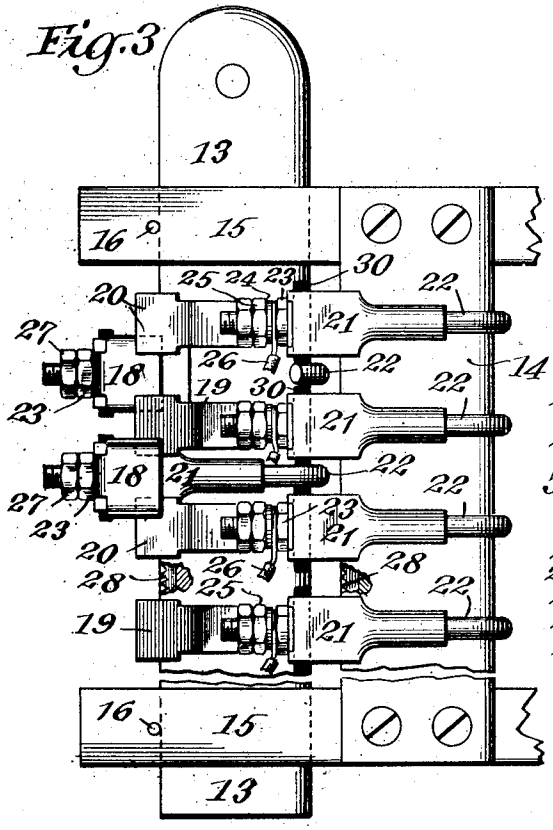


Fig. 4.

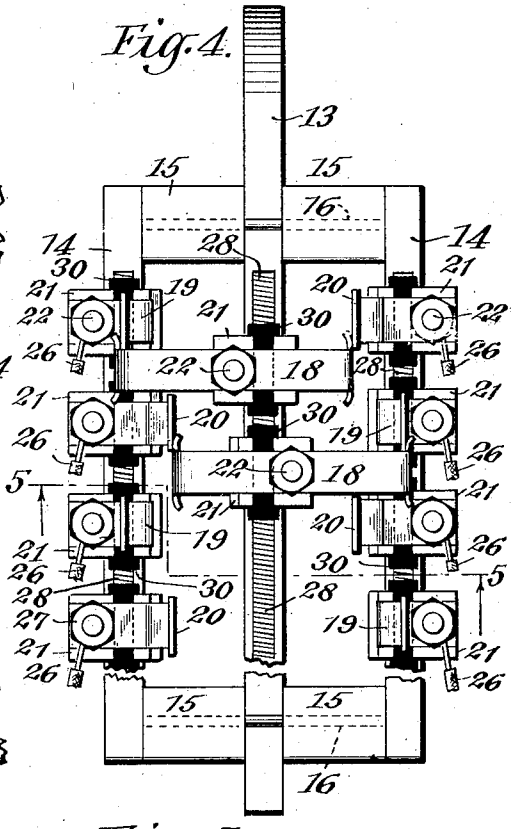


Fig. 5

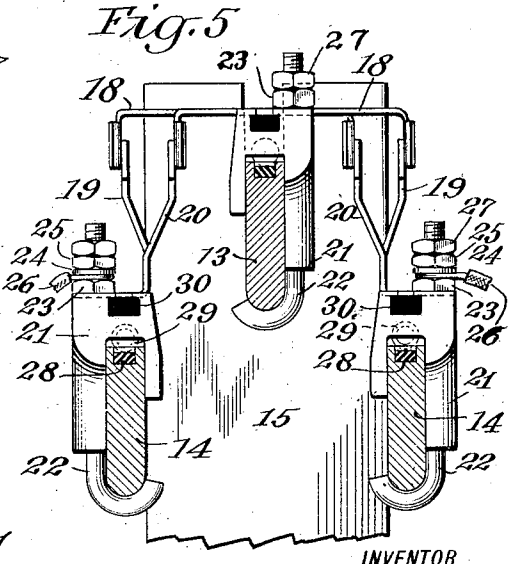


Fig. 6.

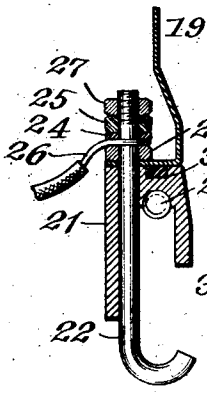


Fig. 7.

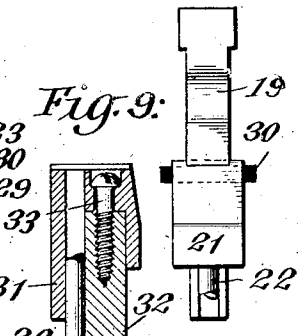
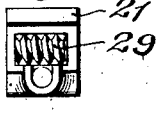


Fig. 8.



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CIRCUIT-CONTROLLER.

1,047,415. Specification of Letters Patent. Patented Dec. 17, 1912.

Application filed July 25, 1912. Serial No. 711,442.

To all whom it may concern:

Be it known that I, SAMUEL P. HULL, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Circuit-Controllers, of which the following is a specification, reference being had therein to the accompanying drawings, forming part thereof.

My invention relates generally to electric circuit controllers and relates particularly to circuit controllers for use in connection with the tappet bars of interlocking machines employed for controlling railway switches and signals.

One of the prime objects of my invention is compactness of construction while complying with standard requirements, enabling a large number of circuits to be controlled by each tappet bar.

Another important object of my invention is to permit a wide variety in the circuits controlled.

Other more general objects of my invention are inexpensiveness of manufacture, effectiveness of operation, non-liability of derangement, simplicity of construction, economy of time and labor in installing and in effecting adjustments, and interchangeability of a large number of parts of the device.

Other more particular objects and advantages of my invention will hereinafter appear.

My invention includes relatively movable contact members arranged in staggered or offset relation so that their paths of movement may overlap in the general direction of their circuit-controlling movement.

My invention also includes means providing for adjustment of the contact members to all desired positions along supporting bars, at least one of which is longitudinally shiftable to effect the circuit-controlling operation.

My invention also includes details of construction and combinations of parts, as will appear from the following description.

I shall now describe the circuit controller embodying my invention illustrated in the accompanying drawings and shall thereafter point out my invention in claims.

Figure 1 is a side elevation, with parts broken away, and the framework in vertical section, of an interlocking machine, and shows in side elevation one of my improved circuit controllers mounted on the framework and operatively connected to the tappet bar of the interlocking machine. Fig. 2 is a front elevation of the machine illustrated in Fig. 1 as seen from the right, and shows three levers of the machine, and shows front elevations of three of my improved circuit controllers connected to the tappet bars corresponding to the respective levers. Fig. 3 is an enlarged side elevation, with parts in section and parts omitted, of my improved circuit controller, looking toward the side which is in rear in Fig. 1. Fig. 4 is a front elevation as seen from the left in Fig. 3. Fig. 5 is a transverse section on planes indicated by line 5—5 of Fig. 4, as viewed from below. Fig. 6 is a transverse section of one of the clamps for adjustably holding the contact springs in place on the supporting bars. Fig. 7 is an elevation of the same as viewed from the right in Fig. 6 with the hook end of the clamp bolt omitted. Fig. 8 is an inverted plan as viewed from below in Figs. 6 and 7 with the hook bolt omitted. Fig. 9 is a transverse section illustrating a modified form of clamp for holding the contact springs on the bars.

While in the accompanying drawings I have illustrated my improved circuit controller as embodied for use with an interlocking machine of a well known and largely used type, it is to be understood that my invention is in no sense restricted to use with this particular style or type of interlocking machine, but could be employed with advantage with many other types of interlocking machines. Furthermore, while the circuit controller of my invention is particularly intended and especially constructed for use with interlocking switch and signal controlling machines in the railway traffic-controlling art, it is to be understood that the use of my improved circuit controller, particularly as to the broader inventive ideas embodied therein, is not necessarily restricted to such art. When the circuit controller of my invention is embodied in an interlocking machine, as illustrated in Figs. 1 and 2 of the drawings, its extreme compactness and flexibility as to circuit combinations are peculiarly advantageous.

Although interlocking machines are well known in the art, a brief description of the one illustrated in the drawings, and with

which my improved circuit controller is shown as operatively connected, may materially assist to a clear understanding of the invention. In railway traffic-controlling operations it is of great advantage to be able to control a large number of circuits and also to be able to effect a maximum of variations in the arrangements of the various circuits, and in the case of interlocking machines the problem is rendered more difficult by reason of the fact that the available space for the circuit controllers is limited, particularly in a lateral direction, for the reason that the switch and signal controlling levers such as 1, 2 and 3 (Figs. 1 and 2) are arranged in banks as closely together as possible.

The levers 1, 2 and 3 are shown as provided with cross-bars or bell-crank arms 4 for operating switches and signals, in Fig. 1 the operation of a switch being indicated by the rod 5 connected to the arm 4 and the operation of a signal being indicated by the wires 6 connected to the ends of such arm. The interlocking between the levers 1, 2, 3, etc., is controlled, as is common in interlocking machines, by the lever latches 7, actuated by latch rods 8 and hand grips 9 (Fig. 1).

In the particular interlocking machine illustrated in the drawings, the usual arcuate slotted rockers 10 are pivoted on the frame of the machine and are pivotally connected near their forward ends by means of rocker links 11 to the upper ends of vertically arranged tappet bars 12, and the lever latches 7 have pins engaging in the slots of the rockers 10. The arrangement is such that the tappet bar 12 will be moved downward a certain distance by the raising of the latch 7 to unlock the lever, will remain stationary at a middle position during the movement of the lever, and will receive a further downward movement when the latch 7 descends to lock the lever in the reverse position. The tappet bars 12 mechanically control the interlocking between the several levers, the first movement of a tappet bar effecting the locking of all levers which should not be moved and the final movement of the tappet bar effecting the unlocking of all levers which may then be moved.

In addition to the mechanical interlocking of the levers which directly and mechanically control switches and signals, the demands of service require also the electrical control of switches and signals, and for this purpose electrical circuit controllers are employed and are operated from the tappet bars of the interlocking machines.

The construction and operation of the circuit controller of my invention will now be particularly described.

In the particular embodiment of my invention illustrated in the drawings, movable contact members are mounted on a longitudinally shiftable flat operating bar 13, and stationary contact members are mounted on similar stationary bars 14, all of the bars being of suitable insulating material, such as wood. The stationary bars 14 are shown as arranged parallel to the shiftable bar 13 at each side and in rear thereof. The stationary bars 14 may form a part of the frame of the unitary device and are shown as firmly secured at their ends by means of screws to end supports 15. The end supports 15 are bifurcated at the front to form guide-ways for the shiftable bar 13, which is slidably held in place in the forks of these supports by means of transverse retaining pins 16. The end supports 15 project backward from the stationary side bars 14 and provide means for supporting the circuit controller on the framework of the interlocking machine and may be conveniently secured on the opposite edges of a cross timber 17 of the gallows frame (Figs. 1 and 2).

The slidable bar 13 carries a series of electrical contact members 18 forming electrically conductive bridges. The movable contact members or bridges 18 may be formed of strips of sheet metal extending transversely of the longitudinally movable bar 13, and are shown as provided with rearwardly turned contact-making end portions which are somewhat wider than the middle or transverse portions of these members and are turned slightly in a lateral direction to provide sloping contact shoulders. The contact strips or bridges 18 may all be of like form of construction, as shown, but in any case are so arranged along the carrying bar 13 that their rearwardly extending contact-making end portions occupy relatively offset positions or are in staggered relation, thereby forming a plurality of sets of movable contact members having their contact-making portions movable in spaced parallel planes. In the drawings, only two such movable contact members are shown, one such contact member for each of two sets, but it is to be understood that each of the contact members 18 illustrated could be repeated along the bar 13, it being, in fact, the intention to employ more or fewer of the bridges or movable contact members 18 in each set according to the particular requirements of the installation. By reason of their offset or staggered arrangement, the contact members 18 may be placed closer together on the bar 13 than otherwise, and this is likewise true of the stationary contact members mounted on the stationary bars 14.

The stationary contact members are shown as forwardly projecting flat springs 19 and 20. The contact springs 19 and 20 may all be of similar construction, excepting that

the contact springs 19 are bent laterally in one direction and the contact springs 20 are bent laterally in the other direction, so that their forward contact-making end portions will be disposed in offset or staggered relation, as shown in the drawings, and corresponding to the staggered contact-making end portions of the contact bridges 18. The contact springs 19 and 20 are shown as arranged in two sets, the staggered contact-making portions of which are arranged in parallel planes in the paths of corresponding contact-making portions of the movable contact members 18. The contact members 19 and 20 have greater width in their contact-making end portions to thereby permit the required overlapping engagement of the correspondingly widened portions of the movable contact members 18 with the limited amount of movement available in an interlocking machine, while also permitting the several contact members to be arranged closely together in series along the supporting bars 13 and 14.

The means provided for holding the electric contact members 18, 19 and 20 on the bars 13 and 14 are so constructed as to permit the adjustment of such electric contact members, including the conductive bridges 18 and the contact springs 19 and 20, to all intermediate positions along the respective bars 13 and 14. Such supporting and adjusting means comprise clamps, which may be of like or uniform construction throughout, for adjustably securing the movable conductive bridges 18 on the shiftable operating bar 13 and for in like manner securing the stationary contact springs 19 and 20 on the stationary bars 14.

The contact member holding clamp includes two principal parts, a carrier block or socket piece 21, which hooks over the front of the bar, and a hook-shaped clamp bolt 22, which hooks over the rear of the bar and passes forward through the carrier block 21 and through the contact member (18, 19 or 20, as the case may be) and serves the purpose of both clamping the carrier block 21 to the bar and securing the contact member to the carrier block. The front face of the carrier block 21 has therein a shallow transverse groove forming low ridges at the sides of the groove and the contact member fits closely in this groove flush with the tops of the ridges, thereby effectually preventing any angular shifting of the contact member on the carrier block. All of the hook bolts 22 are provided with retaining nuts 23. The hook bolts or clamp bolts 22 also serve as binding posts and such bolts for the stationary bars 14 are shown as provided with washers 24 and wire-clamping nuts 25 for clamping in place circuit wires 26, one circuit wire 26 being shown as connected to each contact spring 19 and 20. Circuit wires could in like manner be connected to the contact strips 18, should occasion arise, which, however, will probably be seldom. All of the clamp bolts 22 are provided with usual lock nuts or jam nuts 27.

The clamping means above described permit the adjustment of the contact members 18, 19 and 20 to any positions along the bars 13 and 14 and will firmly hold such contact members at such positions. However, to further assure the rigidity and permanency of the contact members, the carrier blocks 21 and the adjacent faces of the supporting bars 13 and 14 are provided with interengaging gripping means for positively positioning the carrier blocks 21 and the contact members carried thereby. The forward face of each bar 13 and 14 is provided with slightly inclined transverse teeth, and to assure the durability of these teeth they are shown as formed on the exposed face of a strip 28 of tough insulating material, such as indurated fiber (commonly known as "red" fiber), countersunk into the front face of the bar. In its rear face adjacent to the bar, the clamp block 21 is provided with a recess, in which is held a cylindrical spirally-toothed plug 29. The toothed plug 29 may be conveniently formed by simply cutting screw-threads on a cylindrical rod, which may then be cut into suitable lengths. In operation the spiral teeth of the block 29 engage in the inclined teeth on the strip 28 to positively anchor the carrier block 21 in position on the bar. Extremely accurate adjustments may be effected by rotating the block 29, while the bolt 22 is loose, of course, such bolt being afterward tightened.

If desired, the countersunk toothed strip 28 may be omitted and the teeth formed directly on the bar, and in this case preferably the bar should be of some firm material, such as the fiber of which the strips 28 are composed. When the supporting bars 13 and 14 are of wood, as hereinbefore mentioned, the toothed strips 28 may be omitted and the corresponding face of the bars 13 and 14 may be entirely smooth and unprovided with teeth. In this latter case, the teeth of the toothed plugs 29, by reason of the pressure of the clamp bolts 22, will cut into the wood and form therein notches with intervening teeth. In this case, where such teeth have been formed by use, a slight adjustment less than the distance between the teeth of the plug 29 may be effected by rotating the plug 29, as hereinbefore described in reference to the toothed strip 28.

While the toothed engagement of the bars and the clamps and the firm clamping effected by the clamp bolts, having thereon a plurality of nuts, would appear to be sufficient assurance of the permanency of position of the contact members on the bars, yet in the railway traffic-controlling art, including in-

terlocking, every possible safeguard and precaution is and should be employed. Therefore, to obviate even an extremely remote possibility of electrical contact between adjacent or neighboring contact members or of the carrier blocks 21 therefor on the same bar, which might occur through loosening of the clamps, electrically insulative spacing blocks 30 are provided. These spacing blocks may be of any suitable insulating material, such as hard rubber, and may be, as shown, of substantially I-shape, having a reduced middle securing portion and enlarged, projecting end portions or heads. The reduced middle portions of the spacing blocks 30 are received in notches extending parallel with the supporting bar in the front faces of the carrier blocks 21, the spacing blocks lying beneath the contact members and being held in place thereby. The projecting heads of the spacing blocks normally are not in contact with one another, but are substantially spaced, as appears in the drawings, and would not come in contact except under the extreme or unusual conditions above mentioned.

In the modified construction of contact member attaching means illustrated in Fig. 9, a slightly modified carrier block 31 and supporting bar 32 are employed, in which the toothed strip 28, the toothed gripping plug 29 and the emergency spacing blocks 30 are omitted, and in lieu thereof the carrier block 31, in addition to being clamped in place by a hook bolt 22, is assured against displacement or slippage along the bar 32 by means of a wood screw 33 which passes through the forward portion of the carrier block 31 and enters the front of the bar 32, which may be of wood, the screw 33 having its head countersunk beneath the seat for the corresponding contact member by which such screw is covered, and locked in place. The modified construction of Fig. 9 may be employed in many cases in which, after the circuit controller is initially set up or installed, no changes or adjustments are likely to be necessary for a long period.

In using the circuit controller of my present invention with an interlocking machine, as illustrated in Figs. 1 and 2 of the drawings, the upper end of the longitudinally shiftable operating bar 13 is connected with the lower end of a tappet bar 12 by means of a link 34 pivoted at its lower end to the operating bar 13 and pivoted at its upper end on a stud 35 projecting from the lower end of the tappet bar 12.

As hereinbefore explained, the tappet bar 12 has two movements in the same direction for each movement of the lever of the interlocking machine. In the machine illustrated and as is common, the full extent of tappet bar movement is one and one-eighth inches divided into two equal impulses, one impulse occurring when a lever of the machine is unlocked and the other when it is again locked, the tappet bar remaining stationary during the time that the lever is being moved. In the interlocking art, a standard requirement is that electrically conductive parts, such as the carrier blocks 21 and the contact members carried thereby, shall have a minimum spacing or distance between them of at least three-eighths of an inch. The circuit controller of my invention illustrated in the drawings is designed and proportioned to operate under the above described standard conditions as to extent of movement communicated to the operating bar 13 from the tappet bar 12, and also as to the required minimum spacing of the electrically conductive parts of the device.

As illustrated in the drawings, all of the shiftable operating bars 13 are shown in their upper positions, corresponding to the normal positions of the interlocking levers 1, 2, 3, etc. Also throughout the drawings, including the three circuit controllers illustrated in Fig. 2, a similar arrangement of contact members is shown, for simplicity of illustration, but it is to be understood that a different arrangement and number of the contact members could and in practice, as occasion might require, would be employed. In fact, as hereinbefore stated, one of the objects accomplished by my invention is the great number of combinative arrangements of circuits that can be effected by means of this construction, which is very compact in all its dimensions and permits a great many circuits to be opened and closed. Also each installation and each lever of the interlocking machine calls for a peculiar arrangement of circuit opening and closing devices, and the construction permits the widest variation of these operations, by adjustment of the contact members on the shiftable and stationary bars.

In the particular arrangement illustrated in the drawings, the shiftable operating bar 13 carries two movable contact members 18 arranged in offset or staggered relation laterally, and each stationary supporting bar 14 carries four contact springs, two outer springs 19 and two inner springs 20, the springs 19 and 20 being arranged in staggered relation laterally of the device. The arrangement shown provides for four circuits through the circuit controller, two of which are closed in one extreme position of the shiftable operating bar 12, and the other two of which will be closed in the other extreme position of the operating bar, all of the circuits being open when the operating bar is in its intermediate position. In the position of the parts illustrated in the drawings, the uppermost bridging movable contact member 18 is in contact with the uppermost outer contact spring 19

at the left and with the uppermost inner contact spring 20 at the right, completing the circuit between these contact springs. The next and lower movable bridging contact member 18 is arranged on the shiftable operating bar 13 in lateral offset relation to the upper movable contact member and is in contact at the left with an inner contact spring 20 and at the right with an outer contact spring 19, completing the circuit between these contact springs. In the intermediate position of the operating bar 13, all of the circuits shown will be open, the upper bridging contact member 18 then coming opposite the first inner stationary contact spring 20 at the left and opposite the corresponding outer contact spring 19 at the right in spaced relation thereto because of the offsetting or staggered arrangement of all of the contact members. The second movable contact member 18 will come opposite to the second outer stationary contact spring 19 at the left and opposite the second inner stationary contact spring 20 at the right in spaced relation to both of these contact springs. In the lower position of the shiftable operating bar 13, the upper movable contact member 18 will make contact with the second outer stationary contact spring 19 at the left and with the second inner stationary contact spring 20 at the right, completing the circuit through these contact springs. The other or second movable contact member 18 will make contact with the second stationary contact spring 20 at the left and with the second stationary contact spring 19 at the right, completing the circuit through these contact springs. In the position of the parts shown in the drawings, the two upper circuits are closed and the two lower circuits are open; in the lower position of the operating bar 13, the two upper circuits will be open and the two lower circuits closed.

It is to be understood that additional movable and stationary contact members may be attached to the respective shiftable and stationary bars 13 and 14, as is indicated in the drawings by the vacant spaces on the lower portions of the contact-member supporting bars 13 and 14; also that the combinative arrangements of the contact members shown or of additional contact members may be widely varied from the arrangement shown in the drawings, according to the results to be obtained. For example, the arrangement could be such that a movable contact member 18 will remain in contact throughout its movement with a stationary contact spring 19 or 20 at one side of the device and will shift the circuit connection of this contact spring from one to another of the stationary contact springs 19 or 20 at the other side of the device. Many other useful combinations and arrangements of circuit control will readily occur to those skilled in the art, as the exigencies of the case may demand.

It is obvious that various modifications may be made in the constructions shown in the drawings and above particularly described within the principle and scope of my invention.

I claim:

1. An electric circuit controller comprising a longitudinally shiftable operating bar, a plurality of contact members carried by the longitudinally shiftable operating bar and arranged in sets so that the contact-making portions of the contact members of different sets move in different planes, and a plurality of stationary electric contact members arranged in sets corresponding to the sets of movable contact members and having contact-making portions in different planes in the paths of the contact-making portions of the movable contact members of corresponding sets.

2. An electric circuit controller comprising a longitudinally shiftable operating bar, a plurality of electric contact members arranged in two groups alongside of the longitudinally shiftable operating bar, each said group having contact members belonging to a plurality of sets of such contact members having contact-making portions arranged in offset relation, and a plurality of electrically conductive bridges carried by the longitudinally shiftable operating bar for bridging the spaces between the two groups of electric contact members and arranged in sets having contact-making portions in offset relation corresponding to and coöperative with the correspondingly offset contact-making portions of the electric contact members of corresponding sets of such electric contact members.

3. An electric circuit controller comprising a longitudinally shiftable operating bar, two stationary bars alongside of and substantially parallel with the longitudinally shiftable operating bar, a series of electric contact members arranged along and mounted on each stationary bar, and a series of electrically conductive bridges arranged along and mounted on the longitudinally shiftable operating bar for electrically connecting electric contact members on one of the stationary bars with electric contact members on the other stationary bar, the electric contact members and the electrically conductive bridges being arranged in a plurality of corresponding sets with the contact-making portions of each set of the electric contact members arranged in the paths of the contact-making portions of the corresponding set of electrically conductive bridges and out of the paths of the contact-making portions of the electrically conductive bridges of non-corresponding sets.

4. An electric circuit controller comprising a longitudinally shiftable operating bar, two stationary bars alongside of and substantially parallel with the longitudinally shiftable operating bar, a series of electric contact members arranged along and mounted on each stationary bar, a series of electrically conductive bridges arranged along and mounted on the longitudinally shiftable operating bar for electrically connecting electric contact members on one of the stationary bars with electric contact members on the other stationary bar, the electrically conductive bridges and the electric contact members being adjustable to all positions along the respective bars.

5. An electric circuit controller comprising a longitudinally shiftable operating bar, two stationary bars alongside of and substantially parallel with the longitudinally shiftable operating bar, a series of electric contact members arranged along and mounted on each stationary bar, and a series of electrically conductive bridges arranged along and mounted on the longitudinally shiftable operating bar for electrically connecting electric contact members on one of the stationary bars with electric contact members on the other stationary bar, the electric contact members and the electrically conductive bridges being arranged in a plurality of corresponding sets with the contact-making portions of each set of the electric contact members arranged in the paths of the contact-making portions of the corresponding set of electrically conductive bridges and out of the paths of the contact-making portions of the electrically conductive bridges of non-corresponding sets, the electrically conductive bridges and the electric contact members being adjustable to all positions along the respective bars.

6. An electric circuit controller comprising a longitudinally shiftable operating bar, two stationary bars alongside of and substantially parallel with the longitudinally shiftable operating bar, a series of electric contact terminals arranged along and mounted on each stationary bar and arranged on each bar with contact-making portions in staggered relation along the bar, and a series of electrically conductive bridges arranged along and mounted on the longitudinally shiftable operating bar, each such bridge having two contact-making portions, one such contact-making portion for each stationary bar, the bridges having their contact-making portions for each stationary bar arranged in staggered relation along the longitudinally shiftable operating bar, corresponding to the similar staggered arrangement of the contact-making portions of the electric contact terminals of the stationary bars.

7. In an electric circuit controller, in combination, a bar provided along one of its sides with teeth inclined transversely of the bar, an electric contact member, a clamp for holding and positioning the contact member on the bar and provided with a plug-receiving recess adjacent to the toothed side of the bar, and a cylindrical spirally-toothed plug held in the recess of the clamp so that its spiral teeth project into engagement with the inclined teeth on the bar, whereby rotation of the plug will effect an accurate positioning of the clamp longitudinally of the bar.

8. In an electric circuit controller, in combination, a bar, a plurality of electrically conductive contact members, a plurality of clamps adjustable along the bar for holding and spacing the contact members, and electrically insulative spacing blocks carried by the clamps and having portions projecting between the clamps so as to prevent the possibility of an electrical connection being formed between adjacent clamps or contact members.

In testimony whereof I have affixed my signature in presence of two witnesses.

SAMUEL P. HULL.

Witnesses:
HENRY D. WILLIAMS,
BERNARD COWEN.